AGRICULTURAL MARKET ACCESS FOR SOUTH AFRICAN FRUIT PRODUCT EXPORTS IN THE EU UNDER TARIFF RATE QUOTAS (TRQS)

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Declaration

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

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Abstract

The study analysed the access of South African fruit and fruit products into the EU market under tariff rate quotas (TRQs), as granted through the trade agreement between South Africa and the European Union (EU) termed the Trade, Development and Cooperation Agreement (TDCA). The TDCA trade chapter was implemented from 1999 and replaced by the Southern African Development Community-EU-Economic Partnership Agreement (SADC-EU-EPA) at the end of 2016. The TDCA provided a trade liberalisation framework for the promotion of export market access improvements among other development initiatives. The usefulness of TRQs as a trade policy tool in trade agreements – to further the goal of improving market access – forms the primary focus of the questions answered in this research. Fruit and fruit products TRQs of the TDCA have generally not been filled. The extent of influence among tariff and non-tariff factors preventing TRQ fill and the consequential trade and welfare impacts specific to fruit and fruit products TRQ liberalisation concessions of the TDCA are not well understood. This information gap has motivated this study. Four objectives have been analysed in an attempt to establish the impacts of TRQs on the access of South African fruit products to the EU market. The main study objective was to modify the Global Trade Analysis Project (GTAP) Computable General Equilibrium (CGE) model sectors and to innovate the model inputs, to enable an analysis of the market access that the TRQs of the fruit products allow under the TDCA. The publicly available GTAP version 9 database contains complete bilateral trade data and protection linkages among multiple countries and commodities for a single year (2011). Data sourced from various secondary sources, such as the GTAP, TARif Intégré Communautaire/Integrated Tariff of the European Communities (TARIC) and International Monetary Fund (IMF) databases, as well as the primary data sourced through a survey of fruit/fruit products exporting establishments was used. The data analysis methods comprise descriptive analysis, Likert score analysis and CGE analysis of TRQ liberalisation scenarios in a GTAP static model. Three main scenarios containing 10 sub-simulations were simulated

based on the assumptions of full tariff liberalisation, quota expansion and NTMs reduction. The study has argued that a number of tariff and non-tariff influential factors prevent TRQ fill. This study has identified that non-tariff measures (NTMs) exhibit the greatest intensity of influence in preventing quota fill amongst tariff, TRQ administration as well as supply and demand influential factors. The GTAP model analysis shows that partial TRQ liberalisation in which tariff removal is not coupled with TRQ expansion or the removal of some NTMs, weakens South Africa's potential gains in export market access to the EU market. In addition, the analysis of trade liberalisation scenarios indicates that when some NTMs are removed in 2011 pre full implementation of the TDCA in 2012, welfare measured in equivalent variation (EV) improves (US$189 891) in a given year, supporting the assertion that TRQs compound market access barriers and are associated with NTMs. The results show that though exports increase (5% to 37%, TRQ specific) for South Africa, output changes in South Africa are small (<0.1%). The highest welfare gain (US$221 834) was achieved through a combined full tariff liberalisation and some NTMs removal. In the frozen orange juice case, welfare improvements would have been greater for South Africa if TRQ policy (in-quota tariff) distortions had been completely removed in 2011 (US$5611) before the full implementation of the TDCA in 2012, rather than at the end of the TDCA in 2016 (US$4517). Additional welfare loss not accounted for in the EV measure was found to result from uncaptured quota rents that arise when TRQs are not filled. The conclusion is that a delay in concluding and implementing negotiated outcomes as well as a failure to fill TRQs leads to unrecoverable trade and welfare losses. This study recommends other support policies, such as export expansion, to be actively implemented to support the provisions of a trade agreement, such as the fruit and fruit products TRQs of the TDCA. In addition, the quota expansion provision should simultaneously be implemented – with full tariff liberalisation and NTMs removal – in order to improve market access and welfare. The study has contributed a methodological approach to analyse TRQ fill factors through adaptations and innovations of the GTAP model and database to suit TDCA fruit products TRQ

analysis. In addition the study has contributed in the welfare findings of the TDCA assessed in terms of uncaptured quota rents from unfilled TRQs.

Keywords: tariff rate quota (TRQ), welfare, Trade Development and Cooperation Agreement (TDCA), Global Trade Analysis Project (GTAP), computable general equilibrium (CGE), quota rents.

Opsomming

Die studie het die toegang van Suid-Afrikaanse vrugte- en vrugteprodukte tot die EU-mark onder tariefkoers kwotas (TRQ's) ontleed, soos toegestaan deur ‘n handelsooreenkoms tussen Suid-Afrika en die Europese Unie (EU). Dié staan bekend as die Handelsontwikkelings- en Samewerkingsooreenkoms (TDCA). Die gebruik van TRQ's as handelspolitiek instrument in handelsooreenkomste, met die doelwit om marktoegang te verbeter, is die fokuspunt van die vrae wat hierdie navorsing beantwoord. Vier doelwitte is ontleed in 'n poging om die impak van TRQ's op marktoegang van Suid-Afrikaanse vrugteprodukte op die EU-mark te bepaal. Die hoof studiedoelwit was om die CGE-modelsektore van die Global Trade Analysis Project (GTAP) te verander, sowel as om die modelinsette te vernuwe om die ontleding van die marktoegang van vrugte- en vrugteprodukte TRQs onder die TDCA moontlik te maak. Data uit verskillende sekondêre bronne, soos die GTAP, TARif Intégré Communautaire/Geïntegreerde Tarief van die Europese Gemeenskappe (TARIC) en Internasionale Monetêre Fonds (IMF) databasisse, sowel as primêre data verkry deur 'n opname van uitvoere van vrugte en vrugteprodukte, is gebruik. Die data analise metodes bestaan uit beskrywende analise, Likert telling analise en berekenbare algemene ewewig (CGE) analise van TRQ liberalisering scenario's in 'n GTAP statiese model. Die studie het aangevoer dat 'n aantal tarief- en nie-tarief-invloedryke faktore TRQ aanvulling voorkom. Hierdie studie het nie-tariefmaatreëls (NTM's) geïdentifiseer as die faktor wat die grootste invloed uitoefen op die voorkoming van kwota aanvulling. GTAP-modelontleding toon aan dat gedeeltelike TRQ-liberalisering Suid-Afrika

se potensiële winste in uitvoermarktoegang van die EU-mark verswak. Daarbenewens dui die ontleding van handelsliberaliseringscenario's aan dat wanneer NTM's verwyder word voor die volledige implementering van die TDCA in 2011, die welsyn, gemeet in ekwivalente variasie (EV), verbeter in enige gegewe jaar (US$189 891); dit ondersteun ook die bewering dat TRQ’s marktoegangsversperrings versterk, en dat dit ook geassosieer word met NTM’s. Die resultate toon dat alhoewel uitvoere uit Suid-Afrika toeneem, die uitsetveranderinge in Suid-Afrika klein is. Die hoogste welsynswins (US$221 834) is behaal deur die gesamentlike liberalisering van die volle tarief en die verwydering van NTM's. In die geval van bevrore lemoensap, sal welsynsverbeterings in Suid-Afrika groter wees as TRQ-beleidverstorings heeltemal verwyder word voor die volle implementering van die TDCA (US$5611), in vergelyking met aan die einde van die TDCA (US$4517). Bykomende welsynsverlies wat nie in die EV-maatstaf aangetoon is nie, is gevind as gevolg van ongeskeduleerde kwota-huurgeld wat voorkom wanneer TRQ's nie gevul word nie. Die gevolgtrekking is dat 'n vertraging in die afhandeling en implementering van uitkomste wat onderhandel is, sowel as 'n versuim om TRQ's te vul, tot onherstelbare handels- en welvaartsverliese lei. Die studie beveel aan dat ‘n ander ondersteuningsbeleid, soos uitvoeruitbreiding, aktief geïmplementeer word om die bepalings van 'n handelsooreenkoms, soos die TDCA, te ondersteun. Daarbenewens moet die bepaling van die kwota-uitbreiding gelyktydig geïmplementeer word met volle tarief-liberalisering en die verwydering van NTM's, ten einde marktoegang en -welsyn te verbeter.

Sleutelwoorde: tariefkoers kwota (TRQ), welsynsanalise, Handelsontwikkelings- en Samewerkingsooreenkoms (TDCA), Global Trade Analysis Project (GTAP), berekenbare algemene ewewig (CGE), kwota huurgeld.

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List of acronyms and abbreviations

ATF	Agricultural Trade Forum
AVE	*Ad Valorem* Equivalent
BBBEE	Broad-Based Black Economic Empowerment
CBS	Citrus Black Spot
CGE	Computable General Equilibrium
CN	Combined Nomenclature
DAFF	Department of Agriculture, Forestry and Fisheries
DTI	Department of Trade and Industry
EPA	Economic Partnership Agreement
EUROPHYT	European Network of Plant Health Information Systems
EUROSTAT	European Statistics
EU	European Union
EV	Equivalent Variation
FTA	Free Trade Area
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GE	General Equilibrium
GTAP	Global Trade Analysis Project
HS	Harmonised Commodity Description and Coding System
IMF	International Monetary Fund
MACMAP	Market Access Map
MFN	Most Favoured Nation
NTM	Non-Tariff Measure
OFD	Food Products
OLS	Ordinary Least Squares
PC	Policy Case
PE	Partial Equilibrium
PPECB	Perishable Products Export Control Board
PPML	Poisson Pseudo-Maximum Likelihood
ROW	Rest of the World
SACU	Southern African Customs Union

SADC	Southern African Development Community
SAFJA	South African Fruit Juice Association
SAFVCA	South African Fruit and Vegetables Canners Association
SAM	Social Accounting Matrices
SARS	South African Revenue Service
SPS	Sanitary and Phytosanitary
TASTE	Tariff Analytical and Simulation Tool for Economists
TARIC	TARif Intégré Communautaire/Integrated Tariff of the European Communities
TBT	Technical Barriers to Trade
TDCA	Trade, Development and Cooperation Agreement
TOT	Terms of Trade
TRQ	Tariff Rate Quota
UNCTAD	United Nations Conference on Trade and Development
US	United States
USA	United States of America
USDA	United States Development Agency
WEO	World Economic Outlook
WTO	World Trade Organisation

CHAPTER ONE

1. INTRODUCTION

Agriculture accounted for 5% of South Africa's total exports to the world in 2010 (Snyman, 2012). The Foreign Agricultural Service (2018) indicates that in 2017, the South African agricultural sector contributed 10% to the total export earnings of South Africa, noting that citrus, wine, table grapes, apples and pears contributed the largest share in the value of the earnings. The European Union (EU) is an important market for South Africa. The European Commission (2018), however, indicates that the share of South Africa's agricultural exports (as a share of the total exports from South Africa to the EU) was only 11.7% in 2017. Furthermore, that share (11.7%) only accounts for 2.3% of the share of the total agricultural imports by the EU. Agriculture, therefore, accounts for a low percentage of South Africa's contribution to EU imports; thus, indicating limited market access in that sector (European Commission, 2012, 2018).

South Africa signed a free trade agreement, the Trade, Development and Cooperation Agreement (TDCA) in 1999 as a means for improving market access to the EU. The TDCA was fully implemented in 2012, thereby creating a free trade area (FTA) that covers about 90% of bilateral trade (European Commission, 2015a). At full implementation, twelve (12) years after the agreement had been signed, tariffs and customs duties for some commodities that had been gradually reduced were ultimately abolished. As far back as 2007, the renegotiation of the TDCA trade chapter began in a separate process to that of the TDCA's other chapters covering economic and development cooperation as well as political dialogue. The process of renegotiation culminated in the end of the TDCA trade chapter and the implementation of existing and new TDCA trade concessions continued under the new Economic Partnership Agreement (EPA) between the EU and the Southern Africa Development Community (SADC) group which was implemented at the end of 2016 (Sandrey and Gill, 2013; South Africa, DTI, 2017). The SADC group, as party to the EPA, constitutes South Africa, Botswana, Lesotho, Namibia, Swaziland and Mozambique. The Southern African Development Community-European Union-Economic Partnership Agreement (SADC-EU-EPA) is a preferential market access agreement. The TDCA trade chapter continued to be operational until the end of 2016 at the inception of the SADC-EU-EPA (TDCA, 1999; European Commission, 2015a).

The TDCA, being South Africa's major export-oriented agreement, has been a considerable factor in promoting access of South African exports to the EU market (Mbatha, 2011). In 2012, during full implementation of the TDCA, the EU accounted for about 30% of South Africa's trade, the dominant products being fuels and mining. The fruit sector forms one of South Africa's important export sectors. Available agricultural trade statistics for South African fruits underscore the importance of the EU as South Africa's export market. The EU is an important export destination for the South African fruit sector, with 43% of deciduous fruit exports having been destined for the EU market in 2012 (European Commission, 2012). HORTGRO (2017) indicates that 44% of total deciduous fruit production was exported in 2017.

Under the TDCA, fruit/fruit products classified as EU sensitive products were only granted access to the EU under tariff rate quotas (TRQs), which implied no full liberalisation for the concerned commodities. The World Trade Organisation (WTO) defines a TRQ as a two-tiered tariff where imports are permitted at a set quantity at a low in-quota tariff, and out-of-quota imports are permitted at a higher tariff rate: the

Most Favoured Nation (MFN) tariff (WTO, 2015). The highest trade gains can, therefore, not be expected when trade is not fully liberalised. Sensitive products are defined as products of special interest to a country (WTO, 2004). Because sensitive products were excluded from full liberalisation under the TDCA, the same market access arrangement has continued under the SADC-EU-EPA. The EU's sensitive list of products includes fruit products such as canned fruit and fruit juices. For these sensitive products, the TDCA grants preferences in the form of TRQs (South Africa, DAFF, 2014).

There is much at stake for South African agricultural exports, particularly for those commodities regulated under TRQs. The TRQs were adopted in 2000 under the TDCA for a sixteen (16) year period and the TDCA trade chapter remains relevant in this ex post analysis even though the TRQs are now being traded under the SADC-EU-EPA. The trade and concessions of the TDCA fruit TRQs, which were carried over to the SADC-EU-EPA, are only relevant to South Africa even though the agreement includes five (5) other countries (Botswana, Lesotho, Namibia, Swaziland and Mozambique) which also form part of the SADC EPA Group (European Commission, 2016a).

This study views market access of fruit/fruit products under the TDCA as sanctioned by the exports of sensitive lists by way of TRQs, including the removal of trade barriers such as tariffs, customs duties and other influential factors. The General Agreement on Tariffs and Trade (GATT) interprets market access to reflect the situation where there is an altered competitive relationship between imported and domestic products (Bagwell and Staiger, 2001). The changes in market access under the TDCA have thus been in fruit products' coverage for which there were no concessions before. Other market access changes have manifested through TRQ quantity changes, which include increments, but with quota ceilings as well as in-quota tariff cuts. For this study, the concept of successful market access is represented by a situation in which the TRQ is fully utilised. As of 2015, the EU and South Africa have TRQs of 11.3% and 36% share of their agricultural tariff lines, respectively, as noted by the WTO (WTO, 2015). These percentages are considerably large, making it important for both parties concerning the rules about the extent of the protective nature of TRQs. Worldwide, 355 TRQs that have been noted are for trade in fruits and vegetables. These account for more than 25% of all agricultural TRQs notified at the WTO, showing high levels of trade protection in the fruit and vegetable sector (Abbott and Morse, 2000; European Commission, 2012; Sandrey and Gill, 2013; South Africa, DAFF, 2014; Dowlah, 2015; WTO, 2015).

Originally, at the signing of the TDCA in 1999, South Africa had market access to 15 EU countries (Austria, Italy, Belgium, Luxembourg, Denmark, Netherlands, Finland, Portugal, France, Spain, Germany, Sweden, Greece, United Kingdom and Ireland). In 2007, with the expansion of the EU, access increased to 27 countries, adding the Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, Bulgaria and Romania to the original 15. Croatia was then added to make 28 member countries. The EU is thus composed of 28 countries and is referred to as the EU28. In recent times, the United Kingdom has voted to break away from the EU, but until this exit is completed, the status quo of the number of countries party to the South African-EU trade agreement remains. Trade with the original 15 EU member states (which were signatories to the agreement in 1999) was noted to increase tremendously between 2000 and 2007. The DFA (2015) noted a total trade increase of 234% from 2000 to 2004 and 170% from 2004 to 2007 (Sandrey and Gill, 2013; South Africa, DFA, 2015).

The trade chapter of the TDCA's agricultural component is the main interest of this study, specifically, the EU's sensitive product list traded under TRQs. A list of sensitive agricultural commodities, exported by South Africa to the EU, that are excluded from liberalisation were listed in Annex IV[1], List 6 of the TDCA and after the end of the TDCA trade chapter, the sensitive agricultural products are currently listed in Section B of Annex 1[2] of the SADC-EU-EPA as of 2016. The export of these sensitive agricultural products is through export permits that are administered by the Department of Agriculture, Forestry and Fisheries (DAFF). The commodity tariff lines concerned fall within the broad categories of flowers, fruits and wines. Within these categories, selected tariff lines are regulated by a TRQ and these include some fruits and fruit products. The ten (10) TRQs administered through DAFF cover three (3) product categories: flowers (3 TRQs), wine of fresh grapes (1 TRQ) and fruit/fruit products (6 TRQs). For each TRQ, the EU uses a 6-digit order number that specifies

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[1] The TDCA comprises Annexes I to X, of which Annex IV and VI concern agricultural products. The EU offers on the agricultural products studied in this thesis, are specified in Annex IV which lists products in eight (8) different lists. The lists specify the offered tariff lines for liberalisation, duties and quota quantities where applicable. Annexes II and III cover industrial products, whereas Annexes V and VII cover products in the fisheries sector. Of the eight (8) lists of Annex IV, TRQs apply only to the agricultural products in List 6. The condition providing for the annual expansion of the quotas is also set out in List 6 as 3% and is termed the annual growth factor (TDCA, 1999).

[2] Article 121 of the SADC-EU-EPA indicates six (6) annexes and four (4) protocols that form part of the agreement. The annexes list the schedule of each of the parties to the agreement. Annex 1 entitled 'Customs duties of the EU on products originating in the SADC EPA States' defines and sets out how the lists of the products originating from the SADC-EPA states are treated in the EU regarding applicable quotas and duties. Annex 1 comprises Part I and Part II, in which Part I presents the general notes and two sections, A and B. Section A concerns the elimination of customs duties by the EU and Section B concerns TRQs granted by the EU. In Section B, the details of conditions and dates for which the relevant TRQs apply are given. Part II of Annex 1 presents the tariff schedule of the EU detailing the tariff descriptions demarcated according to the sectors of agriculture, fisheries and industry (European Union, 2016).

conditions, such as the quantity as well as the start and end date of the TRQ administered by DAFF (TDCA, 1999; South Africa, Government Gazette, 2014). Fruits and fruit product lines show the maximum usage in the number of TRQs allocated under the TDCA, accounting for six (6) of the ten (10) TRQs hence fruit/fruit products TRQs are chosen as a case study to assess the likely impacts given their greater coverage.

In the Harmonised Commodity Description and Coding System's (HS) 6-digit code, ten (10) fruit/fruit products tariff lines are covered by the six (6) TRQs targeted for this study. The tariff lines are frozen strawberries (HS0811.10); canned pears (HS2008.40), apricots (HS2008.50) and peaches (HS2008.70); tropical and non-tropical mixtures of canned fruits (HS2008.97); frozen orange juice (HS2009.11); pineapple juice (HS2009.41 and HS2009.49) and apple juice (HS2009.71 and HS2009.79). The importance of each of these tariff lines in terms of the relative contribution (value terms) to South African fruit products exports to the EU market is discussed in Section 3.8.2. The DAFF is the authority that issues export permits for the EU fruit TRQs, and this means that South African exporters are in a position to gain quota rents, in this case, TRQ rents (South Africa, Government Gazette, 2014). A quota rent is the difference between domestic prices in the EU and tariff-inclusive world prices multiplied by quantity of imports. The rent on TRQs can accrue for exporters or importers, or both, depending on the administration method (Grant, Hertel and Rutherford*,* 2006). Where TRQs are administered by the exporting country, the rent accrues to exporters and vice versa when importers administer the TRQs.

The design of the TDCA, which excluded some products from liberalisation, may have reduced the effectiveness of the agreement where TRQ trade is concerned.

This study, however, will focus on the impacts resulting from the fruit/fruit products TRQ trade liberalisation given the important contribution of the South African fruit trade. Arita, Beckman and Mitchell (2017) argue that the liberalisation of agricultural tariffs potentially contributes export gains dependent on the size of the tariff. The liberalisation approach concerning TRQ quantities granted under the TDCA has been to expand the TRQ quantities by an annual growth factor of 3%, and tariffs have not been revised annually (TDCA, 1999).

1.1 RESEARCH FOCUS

A study of fruit products TRQs is important, given that the South African fruit sector faces substantial prohibition in the number of fruit products tariff lines exported to the EU market under TDCA TRQs. Given that TRQs only allow partial and not full trade liberalisation, the greater the number of products facing TRQs, the greater the extent of trade prohibitions faced by the South African fruit export sector. In the period 1999 to 2016, DAFF administered ten (10) TRQs under the TDCA. Six (6) of the ten (10) TRQs are fruit/fruit products TRQs namely: frozen strawberries (HS0811.10); canned pears, apricots and peaches (HS2008.40/.50/.70); non-tropical and tropical mixtures of canned fruit (HS2008.97); frozen orange juice (HS2009.11) as well as pineapple and apple juice (HS2009.41/.49/.71/.79). The highest proportion of the TRQs administered by DAFF falls under fruit products (six (6) of the ten (10) TRQs). Therefore, this implies that trade prohibition is greatest for this sector in terms of TDCA agricultural products TRQs. The contribution of the fruit sector exports to the South African economy is well acknowledged; this includes the fact that the EU is a major market for South African deciduous fruit exports (43%).

The focus of this study is, therefore, to understand the access of fruit products to the EU market under the TDCA TRQs. Because the fruit products enter the EU market under TRQs, the liberalisation approach in place requires an investigation in terms of the impacts it has on market access and welfare because this has important consequences for South African fruit products export growth. Following an overview of the implementation structure and administration procedures concerning the TDCA TRQ use of fruit/fruit products, the study analyses factors that influence quota fill. The results on the factors that influence quota fill are used to calculate the weighted intensity score of the influence of each factor on quota fill. The weighted intensity scores form the basis upon which the size of the shocks presented in modelling the removal of selected influential factors preventing quota fill is calculated. Relevant policy liberalisation scenarios are thus modelled to analyse changes in production, consumption, exports, prices and welfare. TRQ impacts differ according to specific commodities, level of quotas as well as tariffs, so a sector-/commodity-specific study is imperative. In this context, the research problem is detailed below.

1.2 RESEARCH PROBLEM

Agricultural exports from South Africa to the EU remain limited (12% of the share of total South African exports to the EU in 2017), despite a trade agreement (such as the TDCA or SADC-EU-EPA) being in place (European Commission, 2018). In the fruit products sector, there is an expectation for an improvement in trade and welfare outcomes as a result of the market access granted through TDCA concessions, yet even with the prevalence of fruit TRQs, trade and welfare consequences for the fruit sector market access have not been evident due to unfilled TRQs. At the same time, South Africa is facing competition in the EU28 from trade arrangements that the EU has made with other countries. Nevertheless, the EU28 market is an important destination for South Africa, as its fruit products are mainly destined for that market. Whilst South Africa is a net exporter of deciduous fruit (Sikuka, 2014), the export of fruit/fruit products happens under TRQs, which naturally present barriers. Therefore, due to the potential availed by the EU market, South Africa must continually negotiate for improved market access conditions in the EU to augment the potential gains. The phenomenon of limiting quantities is associated with products featuring on a country's sensitive list. Even with the quantity limitation, South African fruit products exports do not fill or fully use the TRQs.

The market access target for South Africa, as measured in this study, is the full use of TDCA fruit products TRQs to their fill level. The determination of the TRQ fill level as a market access measure aims to highlight the existence of factors affecting fruit/fruit products' ability to fill TRQ exports quotas. The export quantities of some of the fruit/fruit products are below the set quantity of the TRQ and thus fails to achieve the market access target. It is difficult to judge the extent of market access for fruit/fruit products under the TDCA, as the use of TRQs is influenced by other TRQ fill factors that hinder market access (relating to TRQ administration methods, TRQ definition and use conditions, TRQ supply and demand as well as tariff level associated conditions). This will be explored in this study. How these factors contribute to determining the perceived market access under the TDCA has not been investigated.

The TRQs of fruit/fruit products do not have a 100% fill rate; yet very little is known about the factors that influence why the TRQs are not filled. Literature on market access and TRQs (Abbott and Morse, 2000; Khorana, 2007; Ingco and Winters, 2008; Li and Carter, 2009; Idsardi, 2010; Lemessa and Esmael, 2010;

Francois and Manchin 2013; Narayanan and Khorana, 2014) identify TRQs among the determinants of market access, but in-depth, TRQ-specific factors that influence market access are not isolated in these studies. This is a knowledge gap in the literature that this study intends to fill. The analytical challenge to address is how the influential quota fill factors interact to determine quota use. There is no knowledge of the extent to which existing influential factors individually inhibit tariff quota fill of fruit TRQs under the TDCA. Thus, it is important to analyse the interaction of various factors that influence market access in order to assess market access under TRQ trade. It is, as a result, important to analyse these aspects in order to aid the investigation regarding how best market access under TRQ trade can be measured, and, in this context, develop an intensity score for each influential aspect preventing quota fill.

Approaches to assess the reasons for quota underfill usually give a partial analysis of the consequences of market access targets that are not met. Influential TRQ-fill factors can, through the level of market access of fruit/fruit products, have significant sector-wide impacts which, presently, are unknown and have not been isolated. There is also a lack of clear understanding of the TDCA effects of specific fruit/fruit products TRQ liberalisation regimes on trade, production, consumption, prices, welfare and quota rent changes. Previous studies on the TDCA (Kalaba, Sandrey and Van Seventer, 2005; Sandrey, 2006; Mbatha, 2011; Sandrey, 2011; Sandrey and Gill, 2013) – using various methods of analysis, among which Computable General Equilibrium (CGE) modelling analysis and the Global Trade Analysis Project (GTAP) database were employed – analysed the TDCA prior to its full implementation. The gap in knowledge in these previous studies (discussed in

Section 2.3) arises due to none of them singling out the analysis of fruit/fruit products TRQs nor analysing quota rents. This knowledge gap implies that, fruit product specific TRQ impacts arising from unfilled TRQs have not been determined for the fruit products sectors in question. Thus, there is a lack of research evidence to feed into informed trade policy decision making for the fruit products sector affected by TRQs. This study seeks to close this gap by analysing fruit/fruit products TRQs of the TDCA, further innovating the analysis of the TDCA fruit/fruit products TRQs by combining GTAP CGE analysis with the analysis of factors – in the form of non-tariff measures (NTMs) – that influence quota fill, and, also, by analysing quota rents. Instead of being aware of the countrywide impacts of the TDCA, fruit sector participants are often only concerned with impacts on the sectoral level and at the tariff line level.

Solving a GTAP CGE model to yield sector-wide results could be of more relevance to fruit sector participants. However, the GTAP database and model aggregation combines tariff line trade flow data of the TDCA fruit products into one GTAP sector – the processed food products sector – which among 10 TDCA fruit products tariff lines, includes 262 other tariff lines. A common tariff rate also applies for an aggregated GTAP sector. Therefore, the GTAP model is not sufficient for purpose without a modification that isolates the TDCA fruit products TRQs into individual sectors in the GTAP database and also not useful without incorporating the TDCA fruit products actual in-quota tariff rates. Scenario analysis of trade liberalisation assumptions in the GTAP framework also enables an assessment of the changes in export opportunities, as measured against TRQ rents that may result due to TRQ expansion.

The welfare impacts resulting from fruit/fruit products TRQ liberalisation under the TDCA are not known or well understood. There is, therefore, motivation to quantify welfare impacts in terms of equivalent variation (EV)[3], given that the impacts can be ambiguous depending on the liberalisation path. Studies of TRQs under free trade agreements (Elbehri and Hertel, 2006; Grant, Hertel and Rutherford, 2009; Junker and Heckelei, 2012) indicate that effects on welfare differ depending on the liberalisation path and commodity. Economic welfare is also assessed by taking into account not only EV but quota rents that arise when exporters are able to take advantage by filling the TRQ. This study incorporates the analysis of quota rents as a way to view welfare impacts from the view of the unfilled TDCA fruit/fruit products TRQs. The size of quota rents gained due to the TDCA fruit/fruit products TRQs must be ascertained, as this is a way of measuring the market access opportunity opened through the TDCA. Barichello (2000) notes that the size of quota rents may be seen as the profitability of the export opportunity.

An accurate anticipation of the TDCA's effects may contribute much-needed input to the SADC-EU-EPA analysis, which is in its inception phase. At the end of 2016, the SADC-EU-EPA came into effect, and South Africa now trades fruit products in the EU market under the SADC-EU-EPA. It is, therefore, important to understand the sector- and economy-wide impacts of fruit TRQs on trade and welfare under the TDCA, given that the TDCA forms the basis of some negotiated TRQ concessions under the SADC-EU-EPA. This study can provide more insight into potential impacts under the SADC-EU-EPA.

[3] Elaborated in Section 2.1

1.3 RESEARCH QUESTION

Following the stated research problem, an important research question to ask is whether or not market access of South African fruit products to the EU provides the best market outcome when liberalised through the use of TRQs, for which in-quota tariffs are lowered and quota quantities are expanded yearly. The study addresses the question by studying six (6) fruit/fruit products TRQs of the TDCA, and it seeks to answer the following specific questions:

1. How do factors that influence quota fill interact to determine fruit products quota use?
2. What is the effect of expanding/increasing the fruit/fruit products quota on exports, prices, production and consumption of fruit products in South Africa?
3. Which TRQ liberalisation scenario more positively impacts welfare (measured in EV) and quota rents?

1.4 RESEARCH AIM AND OBJECTIVES

The main objective of the study is to modify the GTAP CGE model sectors and to innovate the model inputs to enable the analysis of fruit/fruit products TRQs market access under the TDCA. The specific objectives are to:

1. Examine the fruit/fruit products export regimes (exports within quota, at quota or over quota limit) faced by different fruit/fruit products (exported to the EU market) in order to assess the effective TRQ instrument in limiting market access.

2. Develop a procedure to assess the intensity of influence posed by tariff and non-tariff factors preventing TRQ fill and use the results to assess quota fill influential factors in a GTAP CGE model.
3. Analyse how the quantity changes of EU fruit/fruit products TRQ affect domestic prices, production and consumption of fruit/fruit products in South Africa.
4. Determine and analyse the welfare impact of EU fruit/fruit products TRQs in different fruit/fruit products TRQ liberalisation scenarios.

1.5 RESEARCH METHODOLOGY

In order to achieve the study objectives, primary and secondary data as well as the GTAP database and model, which is described in Chapter 4, is used. The overview of the TDCA including the fruit products supply and demand status as well as export regimes presented in Chapter 3 is complemented by the GTAP model's result estimations in Chapter 5. To achieve the first objective, secondary data from the EU TARif Intégré Communautaire/Integrated Tariff of the European Communities (TARIC) database is used to examine the export regimes for the different fruit/fruit products TRQs. A simple TRQ fill rate is calculated by comparing the exported volume under TRQ to the notified TRQ. The analysis of this objective is also backed by an overview and analysis of the use of fruit TRQs under the TDCA, as presented in Chapter 3.

To achieve the second objective of developing a procedure to assess the factors that influence tariff quota fill, the study uses data from a survey of fruit sector participants and key informants to capture influential aspects of TRQ fill on a Likert scale. Information pertaining to factors that influence fruit products TRQ fill is gathered through a purposive survey of South African fruit sector participants, specifically with

EU export relevance. Sample selection is done according to exporting establishments' representation of fruit juices and canned fruits. The sample selection process is elaborated in Chapter 4. The results and discussion in Chapter 5 include intensity scores of the weight of influence on quota fill for each influential aspect, as calculated based on Likert scale values. The aggregation of intensity scores for aspects of influential factors such as NTMs is undertaken and the total weighted score is implemented as input in a counterfactual scenario to reduce NTMs in the GTAP model analysis.

The third and fourth sub-objectives are achieved by using the latest version of the GTAP database (version 9), dated 2011. Modifications made to the GTAP database involve splitting one of the GTAP sectors, the food products (OFD) sector (the sector of focus in this study). Splitting the OFD sector enables the addition of the fruit TRQ products of this study as sectors in the model. New sectors are, therefore, introduced into the GTAP database to analyse fruit/fruit products sectors of the model. A simulation of proposed TRQ liberalisation scenarios is then carried out.

1.6 MERIT OF RESEARCH AND SCIENTIFIC CONTRIBUTION

The study contributes to policy analysis of the TDCA fruit/fruit products tariff lines in terms of the HS 6-digit classification code. Given that South Africa is a net exporter of the TRQ-controlled products studied, the reasons for quota underfill are other than the lack of adequate production (and other reasons elaborated in Section 3.7). There is a deficiency of GTAP studies that incorporate primary data on aspects of factors that influence TRQ fill in an effort to understand why certain TRQs are not filled. In this study, evidence is established that contributes to a better understanding of the quota underfill of the EU fruit/fruit products TRQs.

There are no studies on the TDCA that have implemented factors preventing fruit TRQ fill in a GTAP CGE model. The studies on the TDCA using the GTAP model (Section 2.3.4) have drawn conclusions at an aggregated sector level. The possible welfare effects at the more disaggregated HS 6-digit tariff lines are overlooked, especially for fruit TRQ tariff lines. The existing studies are, therefore, of limited use to the segment of the fruit sector whose participants are interested in the markets of specific tariff lines for which the TRQs are negotiated at more disaggregated tariff lines. Based on the investigation of factors that influence market access or TRQ fill, this study contributes to market access literature by developing and using a Likert scale-based measure of scoring the intensity of influential factors in preventing quota fill of fruit/fruit products under the TDCA. Through the weighted scoring that can be established for each aspect that influences quota fill, an alternative way to calculate and measure the factors that influence TRQ fill is developed and used as an input enabling the modelling of NTMs in the GTAP model. The study, therefore, contributes to the literature on and knowledge of factors that influence the access of fruit/fruit products TRQ to the EU market, from the exporting country's perspective.

The GTAP model is written in a general fashion, so adaptations and innovations of the model to suit the needs of implementing TDCA fruit/fruit products TRQs are developed before the proposed simulations are carried out. The innovation of the GTAP model provided by this study involves refining the GTAP CGE model to capture a detailed analysis of TDCA fruit TRQs at the HS 6-digit tariff level. In addition, the GTAP database does not contain TDCA in-quota tariff rates and out-of-quota tariff rates for TRQ fruits products. Hence, this study supplies this extra data to the database through a counterfactual simulation. The contribution of this study is, therefore, an innovation of the GTAP model in the analysis of the TDCA fruit TRQs. This innovation involves supplying extra tariff data to the GTAP database after splitting the existing GTAP processed food products sector into additional or newly defined GTAP sectors at the HS 6-digit level tariff lines and then applying the technique of modelling NTMs in a GTAP CGE framework. The study, therefore, also contributes to the literature by developing an approach that incorporates the analysis of factors that influence TRQ market access into the GTAP CGE model to analyse impacts of the TDCA. The innovation can also be extended for wider application in analysing tariffs and non-tariff factors in other non-fruit products tariff lines of the TDCA or other trade agreements that South Africa has for example with the SADC or the United States.

Further empirical contribution regards welfare assessments in terms of the inclusion of TRQ quota rents captured by fruit/fruit product exporters. Analysing quota rents enables the discussion on fruit/fruit products TRQs as an important source of welfare changes. Welfare changes are not only assessed in terms of EV, but an assessment of quota rents captured by fruit/fruit products exporters is conducted given that when the quota is the limiting policy, quota rents are captured. The quota rents are a component of the producer surplus gain under the TRQ. In this way, this study contributes to the literature by incorporating a quota rents assessment in the analysis of economic welfare, which other studies on the TDCA have not attempted. The study also decomposes/deconstructs welfare change measured in EV to show what the market access influential factors account for. The quota rent analysis contributes in the wider application of TRQs in trade agreements and the analysis of the prospective benefits of fully used quotas.

The study further contributes to a simulation of realistic TRQ liberalisation scenarios. The simulation of a TRQ expansion scenario without any change in tariffs is a realistic situation given this provision through the 3% agreed annual growth factor of fruit/fruit products TRQs, specified in the text of the TDCA. The simulation expresses market access expansion in the EU market through TRQ expansion; hence, enabling an assessment of the effect on trade flows of fruit/fruit products. In this regard, the study contributes as an ex post study to capture the TDCA welfare effects on selected processed fruit exports and the adjustment of domestic prices for fruit products. The relevance of this policy is that the SADC-EU-EPA, which was concluded in 2016, is taken into account in the proposed scenario analysis. The scenario that considers the conclusion of the SADC-EU-EPA provides a realistic analysis and also contributes an ex-ante study predicting/simulating impacts on trade flows and welfare effects in a GTAP CGE framework. The study, therefore, contributes an assessment of expected impacts of fruit/fruit products TRQs of the TDCA by using actual agreed outcomes of the SADC-EU-EPA.

1.7 OUTLINE OF THESIS

The thesis is organised into six (6) chapters, including this chapter, that provide background to the topic, research focus, research problem, research questions and objectives, methodology as well as the merit of the research and contribution to science.

Chapter 2 provides a review of market access literature, including a review of non-tariff influential factors such as NTMs associated with South Africa’s fruit TRQ exports to the EU. The review of previous studies on market access under TRQs also includes a review of the approaches used to analyse TRQs and NTMs. The literature on previous studies of the TDCA is provided to highlight the gaps in the studies of the TDCA.

Chapter 3 gives an overview of the TDCA's fruit products TRQs and the TDCA relationship to the SADC-EU-EPA. TRQ implementation and administration methods under the TDCA, including exporter requirements to access TDCA TRQs, are discussed. A description of exporting arrangements for fruit products from South Africa to the EU, taking cognisance of the institutional arrangements in the TRQ implementation and administration mechanisms is provided. Furthermore, a synopsis of TRQs competing with the TDCA fruit TRQs in the EU market forms part of the overview. An indication of the market for fruit products and their level of integration in the world economy, including the supply of and demand for fruit products in South Africa and the EU, is also provided. Finally, a specific description of fruit products TRQs as a trade policy liberalisation tool under the TDCA is presented. The description centres on the composition of EU28 fruit/fruit products TRQ imports. It also focuses on South Africa's contribution in terms of value and volume of EU imports as well as the existing tariff rates and the conceptualisation of possible TRQ regimes.

The study methodology is presented in Chapter 4. The data, sample selection and data analysis methods used are elaborated in this chapter. Both primary and secondary data is used, and the data presentation in this chapter also includes a description of the GTAP database. The data analysis methods include quota fill analysis (to distinguish the tariff quota regimes) and the calculation of Likert scale-based weighted scores of the aspects that influence quota fill. The GTAP model version 9 is used in the CGE modelling of fruit products TRQs. The model calibration is explained and descriptions of the modifications to the GTAP model are given. The mapping of the modelled GTAP sectors show the changes made to the GTAP model in this study. An explanation on the linking of factors that influence TRQ market access to the GTAP analysis is given, followed by an analytical presentation of quota rent analysis. The chapter also presents an explanation of the trade liberalisation scenarios implemented in the GTAP analysis.

Chapter 5 presents the results and discussion of market access factors that influence TRQ fill and provides for the calculation of intensity scores of each influential aspect in preventing TRQ fill. Quota fill rates are analysed and TRQ export regimes are distinguished in this chapter. Chapter 5 further presents and discusses the results of a survey conducted on the experiences of exporters in terms of factors affecting access of fruit/fruit products into the EU market. The results of the influential aspects' intensity scores are used to determine the proportion of NTMs to be removed via inputs to the GTAP model. In addition, the results of the GTAP model's analysis of TRQ impacts on export market access of South African fruit/fruit products into the EU market are discussed. The effects of fruit TRQ liberalisation scenarios on domestic prices, production, trade and consumption of fruit products in South Africa are then analysed and discussed. The discussion of results also includes welfare analysis (measured in EV) as well as quota rents.

Chapter 6 summarises results, and gives conclusions and recommendations of the study, study limitations and areas for further research.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 INTRODUCTION AND DEFINITION OF CONCEPTS

This chapter reviews previous studies on the TDCA and market access under TRQs, and includes a review of the approaches used by studies analysing TRQs and/or NTMs. To contextualise the study, the review of market access under TRQs includes the current state of knowledge, previous studies on market access under TRQs as well as factors (such as NTMs) affecting quota filling or use under TRQs. Furthermore, a review of previous studies conducted on the TDCA is also given. A definition and clarification of terms/concepts relevant in this study are provided below.

Gibson *et al.* (2001) describe **market access** as the extent to which a country permits imports. Market access, as noted in Bagwell and Staiger (2001), is interpreted in the GATT to reflect the alteration of the competitive relationship between imported and domestic products. By interpreting this definition, therefore, in the context of preferential trade agreements, the removal of trade barriers alters the relationship between imported and domestic products and, thus, describes market access. In the context of this study and the TDCA, the availability of TRQs creates market access, which further expands when preferential access is granted. Shepherd (2010) concludes that a reduction in trade costs is complementary to improved market access. In terms of TRQ market access, this study considers market access as the successful filling of a TRQ granted under the TDCA. In this way, this study departs from the notion that as long as TRQs alter trade or reduce trade costs, the availability of a TRQ (whether filled or not) is complementary to market access.

Tariff Rate Quota (TRQ), which is sometimes referred to as **tariff quota**, is defined as a two-tiered tariff for which imports are permitted up to a set quantity at a low in-quota tariff – with the out-of-quota imports permitted at the MFN tariff rate (Abbott and Morse, 2000). The **Most Favoured Nation** (MFN) principle refers to a non-discriminatory WTO principle requiring that an advantage, favour or privilege extended to one member country by another member country be extended automatically, without conditions applying to any other WTO members. Lemessa and Esmael (2010) elaborate that, based on this principle, in terms of agricultural market access, all like products of each member country will be treated alike, with regard to border measures that include tariffs. The MFN tariff is a higher tariff than the in-quota tariff concerning TRQ trade. Pouliot and Larue (2012) expound that under a TRQ, an import volume defined as a minimum access commitment is taxed at an in-quota tariff rate while additional imports are taxed at an over-quota rate. A **TRQ export regime,** therefore, refers to the administration system of exports based on a system of TRQs and defines whether or not actual exports occur in quota, at quota or over quota (Ingco and Winters, 2008). A preferential tariff quota entails the tariff concessions provided for a predetermined volume of goods. **Tariff preferences** are import duty rates reduced from the MFN rates. Under the SA-EU-TDCA fruit products TRQs, there is a tariff preference for goods originating from South Africa. These are special trade advantages granted by a party to its trading partner to promote trade (TARIC, 2015; WTO, 2015).

Exports within quota receive higher prices in the target domestic markets in comparison to the world price, and exporters are thus able to capture quota rents. **Quota rent** is the difference between domestic prices, and tariff-inclusive world prices multiplied by imports. Quota rents can accrue to exporters, importers or both (Grant *et al.,* 2006). The price difference leads to distortions and trade volume effects that have an impact on welfare. **Equivalent variation** (EV) measures change in welfare. Using the prices before a policy change, EV is the amount of income that changes utility by the same amount as the policy. It calculates the income change that would make an individual equivalent to what they would be after price changes resulting from a policy change (Arora, 2013).

2.1.1 The importance of trade agreements and market access in agriculture

Agricultural products face high tariffs that limit their market access in the world trade arena; hence, the reliance on trade agreements to boost market access. In the definition of the WTO, the market access of goods refers to conditions, including tariff and NTMs, upon which agreeing parties allow the entry of goods into their markets (WTO, 2019). It is widely noted in the literature (Josling, 2011; Arita *et al.,* 2017; Lunenborg, 2018) that agricultural tariffs remain higher than tariffs in other sectors. To this end, Fugazza and McLaren (2014) indicate that market access enabled through tariff preferences in trade agreements is important, especially in the agricultural sector where trade protection through the imposition of tariff barriers, amongst other trade barriers, is rife. The market access conditions availed in trade agreements is expected to have an effect on the level of agricultural exports, especially those from developing nations destined for the developed nations. A condition set out in the GATT, as noted in Saggi, Wong and Yildiz (2019), is that the tariffs on trade need to be eliminated for countries entering a preferential trade agreement.

Africa has largely been described as an under exporter, with roughly a 3% share in world exports (Bouet, Mishra and Roy, 2008; Nicita and Rollo, 2015).

Agriculture is the main export for many developing nations that focus on primary products exports. Pal (2008) notes that many global North-South trade agreements typically exclude agriculture as far as tariff preferences are concerned. Such exclusion has generally been noted for most EU trade agreements with developing countries thus perpetuating reduced market access. Studies, such as Fugazza and Nicita (2013), note that market access that has been afforded through preferential trade agreements has increased bilateral trade. Furthermore, it is indicated that countries not actively engaged in forming trade agreements are at a disadvantage. However, Pal (2008) has noted that regional trade agreements signed by a developing country do not always lead to increased market access in a developed country. Market access is also noted to differ for countries whether within the same trade agreements or in different trade agreements (Bouet *et al.,* 2008). De Sousa, Mayer and Zignago (2012) express that exporters from developing nations, when compared to global north exporters, face difficulties at a scale 50% higher when it comes to accessing developed markets. Some of the impediments that are associated with TRQs and NTMs are discussed below. Fruits are among the agricultural products that face NTMs and market access challenges in developed country markets.

2.1.2 TRQs and NTMs in agriculture

An increase in the number of NTMs notified by the WTO has been noted in the literature (Grübler, Ghodsi and Stehrer, 2016; Orefice, 2017). It is generally observed that NTMs in the agricultural sector are of a more restrictive nature when compared to those other sectors. Pal (2008) indicates that the level of protection of NTMs should be lowered in conjunction with tariff reduction in order for there to be important gains in market access. The introduction of TRQs has largely been criticised for the complexity that comes along with the associated NTMs.

Studies, such as Carrere and De Melo (2011), WTO (2012), Cadot and Gourdon (2016), and Sithamparam, Devadason and Chenayah (2017), indicate that the nature of NTMs has evolved over time, with some measures such as quantitative restrictions and voluntary export restraints being phased out, whilst technical regulations as well as sanitary and phytosanitary (SPS) measures have increased. Some of the available literature (Nicita and Peters, 2013; Sithamparam *et al.,* 2017; Kareem, Martínez-Zarzoso and Brümmer, 2018) on NTMs indicate difficulties generally associated with identifying whether NTMs are simply of a protectionist nature, addressing market failures, or in place as a necessity to protect issues of consumer concerns, such as health and quality.

It is generally accepted that NTMs are in many ways legitimate, for reasons identified in studies such as Nicita and Peters (2013), to regulate trade to protect consumers, domestic markets, the environment and others. NTMs have also been identified as prevalent in the exports, which mainly fall in the agricultural sector, of developing nations (Neeliah, Neeliah and Goburdhun, 2013; Nicita and Peters, 2013). As a consequence of the reduction in tariffs, NTMs have replaced tariffs as barriers to trade (Orefice, 2017). Concerns regarding NTMs are continually raised at the WTO and are mostly related to agricultural products that have been affected by NTMs (WTO, 2012). Since the 1990s, according to WTO (2012), SPS measures and technical barriers to trade (TBTs) have been identified among the measures increasingly used for and targeted at food safety. WTO (2012) reports that 94% of the SPS concerns raised pertain to agriculture.

As trade liberalisation processes have ensued worldwide, and tariffs have been largely removed, TRQs have also been introduced as an option. Henig (2018) observes TRQs as a basis for controversy among trade partners. As noted in Henig (2018), TRQs were introduced to prohibit non-tariff barriers, such as voluntary export restraints. Market access under TRQs is discussed in the following section 2.2.

2.2 REVIEW OF MARKET ACCESS UNDER TRQS

2.2.1 TRQs as minimum access commitments to protected export markets

Developing countries have a small percentage share in total TRQs notified under the WTO (Khorana, 2008). Nicita and Rollo (2015) note that Sub-Saharan exports comprise only 3% of world trade of which only a limited number of products are exported to a few destinations, mainly in Europe, but with minimum access TRQs. Access to previously protected markets is, however, expected to expand with the proliferation of trade agreements. Data from global studies shows that the majority of TRQs are not being filled; minimum access commitments are therefore not met (Ingco and Winters, 2008). Quota underfill has in some instances been attributed to administrative methods of TRQ implementation (Herrmann, Kramb and Monnich, 2000; Skully, 2001). Studies, such as Barichello (2000) and Kirk (2011), have noted that the ability of exporters to use available in-quota quantities is hindered due to transparency issues concerning TRQ administration, lack of data on quota fill rates and license allocation issues.

Francois, McQueen and Wignaraja (2005) argue that the EU’s FTAs with developing countries fall short of establishing free trade. The authors also identify that one of the motivations of the agreements is to compete with other developed countries.

It is further noted in Francois *et al.* (2005) that the asymmetric nature of trade agreements between the EU and a specific partner is explained due to levels of economic development that differ between partners. An example of this asymmetry exists under the TDCA such that South Africa had open access to 95% of the EU market, whilst EU goods had access to 86% of the South African market (European Commission, 2012).

TRQ commitments are administered at different levels of commodity aggregation (Barichello, 2000). In addition, a TRQ commitment can be defined across a broad commodity category (aggregated) such as fruits (HS 4-digit level), whereas in administrative terms a TRQ is defined for specific (disaggregated) HS 6- or HS 8-digit level tariff lines differentiating various forms of product of a single HS 4-digit level commodity. The types of TRQ can be distinguished by their allocation period, which can either be on a permanent or annual basis. A TRQ system that may be deemed efficient is administered in such a way that there are many exporters and no monopoly. Skully (2001) acknowledges that the impact of different TRQ administration mechanisms is not easy to capture in any model.

Developing countries, as noted in Khorana (2008), enjoy better access to countries such as Switzerland regarding fruit exports. In the case of South African fruit products exports under the TDCA, the fruit products exports dominate in terms of numbers of TRQs in fruits compared to other sensitive products TRQs, such as flowers and wine. Open markets are crucial for the South African fruit industry given the reliance of the industry on exports. South African exporters of fruit/fruit products have been using TRQs under the TDCA. The government in South Africa, specifically the DAFF, is involved in managing trade through the allocation of export permits that enable exporters to access the EU market (explained in Chapter 3). Furthermore, for canned fruits entering the EU, as noted in Richards (2011), the TDCA granted a limited tariff relief on a small quota, yet most the EU's value-added agricultural products are granted duty-free and quota-free access into South Africa.

Export history and the TRQ use percentages reported by exporters are some of the aspects considered in administering TRQs (Khorana, 2008). TRQ administration methods also include a first-come, first-served system; licenses on demand; auctions; state trading and domestic purchase requirement (Barichello, 2000; Skully, 2001; Khorana, 2008). Barichello (2000) notes that new entrants are sometimes discriminated based on historical allocations. Khorana (2008) noted that a combination of the different TRQ administration methods stated above can be used. When a combination of TRQ administration methods is used, it makes the mechanism complicated and non-transparent. Joerin (2014) discusses TRQ auctions from the point of view of the importer and argues that TRQs should only be allocated in an auction system, because this system prevents rent-seeking behaviour where firms have interests in gaining quota rents.

TRQs are identified among other export market access determinants, such as tariff protection levels, export subsidies and domestic support measures. Border measures such as customs tariffs, tariff peaks, tariff escalations, quotas and NTMs also determine export market access (Ingco and Nash, 2004; Hugo, Squalli and Wilson, 2006; Khorana, 2007; Ingco and Winters, 2008; Li and Carter, 2009; Perez and Jallab, 2009; Idsardi, 2010; Lemessa and Esmael, 2010; Francois and Manchin, 2013; Narayanan and Khorana, 2014; Arita *et al.,* 2017; Kareem *et al.,* 2018). Trade preference schemes, country-specific quotas, and low institutional and infrastructural quality all impose restrictions on export market access (Hoekman and Martin, 1999; Manchin, 2005; De Gorter and Kliauga, 2006; Hammouda *et al.,* 2006; Brockmeier and Pelikan, 2008).

Khorana (2008) notes that, in general, developing countries have a low level of participation in TRQ trade, a problem which has been attributed to existing tariff and non-tariff barriers (affecting agricultural market access), rather than the lack of export potential. Westhoff *et al.* (2004) point out that there are new NTMs arising due to opportunistic behaviour in the administration of TRQs, and these NTMs have led to quota underfill in some instances. TRQ fill rates (indicating the level of use of TRQs) are thought to reflect the fundamental properties of the TRQ administration method used in distributing the quotas as well as the commodity market conditions in the period of the quota. Furthermore, Westhoff *et al.* (2004) report that underfilled TRQs may have important market influences depending on the reasons for the underfill.

2.2.2 NTMs associated with South Africa's fruit TRQ exports to the EU

Beghin and Xiong (2016) indicate that there are diverse policies that form the basis of standard-like NTMs. Such standard-like NTMs also are noted to characterise the TRQ policy instrument that is relevant to the fruit products under the TDCA. Besides the standard-like NTMs (as noted in Beghin and Xiong (2016)), the TRQ itself has a quota component that is already an NTM. In addition to the NTMs imposed through TRQ administration methods, some forms of NTMs, such as the rules of origin, SPS measures and marketing requirements, also act as barriers to quota fill. Petriccione *et al.* (2011) note that SPS measures include standards regarding additives, disease-causing organisms and residues of pesticides in food.

One or more NTMs affect certain fruit products exported from South Africa to the EU. Protocol 1[4] of the TDCA sets out the rules of origin[5] concerning the application of tariff preferences of that agreement. In general, a certificate of movement proving the origin status must accompany the consignments that South Africa export to the EU. The TDCA is highlighted amongst what Kareem (2011) terms the EU's special preference arrangements significant for African exports. South African exporters of fruit products must comply with export standards of the EU market in order to benefit from the preferential arrangements.

Some of the SPS measures affecting South African fruits destined for the EU market are noted in the EUROPHYT (2016) report of plant health. The European Network of Plant Health Information Systems (EUROPHYT) is responsible for reporting the rejections of imports to the EU, among other issues. The report statistics show the number of rejections of consignments due to harmful organisms, such as citrus black spot (CBS). Other rejections are due to what is termed other documentary reasons. During the period 2011 to 2016, the European Commission (2016) noted the rejection of 216 consignments from South Africa to the EU due to concerning harmful organisms, as reported in EUROPHYT (2016). Put in perspective, if five (5) rejections are reported in EUROPHYT, the situation warrants an EU ban on importation for that

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[4] Protocol 1 of the TDCA is provided for in Article 28 of the TDCA, which indicates that the rules of origin upon which tariff preferences will be granted are laid out in Protocol 1. Title IV of Protocol 1 states that for South African products imported into the EU to benefit from the TDCA concessions, a movement certificate termed the EUR.1 and a declaration by the exporter should be included as part of the consignment. The declaration by the exporter describes the products in a way that enables the products to be identified as originating in South Africa. Article 15 of the Protocol further elaborates on the procedure of issuing out EUR.1 movement certificates (TDCA, 1999).

[5] SARS explains that rules of origin are the criteria used to define where the product was made and the origin is used to ascertain the duty payable (SARS, 2008).

specific year; South Africa has experienced this situation more than once. WTO (2016) notes that as recently as 2013 and 2015, South Africa has raised concerns about the EU's restrictive measures regarding CBS and that this issue has been ongoing since 1994.

South Africa has thus put systems of control in place that are periodically audited by the EU. The processed fruit products sector in South Africa is directly related to the use of fresh fruits in processing, and the producing units/farms that are the sources of the fruits need to be registered and inspected. In South Africa, the Perishable Products Export Control Board (PPECB) is involved as an agent for DAFF in monitoring, certification for exporting and general export controls to the EU market, which is considered a CBS sensitive market. Some processing and exporting establishments in South Africa have raised concerns that the PPECB's mandatory inspection processes duplicate their own processes and ultimately raise the fruit processors' costs. Sinopoli and Purnhagen (2016) indicate that South Africa argues that CBS-related prohibitions have no scientific justification except that the EU imposes this SPS measure to restrict trade.

Whilst all the information concerning a TRQ has to be notified at the WTO, the TRQs still remain unfilled, with the possibility of supply and demand factors together with other supplementary NTMs working to present a market access barrier. This study, whilst not quantifying the NTMs in their tariff equivalents, uses an alternative method to assess the impacts of the reduction of NTMs, as explained in Section 4.2.3.6.

2. 3 REVIEW OF PREVIOUS STUDIES

2.3.1 Previous studies on market access and TRQs

Ingco and Winters (2008) note that TRQ allocation – targeted partially or totally at a specific country under a preference agreement – limits other countries' market access. When considering the functioning of TRQs, variables like the in-quota tariffs, out-of-quota tariffs, expansion of TRQs and magnitude of tariff cuts would determine market access. Li and Carter (2009) studied TRQs notified by 28 WTO members for the years 1995 to 2000. Using a Tobit Model, the authors identified factors affecting the performance of TRQs regarding improving market access. The study noted that a reduction in the in-quota tariffs significantly improved market access, and a reduction in over-quota tariffs marginally improved market access.

Abbott and Morse (2000) evaluated the administration and implementation of TRQs for some developing countries. The findings of Abbott and Morse (2000) and others (Busse, 2003; Campo, 2003; Khorana, 2007; Ingco and Winters, 2008) which identify factors that influence quota fill, are summarised in Table 2.1 and are demarcated per category, specifically for this study.

Table 2.1: Factors affecting quota filling/use under TRQs

Four (4) categories of factors affecting TRQ fill or use				
	TRQ administration methods	***TRQ definition and use conditions***	***Supply and demand conditions of notified TRQ***	***TRQ associated tariff level conditions***
EXPORT SIDE	- implementation mechanisms - export license allocation procedures for TRQs - costly and cumbersome administration procedures - associated transaction costs	- size of import quota notified - time validity of quota allocated	- level of integration in the world economy - indirect trade from developing countries throughout the EU - inadequate supply - unattractive market	- other trade arrangements with the EU offering a better tariff than MFN
IMPORT SIDE	- import license allocation procedures - complicated methods of TRQ administration	- stringent safety standards as well as SPS measures - packaging and labelling requirements - definition of TRQ at a broad HS level - product definition too narrow	- distance between countries - high freight charges - communications - transport costs - discrimination against exporters by importers - low demand for imports - requirements on how products should be processed	- in-quota tariffs too high - binding MFN tariffs - other EU TRQs offered to other countries competing with TDCA TRQs

Source: Author's compilation from various sources - Abbott and Morse (2000); Busse (2003); Campo (2003); Monnich (2003); Khorana (2007); Ingco and Winters (2008); Lim and Blandford (2009).

This study demarcates four (4) categories of factors influencing TRQ fill relevant to South African fruit products exports. The influential factors are grouped based on TRQ administration methods, TRQ definition and use conditions, TRQ supply and demand conditions as well as TRQ tariff level conditions. The factors identified in the literature and presented in Table 2.1 form the basis of the analysis of quota fill factors presented in Chapter 5 of this study. The specific aspects under each of the categories are delineated in the analysis in Table 5.4. Most of the listed aspects of factors that influence quota fill belong in the category of NTMs, except for all aspects in the TRQ tariff level conditions category as well as certain aspects in the TRQ supply and demand conditions category, such as distance, inadequate supply, low demand, exporter discrimination and indirect trade.

Part of the TRQ fill factors indicated in Table 2.1 can be linked to the United Nations Conference on Trade and Development (UNCTAD) classification of NTMs that broadly demarcates import side and export side measures. Further, the UNCTAD classified import side measures are categorised into technical measures and non-technical measures. Thus, the TRQ definition and use conditions category indicated on the import side in Table 2.1 fits in under the UNCTAD classification of technical measures that define three chapters, namely – sanitary and phytosanitary measures, technical barriers to trade and pre-shipment inspection including other formalities (Nicita and Peters, 2013).

Li and Carter (2009) suggest that market access (proxied by TRQ filling in this study) is reliant upon a host of influential market access factors. This study expands on this notion, and compiles and categorises the factors that influence market access under TRQs into four (4) broad categories, before eliciting fruit sector participants' export experiences in a survey described in Chapter 4. The inclusion of these factors when defining fruit/fruit products market access provides a more inclusive determination of the extent of market access under the TRQ. Merely considering the notification of a TRQ as market access and overlooking whether a quota is filled or not may not be as all-encompassing when determining the extent of market access under a TRQ as it could be when these factors are included in defining fruit products market access.

Monnich (2003) distinguishes that in TRQ administration there are administrative measures that form a constituent part of a TRQ aiming to deal with the rationing problem involving quantity restrictions. In this instance, the measures regulate access to the quota, as Monnich (2003) notes. Monnich (2003) further notes that, as part of the TRQ administration, there are regulations in place that change or inhibit trade distribution. Some of these regulations have to do with how the raw products are processed.

The category on TRQ administration methods includes aspects like implementation mechanisms and procedures for export license allocation. There are transaction costs associated with the TRQ administration methods and these ultimately affect quota fill. The next category focuses on TRQ definitions and use conditions. TRQs cover either of one tariff line or several tariff lines; the definition of which, therefore, is either at the broad HS level or at a narrow product definition level. A narrow production definition, such as an HS 8- or HS 10-digit level, likely limits the products qualifying under a particular TRQ, whereas a broad definition, such as an HS 4- or HS 6-digit level, accommodates more products that can receive preferential treatment under a specific TRQ. Stringent food safety standards are among the aspects likely preventing quota fill.

The third category considers supply and demand conditions of notified TRQs. Monnich (2003) notes demand as a probable cause for quota underfill and identifies that low demand can result temporarily, but that low demand links consistently to a situation that can result from the product definition being too narrow or the deliberate choice of an unattractive market. Competition, such as indirect trade from other developing countries, affects TRQ expansion proposals; hence, the expansion of quotas face trade-offs with tariff cuts. Finally, the category of TRQ-associated tariff level conditions comprise the aspects of in-quota tariffs, tariff levels of other EU TRQs that compete with TDCA TRQs to access the EU market as well as other trade arrangements offering better tariffs than TDCA in-quota tariffs. If an in-quota tariff is too high, the expectation is that imports become too expensive; therefore, likely leading to reduced demand.

2.3.1.1 Synthesis of the identified study gap in market access and TRQ studies

Even though TRQs are identified as a determinant of market access in some of the reviewed studies, neither of the identified studies (Busse, 2003; Campo, 2003; Khorana, 2007; Ingco and Winters, 2008) examined market access factors specific to TRQs under the TDCA. This study covers that gap by analysing factors that influence the filling of TRQs for fruit/fruit products under the TDCA. In order to contextualise TRQ policies, market access (which is proxied by quota fill) in this study differs from other studies in which market access is expressed as a broad concept that focuses only on lowered or removed trade costs and does not consider whether or not TRQs are filled. This study offers research focused on TRQ market access defined in the context of fruit/fruit products quota fill and delves deeper into the factors that influence TRQ market access.

Another way that this study differs from that of Li and Carter (2009), is that although Li and Carter (2009) identify factors that impede market access under TRQs, the focus was only on the effects of different TRQ administration methods on quota fill rates, whereas this study differs in data used and the methodology to analyse factors preventing quota fill in a GTAP model. The data on TRQ administration methods in Li and Carter (2009) is from secondary sources, whereas this study exploits primary data gathered in a survey of fruit sector participants, thereby providing a measurement of experienced effects on a Likert scale, as described in the methodology section of Chapter 4. The data in this study is used to analyse factors impeding market access; in addition to this, TRQ administration also includes additional aspects of quota fill influential factors, under the categories of TRQ definition and use conditions, supply and demand conditions as well as TRQ associated tariff level conditions (as indicated in Table 2.1). The methodology for further analysing the influential factors in this study depends on the GTAP model and differs from other GTAP analyses in that it uses calculated shocks to present the market access factors that impede exports. The summary of previous studies on market access and TRQs, including the gap that this study covers, is summarised in Table 2.2.

Table 2.2: Summary of studies on market access and TRQs including the study gap

Author/s	Objective	Method	Finding	Remarks
Abbott and Morse (2000)	Evaluation of tariff quota administration and implementation	Descriptive TRQ rates and quota regimes	Liberalisation of MFN tariffs led to greater market access than the use of TRQs	Focus on commodities not including fruit/fruit products
Campo (2003)	Assess market access of developing countries to the Swiss market	*Ad valorem* equivalents rates	-TRQs are widespread in the Swiss schedule with some TRQs being very quantitatively restrictive - Imports from developing countries found to be stagnant but increasing from the EU to the Swiss market	
Monnich (2003)	Determining the role of TRQ administration methods in TRQ fill	Censored regression model	- Out-of-quota tariffs are prohibitive - Allocating quotas based on historical shares does not cause underfill	
Li and Carter (2009)	Identify factors affecting TRQ performance towards market access improvement	Tobit Model	Reducing in-quota tariffs improves market access more than the reduction of over-quota tariffs	Focus on the schedule of TRQs during the period 1995 to 2000 viewed as the trial period for agricultural TRQs
Brink (2014)	Review of agricultural and trade policy of selected countries	Theoretical review	South Africa and the EU are among the countries that have a large share of tariff lines accessed under TRQs	
Arita *et al.* (2017)	Quantify possible effects of reducing agri-food trade barriers	*Ad valorem* equivalents and CGE model	Partially liberalised sectors employing TRQs exhibit smaller gains	Focus is on trade amongst developed nations
Gap to be filled by this study				
The various studies apply to the period of the early 2000s following the Uruguay Round Agreement on Agriculture and the implementation TRQs. There are a few recent studies on TRQs but with no TDCA focus. The available studies do not focus specifically on fruit products, and no particular attention has been given to market access under specific trade agreements during the period of the 2000s, particularly for fruit products. This study fills the gaps by analysing more recent TRQ data (2011-2016) of fruit products disaggregated at the HS 6-digit level in a CGE model and studies market access of fruit products of the TDCA.				

Source: Author’s own compilation

2.3.2 Previous studies on market access and NTMs

Technical and non-technical NTMs have been isolated in Beghin and Xiong (2016). In Cadot and Gourdon (2016), SPS measures together with TBT measures are characterised as technical NTMs, whilst the NTMs characterised as covering a mixture of command and control type measures are termed non-technical NTMs. Based on the characterisation of NTMs and the elaboration in Beghin and Xiong (2016), it suffices to describe the NTMs pursued under the TDCA, and imposed by the EU on fruit products, as protectionist in nature since the fruit products are classified as sensitive products of the EU28. The ‘sensitive product’ classification by the EU is intended to justify the need to implement measures to protect domestic supply in the EU. The EU being a big player in the world fruit and vegetable imports, as noted by Cioffi, Santeramo and Vitale (2011), can assume a dominating position in the provision of market access for South African fruit and fruit products into the EU.

Nimenya, Ndimira and De Frahan (2012) point to the fact that African countries have lagged in their export performance in the EU market due to stringent safety standards and NTMs impacting food exports. Kareem (2011) confirms the importance of the EU as a market for African exports but also noting the presence of the NTMs faced by African countries in their trade with the EU. In a study of non-tariff barriers faced by South African firms, Koch and Peet (2007) conclude that the difficulties faced by South African firms regarding export destinations have their basis in technical regulations. Gebrehiwet, Ngqangweni and Kirsten (2007), Dal Bianco *et al.* (2015) and Disdier, Fontagné and Cadot (2015) indicate that since the advent of the Uruguay Round Agreement on Agriculture there has been a trend to decrease tariffs. These studies have noted that technical barriers that are more stringent have arisen to compensate for the decreased tariffs. The consequences of this are felt by developing nations exporting agricultural products.

Gebrehiwet *et al.* (2007) conclude that stringent SPS standards set by the developed nations erode the perceived gains of liberalisation. Dal Bianco *et al.* (2015) demonstrate – through the calculation of the *ad valorem* equivalent (AVE) for technical barriers – that technical barriers being country specific have a prohibitive tendency. Transaction costs for exporters are raised. Disdier *et al.* (2015) note that with the increase in economic integration agreements, it has become common practice to include protocols or provisions on NTMs. In this regard, the TDCA is no exception as such provisions, like the rules of origin, form part of the agreement.

In a departure from most of the studies presented in this section, Kareem (2011) concludes that inadequate production capacity, besides the inadequate implementation of trade agreements, explains why African countries have not taken advantage of the market access granted in the EU market.

2.3.2.1 Synthesis of the identified study gap in market access and NTMs studies

In analysing NTMs and market access, the reviewed studies in this section (2.3.2) have focused mainly on technical NTMs and neither of the studies have included primary data as a model input to understand the extent of impact of NTMs on trade and welfare in a CGE framework. Instead, studies such as Nimenya *et al.* (2012), Cadot and Gourdon (2016) have used the price gap method as an estimation. Neither of the reviewed studies have also gathered primary data from the perspective of fruit products exporters that are in a position to gain preferences through a trade agreement.

This study does not only assess market access in relation to technical NTMs, rather it extends and covers the gap by considering a broad range of import and export side measures impacting TRQ fill. In addition the gap in the supplementation of NTMs primary data inputs in a CGE framework is covered in this study by calculating a stringency measure (reported from exporter experiences) of the extent to which NTMs contribute in impacting TRQ fill and ultimately trade and welfare. Table 2.3 summarises previous studies on market access and NTMs and includes the study gap covered by this study.

Table 2.3: Summary of studies on market access and NTMs including the study gap

Author/s	**Objective**	**Method**	**Finding**	**Remarks**
Gebrehiwet *et al.* (2007)	Trade effects of aflatoxin levels on South African food exports	Gravity model	- SPS measures have multiplied and affect trade by developing nations - Stringent SPS standards set by developed countries counter expected trade liberalisation gains	
Koch and Peet (2007)	Analysis of technical regulations impacting small firms	Logit regression	Small exporting firms in South Africa incur export delays due to compliance issues concerning technical regulations	Results are not specific to an industry or export destination
Kareem (2011)	Analysis of factors determining African exports	Generalised method of moments	The EU increases market access for African products by lowering tariff and non-tariff barriers	African exports have not increased in market access of Northern countries
Nimenya *et al.* (2012)	Estimation of AVEs of NTMs imposed on African horticultural and fish exports	Price-wedge method	NTMs and other measures act asymmetrically for different countries	
Dal Bianco *et al.* (2015)	Empirical investigation of the impact of tariff and non-tariff barriers on world wine trade	Poisson Pseudo maximum likelihood estimator	SPS measures do not seem to obstruct exports while technical barriers have varying impacts	Compliance cost higher for African countries compared with EU countries
Disdier *et al.* (2015)	Analyse North-South technical barriers effects on international trade	Gravity equation	- Negative trade effects due to high regulatory standards of the EU - Regulations other than sanitary regulations matter in trade agreements	
Cadot and Gourdon (2016)	Estimating impacts on price of imports due to NTMs on trade	AVEs through price-gap estimation	NTMs raise prices of imports by about 8%	
Gap to be filled by this study				
There is no specific focus on fruit/fruit products of a trade agreement. Trade and welfare effects due to NTMs effects not analysed from the perspective of primary data sourced from fruit exporting establishments. The approach taken to analyse NTMs in this study fills the gap based on type of data collected from fruit exporting establishments to calculate the stringency of NTMs for implementation as a model input in a CGE model.				

Source: Author's own compilation

2.3.3 Approaches used in studies analysing TRQs and/or NTMs

A number of studies (Monnich, 2003; Gebrehiwet *et al.,* 2007; Khorana, 2008; Lim and Blandford, 2009; Li and Carter, 2009; Nimenya *et al.,* 2012; Bureau *et al.,* 2014; Dal Bianco *et al.,* 2015; Arita *et al.,* 2017; Kareem *et al.,* 2018) have analysed NTMs and TRQs from different perspectives and methodologies.

Gonzalez-Mellado *et al.* (2010), Bureau *et al.* (2014) and Arita *et al.* (2017) are closely related in the methodology of analysis of NTMs in a CGE framework, except for the approach in calculating the modelled NTMs shock value. Among the afore-mentioned authors, Gonzalez-Mellado *et al.* (2010), Bureau *et al.* (2014) and Arita *et al.* (2017) use the gravity model in establishing the AVEs of NTMs. An AVE is noted in the WTO (2012) World Trade Report as the level of an *ad valorem* tariff that would have the same trade restricting effect as a specific NTM. Gonzalez-Mellado *et al.* (2010) and Arita *et al.* (2017) use the AVEs calculated in the analysis of NTMs removal in a GTAP CGE model. This is in contrast to Bureau *et al.* (2014) who use a MIRAGE CGE model. The study results differ depending on the analysis and the commodities.

Arita *et al.* (2017) focus on agricultural foods and find that NTMs removal leads to trade expansion with higher gains when NTMs removal is coupled with tariffs removal. The findings in this study regarding tariff reduction results are ambiguous. In some agricultural sectors, net exports and production decrease. In many of the agricultural sectors, tariff removal leads to gains which depend on the size of the tariffs. Bureau *et al.* (2014) also focus on agricultural foods, and the AVEs of NTMs in that study are implemented either as a tax or as an efficiency loss. Bureau *et al.* (2014)

find that for a 25% reduction in NTMs, trade increases by 60%. The study of Bureau *et al.* (2014) also finds that the removal of tariffs shows very low trade gains.

Gonzalez-Mellado *et al.* (2010) focus on agricultural and horticultural products and find that the removal of NTMs increase exports from African countries to the EU. The study of Gonzalez-Mellado *et al.* (2010) indicates that such positive trade effects emanate from removing trade barriers like standards and regulations on packaging, and handling and preservation of products. In addition, the authors analyse welfare and find mixed results, with some countries suffering welfare losses due to removal of NTMs. However, according to Gonzalez-Mellado *et al.* (2010), South Africa experiences welfare gains in comparison to the other African countries (which do not) that the study analyses.

Dal Bianco *et al.* (2015) uses AVEs of NTMs calculated for wine by using average import price wedge, gravity analysis and the Poisson Pseudo-Maximum Likelihood (PPML) model. The findings in Dal Bianco *et al.* (2015) indicate that technical barriers cause substantial trade barriers to exports, SPS measures do not inhibit trade and a 1% increase in tariffs reduces trade by 0.47%. Kareem *et al.* (2018) calculate an index of protectionism for tomatoes, oranges, limes and lemons and use the Gravity Model and the Probit Model. The key findings in the Kareem *et al.* (2018) study show that standards in the EU tomato sector are protectionist, whilst there is no protectionism affecting exporter decisions to export oranges, limes and lemons to the EU. Nimenya *et al.* (2012) analyse NTMs in the fish sector by calculating AVEs of European food standards by using the price wedge method to quantify NTMs. By using a Displacement Multimarket Model, Nimenya *et al.* (2012) find that a decrease in AVEs from an African source positively affects imports and negatively affects price in the EU.

When analysing TRQs, Khorana (2008) calculates AVEs for various agricultural products. Khorana (2008) concludes, in a descriptive analysis, that TRQ management is complicated, lacks transparency and results in high transaction costs. Monnich (2003) calculates fill rates for various commodities and uses a Censored Regression Model to analyse the fill rates. Monnich (2003) concludes that the fill rate is determined by quota size and tariff and the results of the impact on fill rates of quota administration methods are inconclusive. Li and Carter (2009), like Monnich (2003), calculate TRQ fill rates of various commodities, but they use a Tobit Model to analyse the factors influencing TRQ fill. The findings in Li and Carter (2009) show that a reduction of in-quota tariffs significantly improves market access and that the reduction of MFN tariffs marginally improve market access. Lim and Blandford (2009) use a tariff quota equivalency test in their static analysis of various commodities. The study of Lim and Blandford (2009) reports that quota administration methods significantly influence fill rates and that full tariff liberalisation is preferable over smaller tariff reductions or increasing TRQs.

2.3.3.1 Synthesis of the identified study gap in approaches to analyse TRQs and NTMs

The reviewed studies on NTMs and/or TRQs reveal that NTMs are a significant factor impacting export market access either positively or negatively, depending on the target focus of the NTM. This study differs in methodology from the studies reviewed in this section (2.3.3) and differs specifically from Gonzalez-Mellado *et al.* (2010) in that the focus of this study is on the analysis of fruit products quota fill and related influential factors, including NTMs analysis in a GTAP CGE model. Gonzalez-Mellado *et al.* (2010) characterise the restriction of trade, between the EU and selected African countries, by specific NTMs from an exporter's point of view. This study focuses on

South African fruit/fruit products TRQ and uses the exporter's reported experiences in the filling of TRQs to calculate the contribution of NTMs towards quota fill. In a departure from calculating the AVEs of NTMs, this study calculates a Likert scale-based score of intensity of the influence of factors (including NTMs) preventing quota fill. A weighted score of the intensity of influences of each factor is presented as a counterfactual shock to remove NTMs in the GTAP CGE analysis as explained in the methodology in Chapter 4. Table 2.4 summarises various models/approaches in previous studies analysing TRQs and NTMs. The table also includes the study gap and reasons for the selection of the GTAP model and approach to analyse NTMs in this study.

Table 2.4: Summary of models/approaches applied in analysing TRQs and NTMs

Author/s	Objective	Method/Approach/Model	Remarks
Monnich (2003)	Explain variations in TRQ fill rates	Censored regression combined with panel data	Focus is on an agricultural import market
Gebrehiwet *et al.* (2007)	Estimate South Africa's food trade forgone due to stringent aflatoxin standards	Index of protectionism Gravity Model	Trade effects of NTBs proxied by forgone trade due to SPS regulations
Kareem *et al.* (2018)	Investigate protectionism of EU safety standards on food imports from Africa.	Protectionism index Gravity Model and Probit Model	
Khorana (2008)	Analyse the influence of the TRQ admin mechanism on market access for agricultural products	Descriptive	
Li and Carter (2009)	Identify factors affecting performance of TRQs	Two-limits random-effects Tobit Model	
Lim and Blandford (2009)	Impact of quota administration methods on TRQ fill rates	Static analysis to conduct a tariff quota equivalency test	
Gonzalez-Mellado *et al.* (2010)	Evaluation of NTMs for agricultural exports to the EU	AVEs introduced into CGE framework	Survey-based method to identify NTMs
Nimenya *et al.* (2012)	Examine how a decline in AVEs of EU NTMs affect prices of imports from Africa	AVEs of food safety standards using price wedge method	
Bureau *et al.* (2014)	Estimate impacts of NTMs on imports	AVEs of NTMs in MIRAGE CGE model	
Dal Bianco *et al.* (2015)	Analyse impact of trade barriers on wine trade	Gravity Model and non-tariff barriers included as count variables	
Arita *et al.* (2017)	Quantify the effects of NTMs and tariff removal	AVEs,sector-specific Gravity Model and CGE	
Gap to be filled by this study and reason for choice of model/approach			
The methods in the reviewed studies do not incorporate the calculation of NTMs based on exporter experiences or those of other relevant establishments in the export trade processes. Therefore, such methods were not considered in this study. Gonzalez-Mellado *et al.* (2010), whilst taking a survey-based approach, did not analyse either processed fruit products or the TDCA. The survey-based method was adopted in this study, as in Gonzalez-Mellado *et al.* (2010), but the gap of determining the influential factors to TRQ fill (which include NTMs specific to fruit products) is filled by using a different approach of calculating the NTMs' impacts in a CGE framework. Normally, the survey-based approach is avoided mainly due to cost concerns in carrying out a survey of exporters. However, the fruit products export sector surveyed in this study is quite concentrated; hence, for this study's survey, the costs were reasonable. Most of the studies use the Gravity Model and that approach only allows for the analysis on trade and not on welfare. The GTAP CGE framework enables both trade and welfare analysis, represents all countries that are party to the TDCA and takes account of the traded sectors. The GTAP model's advantage over other models is in the analysis of economy wide impacts and the estimation of welfare effects (measured in EV). The model also allows for trade liberalisation simulations at the HS 6-digit level to analyse tariff effects on trade flows. In addition, the GTAP database provides the large required amounts of data needed to analyse international trade issues in the relevant aspects of this study. Whilst there is criticism that the most recent GTAP database at any point in time is a few years behind, in the context of this study, the database of 2011 is timely in the sense that the TDCA was only fully implemented in 2012.			

Source: Author's own compilation

2.3.4 Previous studies of the TDCA

Studies carried out on the TDCA, regarding its implementation as well as its early years, mainly focus on the political economy of the agreement and do not analyse specific tariff lines of the agreement. Such studies include Andriamananjara and Hillberry (2001), Gibb (2003) and Bertelsman-Scott and Draper (2004). Bertelsman-Scott and Draper (2004) note that successful negotiations rest on a detailed understanding of each tariff line. Gibb (2003), in a case study of the EU and South Africa's post-apartheid trading regime, gives background to the key issues centred on the negotiations of the TDCA and contend that the agreement represented an unfair trading relationship. Andriamananjara and Hillberry (2001) conduct a sequential CGE analysis of the TDCA in which the focus is mainly on growth prospects. The study concludes that only 2% of the expected economic growth is linked to trade associated with the FTA. In other studies, such as Grant (2006), Goodison (2007) and Stoneman and Thompson (2007), carried out more than five years after the TDCA came into effect, there is also a focus on the political economy of the agreement.

Kalaba *et al.* (2005) examine the impacts of the TDCA in the initial phase of the TDCA being implemented. The study focuses on bilateral trade flows and trade intensity. Using a trade deepening versus trade widening methodology, the study demarcates high import growth sectors in the EU. Ordinary Least Squares (OLS) regression is used to examine TDCA impacts on South African exports. The study reports a trade balance deficit for South Africa, trade widening where new products lines are added to exports to the EU and that tariff phase down is not always associated with an increase in importance of the EU as a market.

Sandrey (2006), using partial equilibrium (PE) analysis, assesses trade diversion and trade creation impacts of the TDCA on the Southern African Customs Union (SACU). Another study by Sandrey and Jensen (2007) analyse the top twenty (20) South African export groups from all sectors of the economy. Of the top twenty (20) export groups examined, four (4) agricultural commodity groups are included. Concerning the analysis of tariff changes, the study conducts the analysis at both the HS 4-digit and HS 6-digit tariff level and find inconclusive results at the HS 4-digit level. The same study uses a GTAP model with a database of the year 2006 to analyse welfare. Sandrey and Jensen (2007) do not single out tariff quota analysis either for the agricultural commodities or for the rest of the other export commodities. Welfare impacts are calculated but do not isolate the impacts based on analysis of tariff quota lines.

Sandrey (2011) focuses on examining changes in agricultural exports distinguishing between performances among export lines as well as comparing tariff reductions for EU imports into South Africa. The study uses a variant of shift-share analysis to assess the performance of South African agricultural export lines in the EU compared to competitors. The conclusion reached in the study is that, the trade preferences granted under the TDCA indeed augment agricultural exports from South Africa to the EU. Mbatha (2011) assesses the relevance of the TDCA by focusing on an export data comparison of agricultural exports to the EU compared to the rest of the world. Mbatha (2011) used a descriptive analysis to analyse trends in export levels and values as well as a qualitative analysis to analyse the potential impacts on welfare changes for the poor, as brought about by employment changes.

2.3.4.1 Synthesis of the identified study gap in previous TDCA studies

The previous studies of the TDCA reviewed above in section 2.3.4 have mostly been aligned to a political economy analysis of the TDCA and less on agriculture as an export sector. There is also a very limited number of studies conducted within the GTAP CGE framework. In addition the reviewed studies were typically conducted prior to the full implementation of the TDCA which happened in 2012 and also prior to the end of the TDCA trade chapter when it was replaced with the SADC-EU-EPA in 2016. In studies such as Sandrey and Jensen (2007), the authors report some inconclusive results having analysed commodity groups that are highly aggregated and covering many tariff lines instead of single tariff lines or TRQs.

This study fills the gap in the previous studies of the TDCA by extending the analysis to the time of the full implementation of the TDCA in 2012 and to the end of the TDCA implementation in 2016 thus weighing up the effects after implementation rather than projecting the potential effects. Whilst some of the previous studies concluded on potential effects, that gap is covered in this study which offers an ex-post analysis that simulates some of the realistic liberalisation scenarios of a fully implemented TDCA. In search of more conclusive results, this study brings focus and attention on TRQ exports of specific TDCA fruit products tariff lines and thus covers the gap in knowledge where inconclusive results may be a consequence of the commodity aggregation bias. Selected fruit products tariff lines are thus singled out from the aggregated commodity groups or sectors for analysis in this study. Table 2.5 summarises the previous studies of the TDCA and the research gap to be covered by this study.

Table 2.5: Summary of previous studies of the TDCA

Author/s	Objective	Method	Finding	Remarks
Andriamananjara and Hillberry (2001)	Examine effects of TDCA on South Africa’s growth	Sequential CGE analysis	FTA expected to increase South African welfare	
Gibb (2003)	Examine key issues of the TDCA negotiations	Descriptive case study	Unfair TDCA trading relationship between the EU and SA attributed to the WTO regulatory economy	
Kalaba *et al.* (2005)	Analyse bilateral trade between South Africa and the EU	Bilateral trade flows revealed comparative advantage OLS	Very little evidence of positive impacts of the TDCA impacts on trade after 3 years’ implementation	Analysis disaggregated to HS 4-digit level
Author/s	**Objective**	**Method**	**Finding**	**Remarks**
Sandrey (2006)	TDAC trade diversion and trade creation impacts	Time-honoured formula	Trade is diverted from US, China and other countries	The TDCA analysis forms a small part of this study
Sandrey and Jensen (2007)	Mid-term review of the TDCA	GTAP model	- Little evidence of benefits to SA exports due to EU tariff reduction - Projected welfare in 2015 is larger for the EU than SA - Gains for SA concentrated in agricultural sector	Study analyses tariff reduction in general in the agreement and not sector specific, no TRQ focus
Mbatha (2011)	Assess TDCA relevance for South African agricultural exports	Descriptive	TDCA relevant for economic growth on the basis of export growth of South African products to the EU specifically in the agricultural sector	
Sandrey (2011)	Assess South Africa’s TDCA exports	Variant shift-share analysis	Agricultural exports have been promoted as a result of TDCA preferences	HS 6-digit analysis for some agricultural products that exclude fruit products
Sandrey and Gill (2013)	Examine trade effects of the TDCA	Descriptive market shares and growth rates	Limited evidence of TDCA trade creation as a result of the TDCA	
Gap to be filled by this study				
None of the studies have employed the most recent version of the GTAP database, namely version 9. A gap in the reviewed studies includes an analysis at a disaggregated HS 6-digit level, fruit/fruit products-specific sector as well as associated NTMs. Welfare impacts are calculated in studies such as Sandrey and Jensen (2007), but there is no isolation of the impacts based on analysis of tariff quota lines.				

Source: Author’s own compilation

Sandrey and Gill (2013), in a study of the TDCA and seeking to find a link between market share growth and tariff preferences, focus on examining trade effects (by looking at growth rates and market shares) and comparing averages in 1999/2000 and 2010/2011 as pre- and post-TDCA periods, respectively. The study finds that South Africa has not met European growth rates for both total imports and agricultural exports, with trade shares also decreasing. The study concludes that there is no evidence the TDCA has resulted in any significant trade creation, with overall trade showing a decline in the importance of South Africa as a source for EU imports. However, the study notes that for agriculture, the EU has remained South Africa's most important export market.

2.3.5 Studies modelling trade policies and/or TRQs in a PE and/or CGE framework

A selection of various literature studies (Thurlow, 2004; Bahta, 2007; Parappurathu, 2007; Britz and Heckelei, 2008; Narayanan, Hertel and Horridge, 2010a; Bektasoglu, Urban and Brockmeier, 2011; Verreth, Bunte and Lansink, 2011; Anderson, Martin and Van Der Mensbrugghe, 2013; Andriamananjara, Cadot and Grether, 2013; Laborde and Tokgoz, 2013) has paid attention to PE and general equilibrium (GE) models, regarding their application in the analysis of trade policies as well as the suitability of each model in analysing the impact of trade agreements. None of these studies focus on the TRQs of the TDCA, but the studies are important in order to highlight the difference in application of the models and the results that each can provide.

Britz and Heckelei (2008) define a PE model as a single quantitative simulation model or a combination of simulation models that cover both supply and demand for agricultural products, but do not integrate all sectors of the economy. PE models can be single market or multimarket which focus on the commodities of a sector with the potential to estimate the effects on an individual product. PE analysis can capture policy effects at the commodity or sectoral level but not economy wide effects. The disadvantage is that PE analysis will assume that the sector under consideration has limited interactions with the rest of the sectors in the economy, with the result that effects of policy actions are examined in markets directly affected (Parappurathu, 2007).

Parappurathu (2007) explains that a CGE model is a simulation model seeking to explain behaviour in the whole economy seeing as there is interaction in several markets. CGE models represent a market economy where many economic agents maximize their objective functions whilst being subject to their constraints. There is a complete specification of both the supply and demand sides of all markets, such as goods and factors (Burfisher, 2011). Anderson *et al.* (2013) note that economic analyses of consequences of multilateral, plurilateral and bilateral negotiations on international trade policy issues rely increasingly on multisectoral, multiregional and CGE models of the global economy. Hosny (2013), in a survey of literature on the use of CGE models in trade policy analysis, notes that GE models are complex enough to capture essential features of an economic system.

The motivation for carrying out CGE analyses of FTAs, such as the TDCA, is summarised well in studies, such as Van der Mensbrugghe, Beghin and Mitchell (2003); Elbehri and Hertel (2006); Grant *et al.* (2006); Narayanan, Hertel and Horridge (2008); Tsigas and Mora (2009); Meade, Grant and Regmi (2010). PE models can provide focused analyses of how a limited number of products are affected by the imposition of TRQs. Narayanan *et al.* (2010a) note that PE models, though giving benefits of disaggregated analysis, deprive the benefits of an economy-wide analysis that enables an analysis of the overall impacts of a policy. Some studies (Birur *et al.,* 2010; Britz and Hertel, 2011) have demonstrated the benefits of a combined PE and CGE framework when analysing the varied policy instruments.

Other studies (Decreux and Ramos, 2007; Narayanan *et al.,* 2010*a*) have assessed the benefits of PE versus GE models in modelling TRQs as well as the aggregation and disaggregation of TRQs. A challenge in modelling arises due to the need to harmonise TRQs with global commodity trade data. This requires that in modelling TRQs a broad commodity category TRQ be defined in which several tariff lines comprising various products of a commodity are aggregated. Results from the studies (Decreux and Ramos, 2007; Birur *et al.,* 2010; Narayanan *et al.,* 2010*a;* Britz and Hertel, 2011) indicate that a linked PE and CGE model is superior to both the CGE and PE counterparts. By contrasting welfare decomposition results from PE only, CGE only and combined PE and CGE frameworks, Narayanan *et al.* (2010*a*) suggest that a combined PE and CGE framework is the most ideal for performing trade policy analysis.

The CGE framework enables sectoral and aggregate welfare results, whereas applying only the PE framework, which focuses on a particular sector, does not allow for analysis of economy-wide impacts. Elbehri and Pearson (2005) have developed a TRQ module to model TRQs in a GTAP framework and have availed GTAP model codes for that approach. The approach of Elbehri and Pearson (2005) to model TRQs has also been followed by other studies (Van der Mensbrugghe *et al.,* 2003; Drogue and Ramos, 2004; Grant *et al.,* 2006; Grant *et al.,* 2009; Meade *et al.,* 2010; Narayanan, Hertel and Horridge, 2010).

2.3.5.1 Synthesis of the identified study gap in PE and/or CGE modelling of TRQs

The reviewed studies are beneficial in informing the rationale to analyse TRQs for fruit/fruit products under the TDCA in a CGE framework. The literature reviewed also points to the gap in studies in the context of South Africa and fruit/fruit products TRQs. This study does not use the TRQ module developed by Elbehri and Pearson (2005) but instead innovates the GTAP model through implementing the TRQs as individual GTAP sectors. In addition, the trade flows of the fruit products TRQs (mapped as individual GTAP sectors) represent within quota trade flows for the fruit TRQs that are underfilled. This study calculates an expansion factor to fill TRQs in the model through a counterfactual simulation. A further explanation of the methods to analyse fruit TRQs, as adopted by this study, is provided in Chapter 4. Table 2.6 summarises previous studies modelling trade policies and/or TRQs in a CGE and/or PE frameworks as well as the research gap to be covered by this study.

Table 2.6: Summary of previous studies modelling trade policies and/or TRQs in CGE and/or PE framework

Author/s	Objective	Method	Finding	Remarks
Van der Mensbrugghe *et al.* (2003)	Analyse TRQ reforms and multilateral trade liberalisation	Mixed complementarity problem in LINKAGE CGE	TRQ expansion impacts trade flows more positively than tariff reduction	
Drogue and Ramos (2004)	Model EU-MERCOSUR bilateral TRQs in agro-food trade	GTAP CGE using GEMPACK	Market access provided through new TRQs for beef, poultry, wheat, corn and dairy leads to global and EU welfare losses with gains for MERCOSUR	- GTAP version 4 - Block of equations used to introduce TRQs in model - GTAP OFD sector modelled as given

Author/s	Objective	Method	Finding	Remarks
Grant *et al.* (2006)	Combine PE and GE model to analyse the United States (US) dairy-sector TRQs	Subsector PE trade model inside a CGE model	Trade and quota rents increase for most countries when there is partial reform of TRQs	
Bahta (2007)	Analyse potential impact of trade on the Lesotho economy	Lesotho SAM to construct a CGE model	Gains in commodity exports as well as welfare for Lesotho	
Decreux and Ramos (2007)	Modelling TRQs in MIRAGE model	MIRAGE model with TRQs calibrated at the GTAP sector level	MERCOSUR experiences greater welfare gain when MFN tariffs are reduced as opposed to quota expansion	
Grant *et al.* (2009)	Investigate reform options for TRQs	Mixed complementarity framework	Decreasing MFN tariffs lead to greater market access	
Tsigas and Mora (2009)	Tariff and TRQ effects on US food and agricultural exports	PE model GE framework	Tariffs and TRQs cause a loss in economic welfare for the US	
Meade *et al.* (2010)	Analyse trade and welfare impacts due to US sugar TRQ liberalisation	PE-GE model	More positive welfare results from decreased MFN tariffs than increasing quota levels	
Narayanan *et al.* (2010a)	Tariff liberalisation in the Indian Auto sector	PE-GE GTAP model	Recorded welfare gains are higher in the PE-GE model compared to the GE model	GTAP version 6.2 with base year 2001
Bektasoglu *et al.* (2011)	Import tariff liberalisation of EU food and agricultural sector	PE and GE with aggregated and disaggregated sectors	GE model results in higher welfare changes using disaggregated sectors	GTAP version 7
Gap to be filled by this study				
The previous studies reviewed have modelled TRQs for trade agreements but those trade agreements do not include the TDCA. The previous studies also do not disaggregate the GTAP OFD sector, as is done in this study, to extract/isolate the fruit products for analysis at the HS 6-digit level. Aggregation in GE modelling is seen as a disadvantage because the usage of the GE model lacks detail at the tariff line, yet PE models are also criticised for not being useful in analysing economy wide effects. Hence, the gap is addressed in this study by carrying out analysis at the HS 6-digit disaggregated level that facilitates the focus on TDCA fruit products TRQs at the level of detail which is close to the negotiated TRQ concessions. The analysis at that level, therefore, provides sufficient details at the fruit products sector level. The use of the GTAP CGE model enables the analysis of the economy-wide effects feeding into the nub of trade negotiations that require sufficient detail at sectoral level and at the same time requiring adequate detail on the impacts on other sectors in the economy. This study differs from previous studies conducted by calculating quota rents and dis-aggregating the GTAP OFD sector.				

Source: Author's own compilation

2.4 CHAPTER SUMMARY

This chapter has provided a review on the importance of trade agreements and market access in agriculture. A review of market access under TRQs and associated NTMs is given together with a review of previous studies of the TDCA. Approaches to analysing TRQs and NTMs as well as the modelling of policies in PE and CGE frameworks form part of the review. The literature provides the justification for the use of PE and CGE models among other methodological frameworks also listed for the various selected studies. An explanation on the choice of the GTAP CGE framework is given based on the advantage that the CGE framework gives through the analysis of economy-wide effects of trade liberalisation, and the fact that it can be modified for the analysis of the HS 6-digit level fruit product tariff lines of this study. The gaps in research that are relevant to this study are also indicated in the chapter. The conclusion is that the gap to be filled is a disaggregate analysis of the fruit products sector which is required to determine trade and welfare impacts of TRQ exports under the TDCA. The available studies have also not analysed NTMs data from the viewpoint of fruit sector exporting establishments for implementation in a CGE framework to simulate trade liberalisation scenarios. The main strand of the conclusions drawn from the literature, and which is relevant to this study, is that tariffs and NTMs distort market access, and the removal those trade barriers leads to trade and welfare gains of different magnitudes.

CHAPTER THREE

3. OVERVIEW OF THE TDCA: IMPLEMENTATION, ADMINISTRATION AND USE OF TRQs FOR FRUIT/FRUIT PRODUCTS

Parts of this chapter have been published in an Agrekon special issue (Muchopa, Bahta and Ogundeji, 2019).

Muchopa, C.L., Bahta, Y.T. and Ogundeji, A. A. (2019). Tariff rate quota impacts on export market access of South African fruit products into the EU market. Agrekon (on-press) https://doi.org/10.1080/03031853.2019.1593865

The chapter provides an overview and discussion of the TDCA between South Africa and the EU, including the implementation and administration framework of fruit TRQs. A description of the composition of fruit products under the TDCA TRQs and the tariff protection levels is given. A brief review of bilateral FTAs between EU28 and countries receiving similar fruit TRQs to those of the TDCA is also provided. This review also serves to highlight South Africa's TDCA preferences in comparison to preferences of competing exporting countries to EU28, in terms of contribution to the EU28 imports under the relevant TRQs. The chapter therefore addresses the first objective of the study by examining the fruit products TRQ export regimes within the context and overview of the TDCA implementation and administration.

3.1 THE TDCA

The TDCA that governed trade relations between South Africa and the EU was signed in 1999 establishing an FTA over a 12-year period (TDCA, 1999). The chapters of the

TDCA included trade, political dialogue, economic cooperation, development cooperation and cooperation in other areas. The trade chapter of the TDCA established the FTA between South Africa and the EU and improved market access for exporters on both sides. The EU liberalised 90% of imports from South Africa over a 10-year period, and South Africa liberalised 86% of imports from the EU over a 12-year period (South Africa, DFA, 2015). Exemptions from liberalisation of South African exports to the EU are mainly found in the agricultural section of the agreement. The EU granted TRQs for cut flowers, strawberries, fruit juice, canned fruit, dairy and wine. The following fruit/fruit products concessions were made as an initial offer by the EU to South Africa in the form of TRQs: strawberries (250 tonnes at half duty), canned fruits (60000 tonnes at half duty) as well as fruit juice (5700 tonnes at half duty). These quantities have increased annually at an annual growth factor of 3%. The South African Revenue Service (SARS) implements tariff cuts as set out in South Africa's trade offer and DAFF administers quotas granted by the EU. On the other hand, the EU implements and administers quotas granted by South Africa (TDCA, 1999; Sandrey and Gill 2013; South Africa, DFA, 2015).

The liberalisation provisions for agricultural commodities exported to the EU market are listed in Annex IV of the TDCA, ranging from List 1 to List 8[6]. In List 1, all customs duties were abolished three years after entry into force of the agreement. All duties were abolished after 10 years for List 2. List 3 duties were also abolished after 10 years, and List 3 included a duty-free quota on protea flowers which was implemented from entry into force of the agreement until the tariff phase-down after

[6] See also footnote 1 explaining what Annex IV entails

10 years. This meant that after 10 years, a quota on protea flower exports ceased to apply and trade was fully liberalised. Abolishment of duties was also done after 10 years for List 4 with a duty-free quota on sparkling wine, cheese and curd, which lasted until tariff phase-down. In List 5 – consisting of processed agricultural commodities only – a reduction in duties occurred according to conditions set out for each commodity. List 6 comprises only sensitive products regulated by TRQs and which faced reduced customs duties. There were no tariff concessions for List 8 commodities as these are protected in the EU. This study concerns the fruit/fruit products appearing in List 6 of the Annex IV (TDCA, 1999).

The relationship of the TDCA and the SADC-EU-EPA is discussed below.

3.2 THE TDCA TRADE CHAPTER AND THE SADC-EU-EPA RELATIONSHIP

Protocol 4[7] of the SADC-EU-EPA governs the relationship between the TDCA and the SADC-EU-EPA. It details the repeal of the TDCA provisions on trade and trade-related issues that are now implemented under the SADC-EU-EPA. After the TDCA was signed in 1999, the TDCA trade chapter was implemented from 2000 to end 2016. The TDCA has a review clause enabling the review of provisions after five (5) years. The TDCA was reviewed in 2004, in line with the requirements of review within five (5) years of signing, and it was recognised that an update was required. This was followed by a formal TDCA revision in 2007 which led to an amending agreement being signed

[7] Protocol 4 is one of the four (4) protocols forming part of the SADC-EU-EP as Article 111 of the SADC-EU-EPA which provides for the relationship between the TDCA and the SADC-EU-EPA. Protocol 4 of the SADC-EU-EPA specifies the sections of the TDCA that were repealed when the SADC-EU-EPA came into force. Paragraph 1 of Protocol 4 indicates that the TDCA titles II and III regarding Trade and Trade-related Issues, respectively, are repealed. Furthermore, paragraph 3 of Protocol 4 explains that the SADC-EU-EPA takes prevalence over any inconsistencies between it and the TDCA (European Union, 2016).

in 2009. Thereafter, the revision of trade chapters of the TDCA were excluded from the process of TDCA revisions and conducted under the SADC-EU-EPA. South Africa joined the SADC-EU-EPA negotiations in 2007, having been an observer from 2004 when formal negotiations of the SADC-EU-EPA began. In addition, with the experience of the TDCA, South Africa had a basis on which to negotiate for additional market access to the EU under the SADC-EPA Group. The SADC-EPA Group consists of Botswana, Lesotho, Namibia, Mozambique, South Africa and Swaziland. Among the key trade issues, South Africa was concerned with tariff negotiations and seeked improved market access to the EU over and above what the TDCA provided (Sandrey and Gill, 2013; South Africa, DFA , 2015).

The SADC-EU-EPA was concluded in 2014 but was not yet functional. The SADC-EU-EPA trade provisions, on signing of the SADC-EU-EPA in 2016, replaced the TDCA trade provisions. It is envisaged that under the SADC-EU-EPA, South Africa stands to gain more access to the EU. According to a European Commission memorandum release in 2016, South Africa trades with the EU based on improved conditions that built on the TDCA. South Africa sought to improve market access for what currently obtains under the TDCA and such improvement has been achieved for some 32 agricultural products under the SADC-EU-EPA. Notably, some market access improvements include wine, sugar, ethanol, flowers, fruit and fruit products as well as some dairy (South Africa, DTI, 2016). It is envisaged under the SADC-EU-EPA that at full implementation, 98.7% customs duties will be realised as the EU market opens towards South Africa. For the duties, 96.2% are fully removed whilst 2.5% are partial. The EU market opening towards the other countries of the SADC EPA Group is such that 100% of duties are removed (European Commission, 2016).

3.3 FRUIT PRODUCTS EXPORTING ARRANGEMENTS TO THE EU MARKET

The focus of this sub-section is to give a brief overview of the South African actors in the fruit products sector specifically targeting the EU fruit TRQ market. South African establishments exporting fruit juice and canned fruit are benefitting from access to the EU market through the EPA trade arrangement between the EU and the SADC states. Previously, South African exporting establishments enjoyed the same market access under the TDCA. This section presents highlights of the changes in TRQ concessions from under the TDCA to the SADC-EU-EPA.

3.3.1 TDCA and SADC-EU-EPA fruit products concessions

The full implementation of the TDCA, which culminated in the final phase-in of tariff preferences, came into effect in 2012. The trade chapter of the TDCA was renegotiated under the SADC-EU-EPA and as of end-2016, SADC-EU-EPA preferences were being implemented. The SADC-EU-EPA TRQ preferences on fruit products mentioned in this study are specific to South Africa, as they were carried over from the TDCA and remain as concessions relevant to South Africa. The liberalisation of the concerned tariff lines under the SADC-EU-EPA remains partial, as it existed under the TDCA, and relates to concessions on an agreed quota of fruit products and on tariffs. However, what is notably different about the SADC-EU-EPA is that tariffs will gradually be reduced to zero, whereas the TDCA had no such provision. Thus, the SADC-EU-EPA is viewed as a better deal. In the same manner as was expected under the TDCA, EU market access for the fruit juice and canned fruit exports is expected to further improve as a result of the SADC-EU-EPA coming into effect in 2016 and the consequent full implementation of that agreement expected in 2026.

As stated in Section 3.2, Protocol 4 (explained in footnote 5) of the SADC-EU-EPA outlines the relationship between the TDCA and the SADC-EU-EPA and indicates the provisions of the TDCA that have been repealed. In this regard, and specific to this study, the TDCA articles, protocols and annexes contained in the trade chapter were repealed when the SADC-EU-EPA entered into force. For all intents and purposes, the SADC-EU-EPA takes precedence over the TDCA where any inconsistencies between the two texts may arise.

The TDCA (which was implemented from 1999 to 2016), gained liberalisation for specified fruit product quotas as follows: 100% of the MFN tariff rate for frozen strawberries (HS0811.10), 50% of the MFN tariff rate for canned pears (HS2008.40), apricots (HS2008.50) and peaches (HS2008.70) as well as for mixtures of the canned fruit (HS2008.97), frozen orange juice (HS2009.11), pineapple juice (HS2009.41) and apple juice (HS2009.79). The SADC-EU-EPA concessions augment the market access when compared to the access granted under the TDCA. The changes from trading under the TDCA to trading under the SADC-EU-EPA are based on improved concessions for some of the fruit products. In Table 3.1, a comparison of the TDCA fruit TRQ concessions and the SADC-EU-EPA fruit TRQ concessions is presented.

Table 3.1: Comparison of TDCA fruit TRQ concessions and the SADC-EU-EPA fruit TRQ concessions

<table>
<tr><th rowspan="3">TRQ as defined per EU order number</th><th colspan="3">Tariff concession as a percentage (%) of MFN applied tariff</th></tr>
<tr><td>TDCA Tariff</td><td colspan="2">SADC-EU-EPA Tariff</td></tr>
<tr><td>Full implementation (2012)</td><td>Initial (Nov 2016)</td><td>Full implementation (2026)</td></tr>
<tr><td>Frozen strawberries</td><td>100</td><td>100</td><td>100</td></tr>
<tr><td>Pears, apricots, peaches</td><td>50</td><td rowspan="2">50*</td><td rowspan="2">100*</td></tr>
<tr><td>Mixtures of non-tropical fruit</td><td>50</td></tr>
<tr><td>Mixtures of tropical fruit</td><td>50</td><td>50</td><td>50 and 100**</td></tr>
<tr><td>Frozen orange juice</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Pineapple, apple juice</td><td>50</td><td>50</td><td>50</td></tr>
<tr><td>Citrus jams</td><td>n/a***</td><td>50</td><td>50</td></tr>
</table>

Source: Author's compilation based on South Africa, DTI (2016) and European Commission (2016a).

** the two TRQs have been combined under the SADC-EU-EPA*

*** only applicable for tariff line 2007.99.50 within the TRQ*

**** new TRQ, did not exist under the TDCA*

The welfare implications of the tariff changes indicated in Table 3.1 have been further analysed in Chapter 5. Whilst the SADC-EU-EPA has been negotiated for trade between the EU and SADC EPA states (South Africa, Botswana, Lesotho, Namibia, Swaziland and Mozambique), the concessions presented in Table 3.1 are specific to South Africa only and are based on South Africa's previous trade with the EU under the TDCA. The MFN tariffs rates have not changed from before and have, thus, remained the same after the SADC-EU-EPA implementation.

The canned pears, apricots and peaches TRQ, and the canned mixtures of non-tropical fruit TRQ have been combined and capped under a single TRQ for which 100% of the MFN tariff rate concession will be implemented by 2026; thus, leading to duty free access for that TRQ. Whilst duty free access to the EU market will be offered for this TRQ in 2026, the expert opinion interviews reveal that that the capping of the

TRQ to a tonnage of about 57 000, though expanded, is not a welcome development. In 2026, the frozen orange juice TRQ will be implemented duty free. At full implementation of the SADC-EU-EPA in 2026, no changes will be realised for the pineapple and apple juice TRQ which will, thus, remain at a 50% concession of the MFN tariff, as it was under the TDCA. The duty-free access the frozen strawberries TRQ already enjoys will remain under the SADC-EU-EPA. Citrus jams, a new TRQ, introduced with a 50% MFN tariff rate concession, will remain at full implementation in 2026.

3.3.2 Exporters interactions and quota rents distribution

A synopsis of interactions among role players in the fruit sector (based on evidence gathered from this study's survey elaborated in section 4.1.4) shows that the fruit processing sector interacts with fruit production when farmers deliver their produce to processing plants, and, in certain instances, there are contracts between farmers and canners or juice processors. Canners sell canned products to local and foreign retailers, brand owners and importers or distributors. Puree, which is a semi-processed product, is sold to other domestic and export market manufacturers. In order for the exporting establishment to benefit from preferential tariffs on exported fruit products to the EU, they must apply to export under an allocated quota determined by the SADC-EU-EPA or, previously, by the TDCA.

After the exporting establishments have supplied all the required documentation, have complied with all the origin rules and have exported their goods, SARS becomes involved in processing the requests for preferences for each exporting establishment requesting such service. Among the role players is the PPECB, an inspection body appointed by DAFF that is responsible for inspecting consignments for conformity with quality requirements for exports. The PPECB issues export certificates and documents facilitating the export of products. Phytosanitary certificates are another requirement for exporters, and these are issued from the National Plant Protection Organisation (NPPO) of South Africa. The NPPO of South Africa liaises with the relevant NPPO of an importer country and issues the phytosanitary certificates to exporters only after inspection has shown that they meet the conditions and requirements set by the importer country. A movement certificate, referred to as EUR1, certifies the country of origin of the consignment destined for the EU market. Under the SADC-EU-EPA, as it was under the TDCA, the EUR1 movement certificate is required for a preferential tariff to be granted to an exporter who wishes to take advantage of the preference. Such granting of preferences is administered by SARS (TDCA, 1999; SARS, 2008).

The South African fruit canning and fruit juice sectors participating in EU TRQ exports are structured under two umbrella associations, namely the South African Fruit and Vegetable Canners Association (SAFVCA) and the South African Fruit Juice Association (SAFJA). There are other exporters outside of these associations that play a fringe role in TRQ exports destined for the EU market. SAFVCA, the industry body focusing on general manufacturing interests of the fruit and vegetable processing sector, also partners with SAFJA in representing the interests of fruit juice establishments that export under EU fruit TRQs. SAFJA is the representative body for companies engaged in processing and packaging of fruit juice concentrates, pulp and purees. South Africa, together with other member states in SACU, boasts four (4) fruit canning factories, three (3) fruit concentrate factories, a pineapple processor, two (2) jam units as well as ten (10) vegetable related units. Processed fruit products

(HS2008) are export oriented, with roughly 80% of the processed products destined for export. For fruit juices, concentrates and purees (HS2009) about 30% of the total processed product is destined for export (SAFVCA, 2015).

The number of EU fruit TRQ beneficiaries or establishments that were allocated quotas during the years 2013 to 2015 are presented in Table 3.2.

Table 3.2: Number of establishments participating under EU fruit TRQ exports (2013-2015)

TRQ as defined per EU order number	**Year**		
	2013	***2014***	***2015***
Frozen strawberries (HS0811)	0	0	0
Pears, apricots, peaches (HS2008)	6	4	4
Fruit mixtures (non-tropical fruit and tropical) (HS2008)	3	2	2
Frozen orange juice (HS2009)	2	1	1
Pineapple, apple juice (HS2009)	4	3	4

Source: Author's compilation based on SAFVCA (2015).

The indications are that fruit TRQ exports to the EU market are concentrated among a few establishments. This is not peculiar as it is generally a phenomenon of the fruit canning and fruit juice sectors, as revealed through discussions with industry experts. There are six (6) establishments that participated in EU fruit juice (HS2009) TRQs for the marketing periods 2013, 2014 and 2015. For the canned fruit (HS2008) TRQs, indications are that seven (7) establishments exported to the EU market under TRQs during that same marketing period. There are about ten (10) establishments in the fruit canning processing and fruit juice industry represented under SAFVCA and SAFJA (SAFVCA, 2015).

Discussions with industry leaders revealed that some of the establishments participate across more than one TRQ. Over the years, various establishments in the fruit canning as well as the fruit juice industries have consolidated their operations through processes that include acquiring operations, and mergers. Establishments in such business arrangements are not entitled to apply separately for the allocation of quotas, they have to apply as one entity.

Permits to export under the trade agreement, once acquired by a certain exporter/establishment, are not tradable among the holders or any party and are also not transferable to any party. The exporters benefitting under this arrangement of export permits that are administered by the exporting country, are expected to accrue quota rents as holders of export permits under the relevant TRQs. Quota rents are, however, only accrued when the quota is binding (namely, when export quantities are limited by the quota amount) and the situation in which the quota rents are accrued is such that the domestic price in the EU market is higher than the world price plus tariff. The quota rent gains are further illustrated in the frozen orange juice case in Section 5.3. There are other exporters, especially in the fruit juice sector, that export outside the EU fruit TRQs and, therefore, do not take advantage of the preferences granted under the trade agreement. Such exporters likely export at the MFN tariff rate under *erga omnes* TRQs. For *erga omnes* TRQ, importers are the likely capturers of quota rents since exporters do not need a licence for TRQ exports and are thus unaware of the tariff rate that will apply to their exports.

Discussions with fruit sector industry experts largely indicated that the exporting establishments already involved in TRQ trade are likely the only benefactors able to capture quota rents as they are exclusively aware of the TRQ trade opportunity.

Seemingly, producers or farmers that supply fruit processors are not necessarily aware of whether the canned fruits and juices produced from their fruits are destined for export markets or not. The interactions of producers with processing or exporting establishments are, therefore, not focused on negotiating produce sales aimed at capturing some potential tariff quota rent. Producers do not necessarily concern themselves with establishing whether or not the eventual exports are exported under the EU tariff preferences.

3.4 TRQ IMPLEMENTATION AND ADMINISTRATION FRAMEWORK OF THE TDCA

3.4.1 TRQ implementation and administration structure for EU fruit TRQs

Figure 3.1 depicts the administration structure of the EU fruit TRQs, as managed by DAFF and SARS on the exporter side of the trade agreement. The WTO rules, under which bilateral trade agreements must comply, are an external environment to the administration structure of TRQs by South Africa (the exporter). The EU policy environment is also part of the external environment. The external environment, as indicated by the dotted lines of interactions, is envisaged as influencing the broader framework within which the fruit TRQs are administered. The negotiated agreement has to comply with the stipulations of the WTO as well as take cognisance of the EU market (for which the TRQ exports are destined) requirements. Considering the internal environment of the administration of TRQs, four (4) blocks of interactions are set out. These are (1) the government departments tasked with trade negotiations, implementation and administration of the EU TDCA fruit TRQs, (2) the processed fruit industry under the relevant umbrella associations, (3) non-represented fruit sector interests and (4) the Agricultural Trade Forum (ATF) that serves as a linking pin between industry and government.

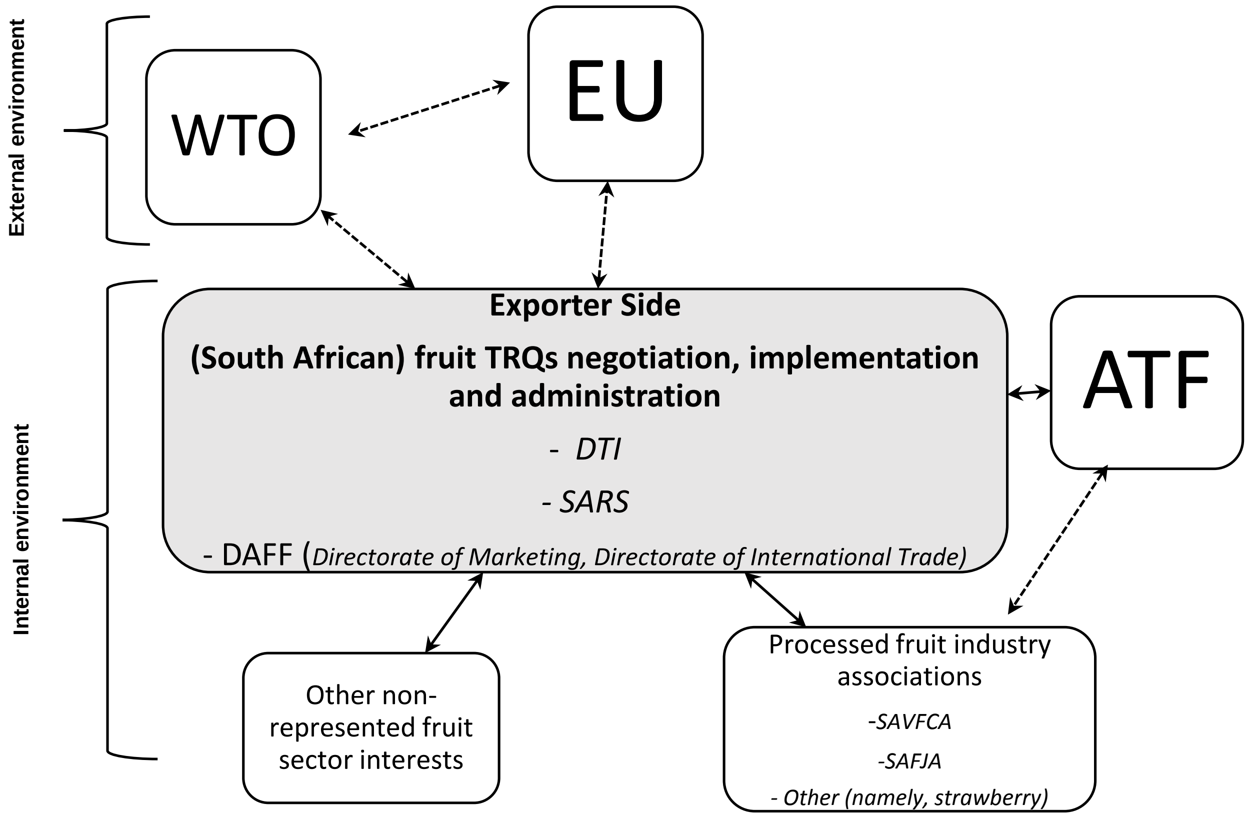


Figure 3.1: Administration structure of EU fruit products TRQs from the exporter side
Source: Author's own design

The Department of Trade and Industry (DTI), with inputs from the DAFF Directorate of International Trade, negotiates the aspects of the trade agreement pertaining to EU fruit products TRQs, among other aspects. The DAFF Directorate of Marketing together with the DAFF Directorate of International Trade, both working with SARS, are at the centre of the tariff quota allocation process. The quotas are allocated on an export permit basis or first-come, first-served basis depending on the tariff line and the terms of the TDCA/SADC-EU-EPA. The government gazette released every year to inform prospective exporters about the available quotas and requirements to apply for export permits, stipulates that exporters and potential exporters must comply with rules of origin, SPS and other technical requirements of the TDCA/SADC-EU-EPA. Export permits are issued only to exporters registered with the DTI and SARS; therefore, exporter registration is a requirement for all incumbents.

Discussions held with officials in DAFF and DTI revealed that, the allocation of quotas is also dependent upon how the industry is using the quotas. The DAFF Directorate of Marketing is responsible for issuing the export permits and, thus, allocates the quotas. For the TRQs administered on this basis, the allocation of quotas is premised upon the notion of deserving exporters regarding quota use. Quotas are allocated on a provisional basis at the beginning of the year, allowing for an assessment of use at the end of June each year. In September, the reallocation of quotas is undertaken based on the assessment of use. SARS is responsible for the fruit TRQs that are allocated on a first-come, first-served basis.

The DAFF Directorate of International Trade is responsible for communicating the quota use balance on a monthly basis. This communication is effected by the ATF members. The ATF, in turn, shares the information with the exporters, a process that enables the exporters to be fully aware of the availability or balance of the quota leading up to the year end in which the quota applies. The Directorate of International Trade also assists exporters with trade-related queries regarding EU member states. In such instances, the Directorate of International Trade is positioned to seek a means of intervention that will work towards assisting with the full use of the quotas.

3.4.2 Trade Permit System

The TRQ administration mechanism for fruit/fruit products under the TDCA is published in government gazettes. Under that mechanism, exporters receive permits on an annual basis to export, under the TRQs, to the EU. The trade permit system gives the details of the considerations made in the allocation of permits; however, the actual calculations are kept confidential. South Africa (2014) and discussions with government officials in DAFF and DTI further revealed that the DAFF TRQ administration methods consider historical exporters' market share for the past three (3) years. Some of the criteria considered in the TRQ allocation process have a basis in the national transformation agenda under which criteria, such as Broad Based Black Economic Empowerment (BBBEE) scores, new exporters and emerging exporters are considered. The criteria, through the promotion of favourable conditions for new entrants, is geared towards promoting accessibility through BBBEE.

The BBBEE point scoring system is used for purposes of increasing export participation opportunities for historically disadvantaged and increasing the number of newly established businesses. Two rounds of allocations ensue where, in in the first round, the applicants get equal allocations within their respective BBBEE-rated levels. The surplus or remaining quota is then reallocated in the second round, where it includes BBBEE non-compliant applicants (South Africa, Government Gazette, 2014).

When export permits for the six (6) fruit products TRQs are issued, other criteria to be considered include the status of the applicant (classification in terms of historical advantages/disadvantages), the quota applied for by the applicants, quota available and the number of applicants applying for a quota. There is no charge for quota allocation by DAFF, except a fee of less than R1000 for the issuing of an annual permit. Besides that small share in fees going to the government, the quota rents are accrued to the quota recipients (South Africa, Government Gazette, 2014).

DAFF works closely with two umbrella associations, the SAFVCA and SAFJA, that assist in the assessment of quota use and administration. The same fruit products TRQs, now administered under the SADC-EU-EPA by DAFF, have to undergo the same administration procedures as they did under the TDCA. The available quota is notified at the beginning of the administration period. A reallocation process ensues, during a set period in the year, where DAFF deducts quotas from exporters who are not using them and allocates or adds quotas to exporters using their allocation (Parliament of Republic of South Africa, 2013). Therefore, a flexibility exists that allows the quotas to be filled by the parties who are in a position to do so.

The implications of the trade permit system implementation hinge on the ability of full quota use from the South African perspective. It is particularly important to note that regardless of the applicant’s export ability in terms of capacity, the exporter will potentially receive the least or no allocation depending on their level of BBBEE compliance. The allocation based on BBBEE points was designed to rationalise market access within the South African agricultural environment but has had adverse impacts on the filling of quotas. The system indirectly or unintentionally limits the quota granted – on the basis of BBBEE non-compliance – to those exporters with capacity.

Using 2013, the year following the full implementation of the TDCA, the data gathered from DAFF, presented in Table 3.3, indicates that the historically advantaged big exporting companies have not been fully receiving their requested quota allocation.

Table 3.3: TDCA fruit products quota allocation to applicants in 2013

Products, HS codes and notified quota in kgs	Category of applicant and applicant ID	Quota requested/applied for as a share (%) of notified quota	Quota allocated/received as a percent of quota requested
Frozen strawberries HS0811.10 347 500 kgs	**n/a**	0	0
Orange juice frozen HS2009.11.99 973 000 kgs	Historical[a] exporter A	102.77	64.70
	Combined[b] exporter B	30.83	92.33
Canned fruit (pears, apricots and peaches) HS2008.40/.50/.70 57 155 750 kgs	Historical exporter H	100.77	56.46
	Historical exporter I	100.77	22.72
	Combined exporter J	2.10	100.00
	Combined exporter K	2.62	100.00
	Combined exporter L	4.37	100.00
	Combined exporter F	5.60	100.00
Mixed fruit HS2008.97.59/.74/.78/.98 28 231 800 kgs	Combined exporter L	0.89	100.00
	Historical exporter H	88.55	47.86
	Historical exporter I	90.85	46.65
Apple juice HS2009.71.20/.99; 2009.79.11/.19/.30/.91/.98 6 950 000 kgs*	Historical exporter D	28.78	100.00
	Combined exporter E	14.39	41.80
	Combined exporter A	8.63	69.67
	Combined exporter F	0.10	83.60
Pineapple juice HS2009.41.92.10/.20/.30	Combined exporter A	47.50	0.10

Source: Own calculations based on the 2013 DAFF database

**TRQ amount also includes the pineapple juice*
[a] *Historical means exporters with three or more years export history, are applying for large quantities*
[b] *Combined exporter refers to exporters/companies that have markets share history of less than three years and are applying for small quantities*

DAFF categorises the applicants into historical and combined exporter categories where a historical exporter means an exporter/company with a three (3) or more year exporting history and applies for large quantities. A combined exporter refers to exporters/companies that have a market share history of less than three (3) years.

Due to uncertainty leading up to the reallocation period, quota applicants make alternative decisions to export their stock/output to other exiting destinations. Consequently, the allocated TDCA fruit products export permits are underutilised. In this instance, it is plausible to conclude that the inability to fill TRQs is not entirely attributable to the lack of supply, demand or tariff levels since the permit allocation and TRQ administration system present barriers to quota fill. Hasha (2004) and CBI (2015) support this notion by pointing out that the EU runs at a deficit in most fruit and vegetables under the EU import regime, which focuses on prices. Therefore, EU demand exists to fulfil the required imports of fruit and vegetables at the desired prices. The TDCA TRQ easily gains assured market access and due to the preferential arrangement, the TDCA diverts trade from the EU's MFN trading partners.

3.4.3 Exporter requirements for market access under TDCA TRQs

To make use of quotas, potential exporters have to follow the application procedures and are subject to the administration and allocation of export permits. Under the TDCA, the requirements for market access are guided by SARS and cover the rules of origin, which are used to decide whether or not the products are eligible to take advantage of the trade preferences. Preferential rules of origin apply under the TDCA. SARS explains that rules of origin are the criteria used to define where the product was made and the origin is used to ascertain the duty payable. An exporter has to complete a EUR.1 movement certificate, which is for supporting claims for preferential rates, and this certificate accompanies the consignment for export. SPS measures and technical standards also form part of the market access conditions (SARS, 2008).

3.5 DESCRIPTION OF THE TRQs OF FOCUS IN THE STUDY

3.5.1 TDCA fruit/fruit products TRQs

The six (6) fruit products TRQs of the TDCA, under the administration of DAFF, cover the export of 33 fruit products tariff lines (Table 3.4 defines the HS 8-digit level at which they have been negotiated). The HS classification code identifies commodity groups by a 6-digit code. Within each reported TRQ, two (2) additional subdivisions relating to the European Community are included to identify the specific commodity falling under that TRQ. The result is an 8-digit level Combined Nomenclature (CN) code identifying a specific tariff line. The CN integrates the HS nomenclature such that the first six (6) digits relate to the HS nomenclature and the last two (2) digits relate to the CN subheadings specific to the European Community. Table 3.4 presents the (six) 6 specific TRQs indicating the HS 6-digit, 8-digit and 10-digit CN codes where applicable to the fruit products. The table was prepared using information from the Government Gazette General Notice 1084 of 2014 (South Africa, Government Gazette, 2014). The EU uses a system of order numbers to define country-specific TRQs and such data is publicised in the TARIC database. Only a subset of 8- or 10-digit tariff lines are covered in a particular order number, and, thus, the other 8- or 10-digit tariff lines falling in the same 6-digit tariff line descriptions will not be part of a given TRQ (European Commission, 2015).

Table 3.4: HS 6-digit, 8-digit and 10-digit CN codes for fruit/fruits products TRQs

	Broad commodity description	HS 6-digit code	8-digit CN code(s)	10-digit CN code(s)
TRQ	Frozen strawberries	0811.10	0811.10.90	n/a
TRQ	Canned pears	2008.40	2008.40.51 2008.40.59 2008.40.71 2008.40.79 2008.40.90	n/a
	Canned apricots	2008.50	2008.50.61 2008.50.69 2008.50.71 2008.50.79 2008.50.92 2008.50.98	n/a
	Canned peaches	2008.70	2008.70.61 2008.70.69 2008.70.71 2008.70.79 2008.70.92 2008.70.98	n/a
TRQ	Non-tropical mixtures of canned fruit	2008.97	2008.97.59 2008.97.74 2008.97.78 2008.97.98	n/a
TRQ	Tropical mixtures of canned fruit	2008.97	2008.97.72	n/a
TRQ	Frozen orange juice	2009.11	2009.11.99	n/a
TRQ	Pineapple juice Apple juice	2009.41 2009.49 2009.71	n/a 2009.49.30 2009.71.20 2009.71.99	2009.41.92.10 2009.41.92.20 2009.41.92.30
	Apple juice	2009.79	2009.79.11 2009.79.19 2009.79.30 2009.79.91 2009.79.98	n/a

Source: Author's compilation using information contained in South Africa, Government Gazette (2014).

The data on the TRQs is reported in the HS classification code at a 6-digit level; therefore, the analysis in the GTAP model was conducted at the HS 6-digit level. Where necessary in the descriptive and overview sections of the study, 8-digit as well as 10-digit tariff lines are analysed, given that the negotiations for such tariff lines are at a specified HS digit level. Although the TRQs under the TDCA enable the 8-digit identification of the tariff line, some of the reported 8-digit tariff lines are combined in a single TRQ at the HS 6-digit level; hence, the TRQ is defined across a broad range of tariff lines.

The fruit and fruit products TRQs studied and indicated in Table 3.4 are (1) frozen strawberries (HS0811.10) with an 8-digit CN code TRQ reported; (2) canned pears (HS2008.40), apricots (HS2008.50) and peaches (HS2008.70) falling under a 6-digit TRQ combining the three canned fruit groups, each of which can be identified by an 8-digit CN code; (3) canned mixtures of fruits (HS2008.97) falling under a 6-digit TRQ combining four different mixtures, each of which have an 8-digit CN code; (4) non-tropical canned mixture of fruits (CN2008.97.72) with an 8-digit CN code TRQ reported; (5) frozen orange juice (HS2009.11.99) with an 8-digit CN code TRQ reported and (6) pineapple juice (HS2009.41 and HS2009.49) and apple juice (HS2009.71 and HS2009.79) falling under a single TRQ, splitting the allocation 50% between the pineapple juice and apple juice tariff lines. A combination of 8-digit and 10-digit CN codes separately identify the tariff lines under the pineapple and apple juice TRQ.

3.5.2 Tariff protection and quota levels

Duty rates are attached to a tariff line. For the TDCA fruit TRQs, the information on duty levels, available in the TARIC database, indicate duty rates mostly at the 8-digit codes. Table 3.5 presents the tariff rates (set out in the TDCA) for tariff lines for each of the six (6) TRQs identified by an EU order number.

Table 3.5: Tariff rates per order number of the TRQs

	Broad commodity description HS 6-digit code	8-digit CN code(s)	TDCA preferential in-quota tariff rate (%); 2011-2016	*Erga omnes* (MFN) duty (%); 2011-2016	Concession level in 2011 (kg)
TRQ	Frozen strawberries HS0811.10	0811.10.90	0	14.4	332 500
TRQ	Canned pears HS2008.40	2008.40.51 2008.40.59 2008.40.71 2008.40.79 2008.40.90	19.1 8.3 10.0 9.1 8.7	17.6 16.0 19.2 17.6 16.8	54 682 250
	Canned apricots HS2008.50	2008.50.61 2008.50.69 2008.50.71 2008.50.79 2008.50.92 2008.50.98	10.0 9.1 10.8 10.0 7.1 8.5	19.2 17.6 20.8 19.2 13.6 17.0	
	Canned peaches HS2008.70	2008.70.61 2008.70.69 2008.70.71 2008.70.79 2008.70.92 2008.70.98	10.0 9.1 10.1 9.1 7.9 9.5	19.2 17.6 19.2 17.6 15.2 18.4	
TRQ	Non-tropical mixtures of canned fruit HS2008.97	2008.97.59 2008.97.74 2008.97.78 2008.97.98	9.1 7.1 10.0 9.6	17.6 13.6 19.2 18.4	27 011 400
TRQ	Tropical mixtures of canned fruit HS2008.97	2008.97.72	4.9	8.5	
TRQ	Frozen orange juice HS2009.11	2009.11.99	7.9	15.2	931 000
TRQ	Pineapple juice HS2009.41 HS2009.49	2009.41.92. 2009.49.30	7.9 7.9	15.2 15.2	6 650 000
	Apple juice HS2009.71 HS2009.79	2009.71.20 2009.71.99 2009.79.11 2009.79.19 2009.79.30 2009.79.91 2009.79.98	9.0 9.0 15.0+9.80Eur/100kg 15.0 9.0 9.0+10.20Eur/100kg 9.0	18.0 18.0 30.0+18.40Eur/100kg 30.0 18.0 18.0+19.30Eur/100kg 18.0	

Source: Author's compilation based on TARIC (TARIC, 2016).

The tariff protection ranges from 7.9% to 9.98% for the in-quota fruit products exports from South Africa to the EU and from 14.4% to 22.24% for the out-of-quota exports. Given that, the tariff concession lowers the price for the importer; the exporter benefits by receiving an increased number of orders for exports. The other part of the TRQ is the quota level. The TRQ of canned pears, apricots and peaches receives a high quota concession, in terms of the volume (in kilograms) of notified allowable quota, from the EU. In 2011, as indicated in Table 3.5, the TRQ quantity allowed was 54 682 250 kg. The tariff line facing the highest tariff protection is HS2009.79.91 in the apple, pineapple TRQ. The lowest protection of a zero in-quota tariff rate is for the frozen strawberries tariff line (HS0811.10.90), which is also a standalone TRQ.

The TDCA tariff rates for frozen orange juice; canned pears, apricots and peaches; canned fruit mixtures, and apple and pineapple juice TRQs are 50% lower than the MFN rate implemented for out-of-quota imports. In accordance with the provisions of the TDCA, these rates applied for the years 2011 to 2016 and are used for this study. The frozen strawberries in-quota tariff rate is a concession of 100% of the MFN rate. Despite this concession, South Africa has recorded zero exports under the frozen strawberries TRQ. Industry opinions (solicited as detailed in Section 4.1.4.1) suggest that South Africa has not had export capacity in the frozen strawberries sector during the TDCA era. The EU exclusively concedes a full tariff rate concession to a fruit product tariff line or TRQ that can be perceived as a non-beneficial export sector to South Africa.

3.6 EU PREFERENTIAL TRQs IN COMPETITION WITH TDCA FRUIT PRODUCTS TRQs

This sub-section aims to describe the facets of TRQ provisions in the trade agreements common across the TRQs of focus in this study and also for the countries in other trade agreements with the EU. The EU28 has country-specific TRQ commitments that differ for each country with a trade agreement. There is a zero-duty access for specified quantities of selected tariff lines and varying percentages of in-quota tariffs for the different fruit TRQs common across the countries. Considering the TRQs in this study, the following countries also have exported similar products to the EU28 under TRQs: Mexico, Tunisia, Turkey, Israel, Ukraine, Peru and Colombia (TARIC, 2016).

In Europe, as of 2014, the EU has a preferential arrangement with Ukraine. Tunisia has an association agreement with the EU concluded in 1995, and this forms part of the Euro-Mediterranean partnership. Israel also signed a bilateral association agreement with the EU in 1995. In 2012, Colombia and Peru signed a free trade agreement with the EU. The EU has become Turkey's top export market, through a customs union agreement signed in 1995. Mexico has a free trade agreement, the EU-Mexico Global agreement, signed in 1997. Common to all the agreements is a clause stating that at full implementation, the agreement will increase market access for agricultural products. Regarding the agreement between the EU and Mexico, the EU conceded, for imports into EU from Mexico, the following TRQs common with the TDCA TRQs, prepared tropical fruit (1500 tonnes, duty free), orange juice (1000 tonnes at half duty, 30000 tonnes and 25% duty) and pineapple juice (2500 tonnes at half duty). For the year 2016, TRQ access to EU concessions made to these countries (Tunisia, Colombia, Israel, Peru, Mexico, Turkey, Ukraine) was established at varying volumes per tariff lines combined under different TRQs, as presented in Table 3.6 (Rudloff and Simons, 2004; Nedumpara, Kumari and Joan, 2012; European Commission, 2015*a*).

Table 3.6: EU fruit products TRQ concessions in 2016 (thousand kg)

	South Africa	Tunisia	Colombia	Israel	Peru	Mexico	Turkey	Ukraine	*Erga omnes*
Frozen strawberries	370					1 000			
Canned pears, apricots, peaches	60 866	5 160		112			2 100		2 838
Mixtures of canned fruit	30 062	1 000				1 500			
Frozen orange juice	1 036			56 280		30 000			1 500
Pineapple and apple juice	7 400		21 800*		10 900*	2 500		10 000	7 044

Source: Author's compilation based on TARIC (TARIC, 2016).

* TRQ combines other fruit preparations besides apple and pineapple

In Table 3.6, the *erga omnes* TRQ refers to a non-preferential TRQ for which any country is free to compete and supply the EU on that non-preferential basis. Three (3) *erga omnes* TRQs are available, namely pears, apricots and peaches; frozen orange juice; and pineapple and apple juice. The non-preferential TRQ is available on a first-come, first-served basis to all countries. For frozen strawberries, South Africa competes with a TRQ for Mexico. The South African TRQ for pears, apricots and peaches is in competition with the TRQs for Turkey, Tunisia and Israel, in addition to a non-preferential TRQ. Mixtures of fruit juices from South Africa enter the EU in competition with those from Tunisia and Mexico. Besides the TDCA TRQ, frozen orange juice is also supplied to the EU28 through three other TRQs, a non-preferential TRQ for all countries, and separate TRQs for Mexico and Israel. In addition to a non-preferential TRQ, pineapple and apple juice is supplied to the EU28 through TRQs from Mexico, Ukraine, Colombia and Peru.

All products compete at the 10-digit tariff line, as defined by the EU CN codes, except for frozen strawberries which compete at the 8-digit tariff line. Mexico has a larger TRQ in terms of the quantity of frozen strawberries conceded by the EU, and is the only country in competition with South Africa for that TRQ. South Africa dominates in the pears, apricots, peaches TRQ as well as canned mixtures of fruit – in terms of the quota quantities at their disposal. Based on the TRQ concession data presented in Table 3.6, the frozen orange juice TRQ is the TRQ that South Africa has the least quota quantity (1 036 kg) allocated to in comparison with its competitors, Israel and Mexico with 56 280 kg and 30 000 kg, respectively.

Table 3.7 indicates the in-quota tariff rates of specific tariff lines for which South Africa competes with the previously identified exporter countries in supplying the EU under concessions of fruit TRQs. The tariff rates are implemented at the CN 10-digit code. There are no competing tariff lines recorded for canned pears. In addition to the presentation in Table 3.6, three (3) separate non-preferential tariff lines with a tariff of 20% have also been notified for the following CN codes: apricots (CN2008507130), apple juice (CN2009791111, CN2009791119, CN2009791191; CN2009791199, CN2009791910, CN2009791990) and frozen orange juice (CN20091199). Any country is free to compete to supply under the non-preferential tariff lines, because the MFN status applies where there are no preferential tariffs granted to any specific country.

Table 3.7: Competing fruit products tariff lines with the TDCA in 2016

Tariff lines within a specific TRQ (CN 8-digit or 10-digit code)	Competing country and tariff rate (%)	
Frozen strawberries 08111090	 Mexico	 7.2
Pears	None recorded	n/a
Apricots 2008509210 2008509220 2008509811 2008509813 2008509815; 2008509819	 Turkey Turkey, Tunisia Turkey Turkey, Tunisia Turkey	 0 0 & 0 0 0 & 0 0
Peaches 2008707110	 Israel	 0
Mixture of fruit juices (tropical and non-tropical) 2008975911; 2008975915; 2008975919; 2008975990 2008977211; 2008977215; 2008977219; 2008977290 2008977411; 2008977415; 2008977419; 2008977490 2008977811; 2008977815; 2008977819; 2008977890 2008979811; 2008979815; 2008979819; 2008979820; 2008979890	 Tunisia Tunisia Tunisia, Mexico Tunisia Mexico	 0 0 0 & 4.7 0 7.4
Frozen orange juice 2009119911; 2009119992 2009119996 2009119919; 2009119994 2009119998	 Mexico, Israel Mexico, Israel Israel Israel	 2.9 & 0 2.9 & 0 0 0
Pineapple juice 2009419210; 2009419220; 2009419230 2009493010; 2009493091; 2009493099	 Mexico Mexico	 5.8 5.8
Apple juice 2009712010; 2009712090 2009719910; 2009719990; 2009791111; 2009791191 2009791119; 2009791199 2009791910; 2009791990 2009793010; 2009793090;2009799110; 2009799190 2009799810; 2009799820; 2009799870; 2009799890	 Ukraine Ukraine Ukraine Ukraine, Colombia, Peru Ukraine Ukraine	 0 0 0 0 0 0

Source: Author's compilation based on European Commission Statistics (2016).

The tariff concessions in the competing TRQs, indicated for 2016, lead to competition between South Africa and other exporters for these TRQs. Besides frozen strawberries, where South Africa enjoyed a 0% preferential tariff quota rate, observations of the preferential tariff quota rates for all the competing countries were mostly at 0%. Of the competitors, Mexico was the only country with in-quota tariff rates ranging from 2.9% to 7.2% for different tariff lines. Despite this, all the rates for Mexico were well below the rates the TDCA offered to South Africa, as indicated in Table 3.5 (Section 3.5.2).

3.7 MARKET FOR FRUIT/FRUIT PRODUCTS AND LEVEL OF INTEGRATION IN WORLD ECONOMY

3.7.1 Production, processing and markets for fruit/fruit products

As noted in Sikuka (2014), South Africa is a net exporter of deciduous fruit with roughly 90% of production destined for the export market. The EU remains the biggest world importer of fruits, even when intra-EU trade is not included. South Africa, on the other hand, experiences a low domestic consumption of canned fruit compared to exported canned fruit (Wilson, 2014). SAFVCA reports that more than 400 000 tonnes of fruit, sourced from about 1 500 farms, is processed every year (SAFVCA, 2015).

In terms of global hectares for peach production, DAFF (2011) notes that South Africa is a small grower. In 2010, South Africa was the fourth largest producer of peaches in the Southern Hemisphere, after Chile, Argentina and Brazil. Brazil and Argentina, however, have large domestic markets that absorb the peach production, leaving little or none for export. Chile is South Africa's main competitor in the EU market. In 2010, South Africa contributed about 8% to the Southern Hemisphere world peach exports, while Chile contributed 77%. For apples, South Africa was the fourth largest producer in the Southern Hemisphere. In 2013, South Africa was the second largest producer of pears, after Argentina, in the Southern Hemisphere, with Chile being the third largest. The EU is a common export target for pears for all three countries. The other producers are Australia, Brazil and New Zealand; their exports are small, and, therefore, add no competitive pressure to the EU market (South Africa, DAFF, 2014a). Africa is the leading export market for South African apples with exports amounting to about 50% of the production, followed by the EU. Generally, African, Middle Eastern and Asian markets are believed to have less stringent export standards than the EU market, which may explain why the EU is not the leading importer of South African apples (Sikuka, 2015).

The EU, Asia, Americas, Africa, Oceania and Middle East are all among South Africa's markets for processed fruits. In terms of production of processed peach products, Greece is the global power regarding canned and puree products. The other competitors in canned peaches are California in the United States of America (USA), Spain, China, Chile and Argentina. Russia, Japan and Hong Kong are the main export markets for South African canned peaches. Brazil, Mexico, EU, China, USA and Australia compete in orange juice production with South Africa, who occupies the sixth position among these countries. Brazil is the leading exporter of orange juice and the EU is the leading importer (Foodnews, 2015; USDA, 2016). Sinngu and Antwi (2014), in a study on the citrus fruit industry in South Africa, found that the South African citrus fruit industry enjoys a better global competitive advantage in several citrus fruit products than its Southern Hemisphere rivals. Sinngu and Antwi (2014) also concluded that regarding orange juice, South Africa's competitiveness decreases when moving from primary oranges to processed orange juice.

Figures 3.2 and 3.3 show South Africa's TRQ export contribution to processed fruit in the EU.

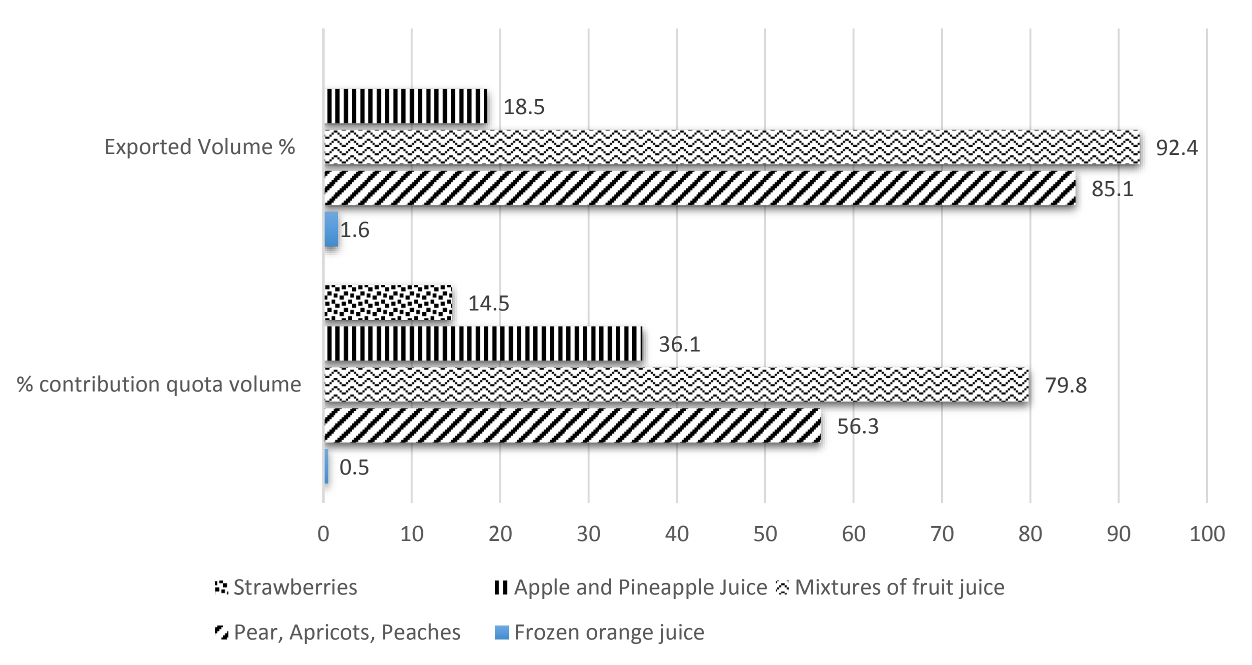


Figure 3.2: South African fruit TRQ contribution to total EU TRQ import quantity versus exported quota volume contribution (2012)

Source: Author's own design based on TARIC data (TARIC, 2015).

As indicated in Figure 3.2, South Africa contributed only 0.5% to the quota volume of TRQ allocations for frozen orange juice by the EU28 in 2012. The highest allocation to South Africa was found in the TRQ for mixtures of fruit juice (79.8%), followed by the TRQ for pears, apricots and peaches (56.3%). The same pattern translated in the contribution of South Africa's actual exported volume to the total exports per each TRQ. Frozen orange juice contribution was 1.6% and the mixtures of fruit juice contributed was a high 92.4%. TRQ exports for mixtures of fruit juice (92.4%) and pears, apples and apricots TRQ (85.1%), therefore, dominated South Africa's fruit products TRQ trade. For the 2015 EU28 imports (not shown in Figure 3.2), the frozen orange juice TRQ trade amounted to 3.2% of the total EU frozen orange juice TRQ imports from the world (TARIC, 2015). With this 3.2%, South Africa exported the maximum allowable under their TRQ allocation, which determined this level of participation.

South Africa's production of canned peaches, pears and apricots, as indicated in Figure 3.3, shows that canned peaches recorded the highest production for the years 2010 to 2013, followed by pears, then apricots. When exporting to the EU market, canned pears, apricots and peaches are exported under one TRQ combining the three fruit products.

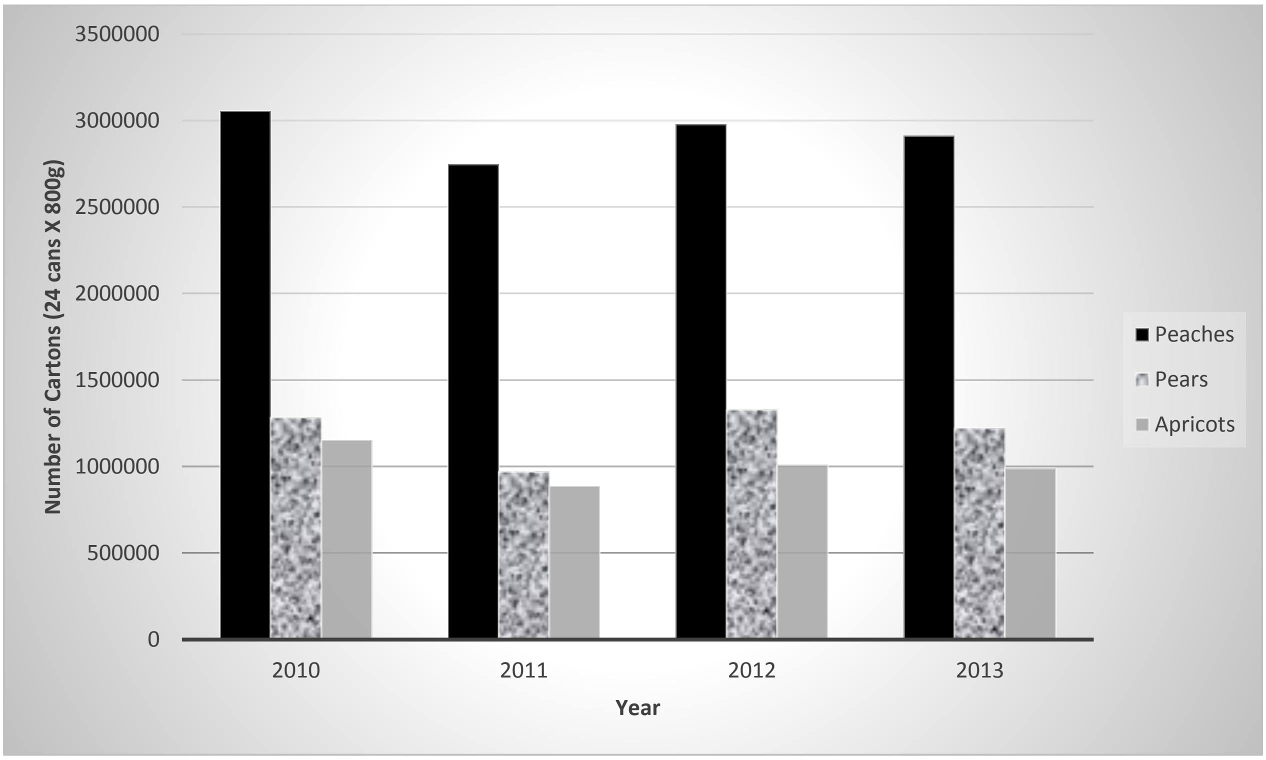


Figure 3.3: South Africa's total canning production, peaches, pears, apricots (2010-2013)

Source: Author's own design based on data from the World Canned Deciduous Fruits Conference (Wilson, 2014).

Based on the 2012 canning production presented in Figure 3.3, about 55% (55 919 000 kg) of the canned production was offered, by the EU28, for South African exports under the TRQ for pears, apricots and peaches. Under the TRQ for pears, apricots and peaches, there is an indication that only 38% (39 052 870 kg) of the total canned production in 2012 was exported to the EU under TRQ. There is, therefore, an indication that South Africa's export potential (in relation to its exports to the EU under TRQs) could be as high as 55%. However, certain factors that influence market access are responsible for the low level of participation (38%); these are further elaborated on in Chapter 5.

3.7.2 Sector size, export growth and EU destination of the South African fruit products

The size of the processed fruit sector in terms of the volume of the fruit purchased for processing, for each of the relevant fruits, is illustrated in Figure 3.4.

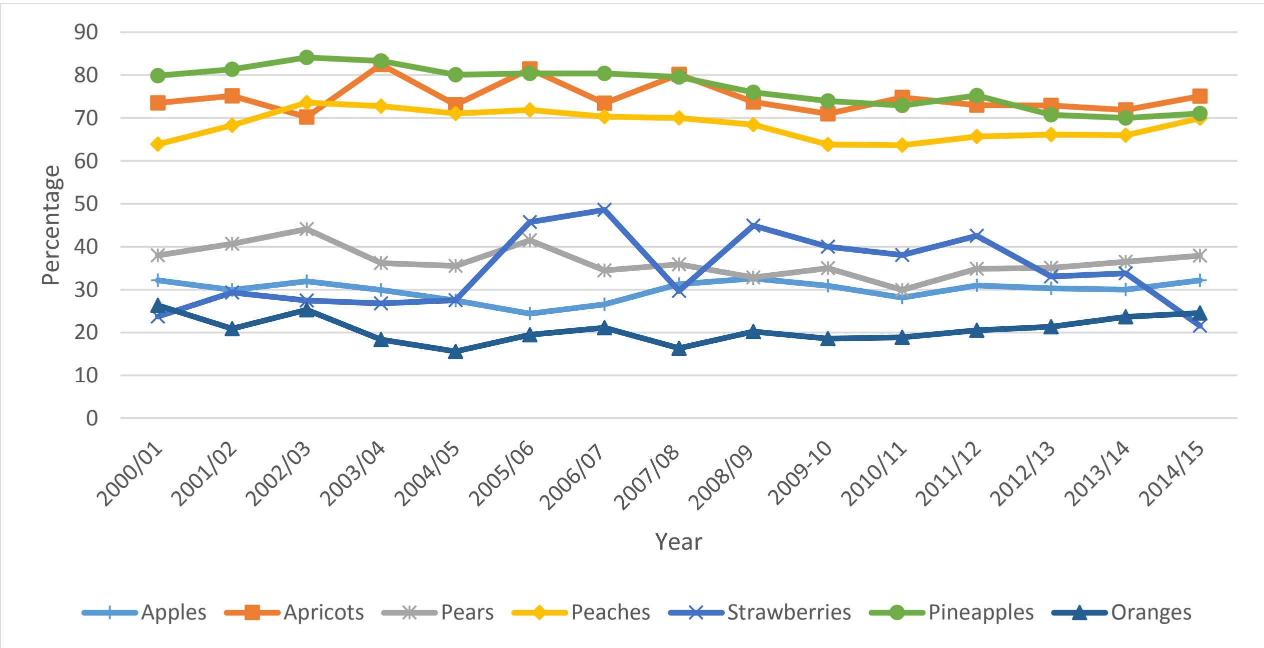
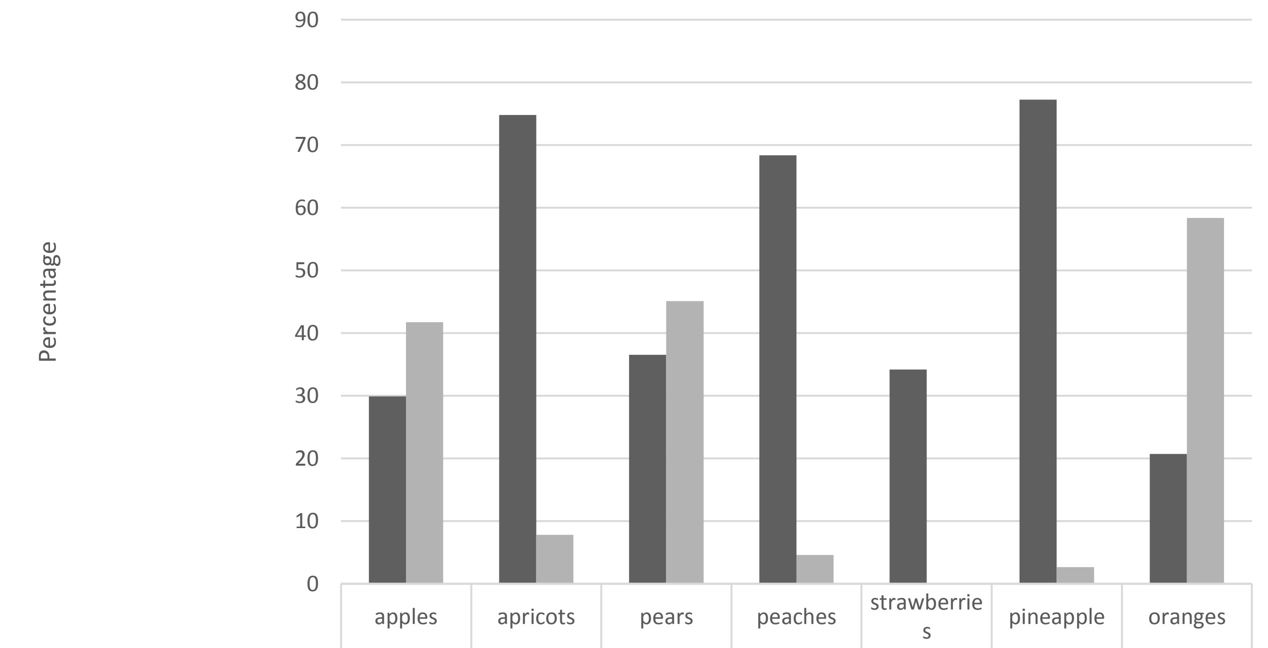


Figure 3.4: Volume of fruit production purchased for processing (2000-2015)

Source: Author's own calculations based on Abstract of Agricultural statistics (South Africa, DAFF, 2016).

The fruit purchased for processing is processed into various products, ranging from canned fruit, purees, juices and jams. In Figure 3.4, it is shown that the volume of apple, pear, strawberry and orange production that is purchased for processing ranges between 15% and 45%. Apricot, peach and pineapple production, purchased for processing, ranges between 60% and 80%.

In Figure 3.5, a comparison between purchases of fresh fruit for processing and fresh fruit for exporting is presented. On average, for the years 2000 to 2015, about 37% of pear, 75% of apricot and 68% of peach production was purchased for processing; in comparison 45% of pear, 8% of apricot and 5% of peach production was exported fresh. The orange production that was purchased for processing was only about 20%, and almost 60% of fresh oranges produced were exported. Pineapple production purchased for processing is above 75% with less than 10% of the production of fresh pineapples being for export.



	apples	apricots	pears	peaches	strawberries	pineapple	oranges
% purchases for processing	29.9	74.8	36.56	68.37	34.18	77.27	20.72
% fresh export	41.73	7.83	45.12	4.61	0	2.64	58.41

Figure 3.5: Fruit production purchased for processing vs for fresh exports (2000-2015)
Source: Author's own calculations based on Abstract of Agricultural statistics (South Africa, DAFF, 2016).

Siphugu (2012) notes that exports account for 90% of all South African canned production. More than half of South Africa's exports are destined for Europe. It is reported that, generally, the amount of fruit that goes to canning also fluctuates if the fresh fruit industry's shipments to Europe are limited when they face strict EU fresh fruit-quality standards.

Table 3.8 shows the destination country of the EU market for each of the TRQs (covering various tariff lines).

Table 3.8: Destination country in EU market by TRQ (2002-2015)

TRQ (CN 8-digit or 10-digit code)	Destination EU Country (Total)
Frozen strawberries 08111090	France, Poland **(2)**
Pears 2008.40.51; 2008.40.59; 2008.40.71 2008.40.79; 2008.40.90	Austria, Belgium, Bulgaria, Croatia Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom **(27)**
Apricots 2008509210; 2008509220; 2008509811; 2008509813; 2008509815; 2008509819	Austria, Belgium, Bulgaria, Croatia Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom **(27)**
Peaches 2008707110	Austria, Belgium, Bulgaria, Croatia Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom **(27)**
Mixture of fruit (tropical and non-tropical) 2008975911; 2008975915; 2008975919; 2008975990; 2008977211; 2008977215; 2008977219; 2008977290; 2008977411; 2008977415; 2008977419; 2008977490 2008977811; 2008977815; 2008977819; 2008977890; 2008979811; 2008979815; 2008979819; 2008979820; 2008979890	Austria, Belgium, Cyprus, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom **(15)**
Frozen orange juice 2009119911; 2009119992; 2009119996 2009119919; 2009119994; 2009119998	Austria, Belgium, Cyprus, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Poland, Spain, United Kingdom **(15)**
Pineapple juice 2009419210; 2009419220; 2009419230 2009493010: 2009493091; 2009493099	Austria, Czech Republic, Denmark, Estonia, France, Germany, Italy, Latvia, Lithuania, Netherlands, Portugal, Spain, United Kingdom **(13)**
Apple juice 2009712010; 2009712090; 2009719910; 2009719990; 2009791111; 2009791191 2009791119; 2009791199; 2009791910; 2009791990; 2009793010; 2009793090; 2009799110; 2009799190; 2009799810; 2009799820; 2009799870; 2009799890	Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom **(16)**

Source: Author's compilation based on European Commission Statistics (2016).

Of the EU28, Luxembourg is the country with which no TRQ trade has been recorded. Canned pears, apricots and peaches enjoy the most coverage of exports of EU market destination countries, namely 27 of the 28; whilst juices and mixtures of canned fruit are destined for a coverage of 15 EU countries. TRQs exports of frozen strawberries were recorded only for the years 2002 to 2005, and the exports were destined only for France and Poland. Thereafter, there was no recorded TRQ exports for this tariff line. The United Kingdom is a destination market for five (5) of the fruit TRQs, as indicated in Table 3.8. In this regard, these TRQs are an important factor within the context of the impending exit of the UK from the EU (BREXIT), and there may be unknown implications affecting the SADC-EU-EPA due to this.

Figure 3.6 shows tariff line imports by the EU from South Africa for the period 2002 to 2015. As expected for frozen strawberries (HS0811) over a 14-year period, tariff line imports by the EU market indicated 0% growth in frozen strawberries imports. During the same 14-year period, canned fruits, canned mixtures of fruits and fruit juice tariff lines showed, in general, an increase of South African exports to the EU market. Key industry informants have explained that the increase in frozen orange juice exports is due to the fact that the quota is small and that South Africa has a large capacity to produce frozen orange juice. Therefore, there is abundant supply which can meet export demand when the quota is increased. The fruit juice sector has also been able to respond to industry trends regarding new products packaging, namely fruit juice cups, which has also added to the increase in exports.

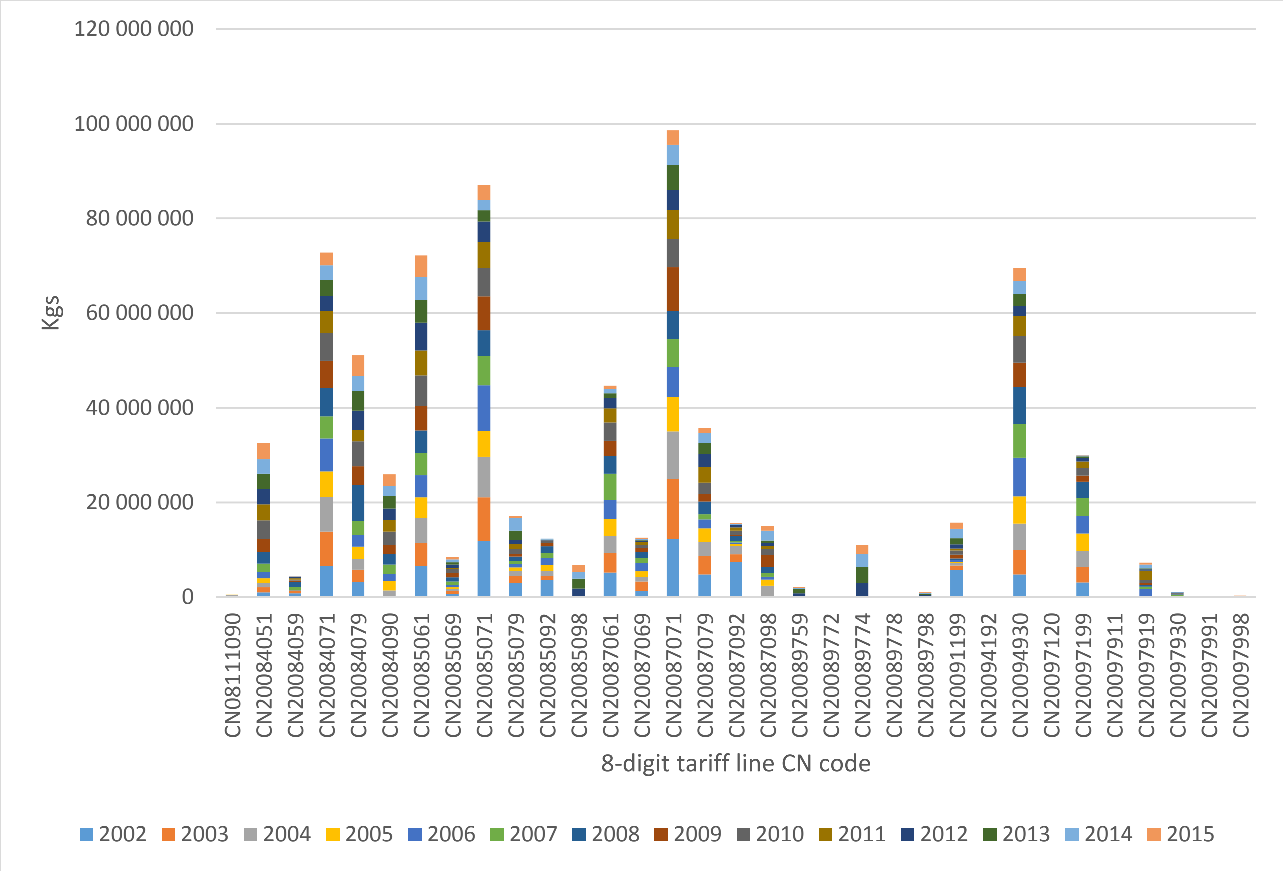


Figure 3.6: Fruit products imported by the EU market from South Africa (2002-2015)
Source: Author's own design based on Eurostat (Eurostat, 2016).

3.7.3 Supply and demand of fruit products in South Africa and the EU

Kwasowski (2009) and the European Commission (2011) respectively indicate that the EU is a net importer of concentrated apple juice as well as processed pear products. Some studies (CBI, 2009; CBI, 2018) indicate an increase in total EU imports of canned fruit. The CBI (2018) notes that import volumes are stable for canned fruit types that can also be found in Europe. Import volumes of tropical products have been increasing, according to the same report, and in addition, the data on consumption of juices and canned fruit show an upward trend, indicating that there is demand.

Opportunities exist for canned fruit exporters from the geographical south (like South Africa), to export to the EU when climate and weather negatively influences the production of fresh produce in the EU. Given the long shelf life of canned fruits, seasonal variation in supply is not an issue, as the product can be stored. The CBI (2018) further notes an increase in total European imports since 2012 at an average 1% annual growth rate. There are no structural changes in the EU market that cause import fluctuations (CBI, 2018).

The Trade Map database of 2016 provides data on the trade of fruit products. The value of exported frozen orange juice, in 2016, can be compared as follows: South African exports to the EU (US$3 737), South African exports to the world (US$4 708) and EU imports from the world (US$459 546). This shows that there is enough potential demand in the EU, if South Africa can be more competitive. The same picture can be seen for 2011 and 2012 trade values. An aggregation of Trade Map data shows that for pears, apricots and peaches TRQ, for the years 2011, 2012 and 2016, South African exports to the EU were only about 10% of what the EU imports from the world in terms of quantity. South Africa, therefore, has capacity to increase exports to the EU, given that South Africa is able to export twice more to the world than its exports to the EU. In 2016, for example, South African exports to the EU and the world were 29 824 tonnes and 92 673 tonnes, respectively (Trade Map, 2016).

3.8 TRQs AS A TOOL FOR TRADE LIBERALISATION UNDER THE TDCA

In the face of agriculture being a major sector excluded from full trade liberalisation provisions, TRQs have become a tool to provide some form of liberalisation for a sensitive list of products. The TRQs provide the trade concessions detailing fruit products covered, quantitative limits as well as tariff reductions. The trade concessions are only due to the negotiated quantities. TRQs are used as a tool for trade liberalisation, which involves tariff reduction and TRQ expansions. Market access is a key element of most trade arrangements and TRQs to contribute towards market access of products that would normally not be freely traded. Tables 3.9 to 3.13 present data useful in describing the market access for South African fruit products discussed in this study.

3.8.1 Tariff Rates

Table 3.9 presents the different tariff rates imposed by the EU28 on TDCA fruit products tariff lines. The European Commission (2014) reports that the sector of fruits, vegetables, nuts, and their preparations is the leading import sector in the EU28, and that this sector comprises the imports largely associated with duties in comparison to other sectors. The tariff lines in that sector reportedly benefit the most from preferential market access (European Commission, 2014). Similarly, the tariff lines presented in Table 3.9 are among the EU28 imported products that benefit from preferential access.

Table 3.9: Tariff rates imposed by EU28 and relevant to the TDCA fruit TRQs - 2016

Tariff line	***Erga omnes* (MFN) duty (%)**	**TDCA preferential in-quota tariff rate (%)**	**Tariff preference for South Africa (%)**
0811.10.90 frozen strawberries	14.4	0	-
2008.40.51 canned pears	17.6	9.1	-
2008.40.59	16.0	8.3	-
2008.40.71	19.2	10.0	-
2008.40.79	17.6	9.1	-
2008.40.90	16.8	8.7	-
2008.50.61 canned apricots	19.2	10.0	15.7
2008.50.69	17.6	9.1	14.1
2008.50.71	20.8	10.8	17.3
2008.50.79	19.2	10.0	15.7
2008.50.92	13.6	7.1	10.1
2008.50.98	17.0	8.5	13.5
2008.70.61 canned peaches	19.2	10.0	-
2008.70.69	17.6	9.1	-
2008.70.71	19.2	10.1	-
2008.70.79	17.6	9.1	-
2008.70.92	15.2	7.9	-
2008.70.98	18.4	9.5	-
2008.97.59 canned fruit mixtures	17.6	9.1	12.3
2008.97.72	8.5	4.9	5.0
2008.97.74	13.6	7.1	9.5
2008.97.78	19.2	10.0	13.4
2008.97.98	18.4	9.6	14.9
2009.11.99 frozen orange juice	15.2	7.9	11.7
2009.41.92 pineapple juice	15.2	7.9	11.7
2009.49.30	15.2	7.9	11.7
2009.71.20 apple juice	18.0	9.0	14.5
2009.71.99	18.0	9.0	14.5
2009.79.11	30.0+18.40Eur/100kg	15.0+9.80Eur/100kg	26.50+18.40Eur/100kg
2009.79.19	30.0	15.0	25.5
2009.79.30	18.0	9.0	14.5
2009.79.91	18.0+19.30Eur/100kg	9.0+10.20Eur/100kg	14.5+19.30Eur/100kg
2009.79.98	18.0	9.0	14.5

Source: Author's compilation based on TARIC database (TARIC, 2016).

An examination of the tariff rates in Table 3.9 shows that, in general, the tariff preferences for all tariff lines presented are lower than the MFN rates, as expected of a negotiated outcome. The TDCA in-quota tariff is the reduced tariff applied to South African products exported to the EU28 under the relevant TRQ. In this study, the only duty free TRQ among the observed TRQs is frozen strawberries. The *erga omnes* tariff is the tariff for all imports into the EU from all countries, according to the MFN principle. Tariff preference refers to preferential tariff treatment that could be seasonal and that could also be applied to tariff lines not in the summary of negotiated TRQ quantities but resulting from a trade agreement implementation. A mix of *ad valorem* and non-*ad valorem* tariffs imposed on the concerned tariff line are indicated in Table 3.9. The *ad valorem* tariff specifies the tax as a percentage of value of imports. The non-*ad valorem* tariff is either a specific tariff, where the tax is a monetary amount per unit of import, or a compound tariff, which combines *ad valorem* and a specific tariff (the sum of *ad valorem* and specific components) (WTO, 2012).

For the six (6) TRQs, comprising 33 HS 8-digit tariff lines, the EU28 applies compound tariffs to only two (2) of the tariff lines, whilst *ad valorem* tariffs are applied to the rest. Both tariff lines with non-*ad valorem* tariffs are for apple juice. These two tariff lines recorded no contribution measured by import value share of the concerned pineapple and apple juice TRQ (Table 3.10 in Section 3.8.2). The code description of the two tariff lines (shown in Table 3.10) also has thresholds appended. The finding that these two tariff lines show no contribution to import value share contribution (Table 3.9) may be an expected development. This is based on the literature, such as Gibson *et al.* (2001) who note that non-*ad valorem* tariffs provide significantly higher protection than *ad valorem* tariffs. A further examination of the tariff rates shows that for Israel and Mexico (shown in Table 3.7) the 2016 preferential tariff quota rates for frozen orange juice were 0% and 2.9%, respectively. South Africa was at 7.9% which, as per the TDCA, is 50% of the MFN rate. The MFN rates (*erga omnes*) for the six (6) TRQs ranged from 8.5% to 30%, as shown in Table 3.9 (column 1). The highest MFN rate applied to apple juice tariff lines CN2009.79.11 and CN2009.79.19 with 30%+18.40Eur/100kg and 30%, respectively. The canned mixture of fruit tariff line CN2008.97.72 had the lowest MFN rate at 8.5%.

The canned mixture of fruit (CN2008.97.72) tariff line does not contribute in terms of value shares, yet was the tariff line with the lowest MFN rate and, consequently, the lowest in-quota rate. Additional analysis for each tariff line is presented in Table 3.10 (Section 3.8.2) to show the composition in terms of value.

3.8.2 HS 6-digit and CN 8-digit composition of EU28 fruit/fruit products imports under TRQs

Table 3.10 depicts the composition of the 2015 tariff quota imports by the EU28 from South Africa. In the EU28, the member states consumers of the TRQ products include the Netherlands, Germany, Italy, Austria, United Kingdom, Belgium, France, Sweden and Spain.

At the HS 6-digit level, among all the 2015 EU imports, South African pears (HS2008.40) contributed the highest percentage (56.7%) to the EU28's imported value followed by peaches and apricots with 53.9% and 41.1%, respectively. Besides frozen strawberries with a 0% contribution, frozen orange juice, and pineapple and apple juices contributed very low percentages ranging below 4%. The frozen orange juice TRQ contributed only 2.2% of the import value.

Table 3.10: Composition of EU28 fruit products imports from South Africa under TRQ

HS6 product code (% import value share)	8-digit CN codes description	8-digit CN code import value share (%)
Strawberries 081110 **(0%)**	0811.10.90 - *frozen strawberries*	0
Pears 200840 **(56.7%)**	2008.40.51- *net content <1kg, sugar content exceeding 13 % by weight* 2008.40.59 - *other* 2008.40.71 - *net content <1kg, sugar content exceeding 15 % by weight* 2008.40.79 - *other* 2008.40.90 - *not containing added sugar*	43.1 8.9 66.8 74.0 57.3
Apricots 200850 **(41.1%)**	2008.50.61 - *net content <1kg, sugar content exceeding 13 % by weight* 2008.50.69 - *other* 2008.50.71 - *net content <1kg, sugar content exceeding 15 % by weight* 2008.50.79 - *other* 2008.50.92 - *net content of 5 kg or more* 2008.50.98 - *net content of <5kg*	40.8 16.0 86.6 25.0 0 45.8
Peaches, including nectarines 200870 **(53.9%)**	2008.70.61 - *net content <1kg, sugar content exceeding 13 % by weight* 2008.70.69 - *other* 2008.70.71 - *net content <1kg, sugar content exceeding 15 % by weight* 2008.70.79 - *other* 2008.70.92 - *net content of 5 kg or more* 2008.70.98 - *net content of <5kg*	36.1 32.6 89.8 53.1 22.0 41.5
Mixtures of canned fruit 200897 **(6.5%)**	2008.97.59 - *content >1kg containing by weight 50% or > of tropical fruit, other* 2008.97.72 -*no single fruit exceeds 50% of the total weight of the fruit* 2008.97.74 -*other* 2008.97.78 -*other* 2008.97.98 –*other*	3.76 0 17.7 0.21 5.93
Frozen orange juice 200911 **(2.2%)**	2009.11.99 -*of a Brix value not exceeding 67, other*	2.19
Pineapple juice 200941 **(0.001%)** 200949 **(2.47%)**	2009.41.92 - *of a Brix value not exceeding 20, containing added sugar* 2009.49.30 - *of a Brix value exceeding 20 but not exceeding 67, added sugar*	0 2.51
Apple juice 200971 **(3.18%)** 200979 **(0.50%)**	2009.71.20 - *of a Brix value not exceeding 20, containing added sugar* 2009.71.99 - *of a Brix value not exceeding 20, not containing added sugar* 2009.79.11 - *Brix value >67, value not exceeding € 22 per 100 kg net weight* 2009.79.19 - *other* 2009.79.30 - *of a Brix value exceeding 20 but not exceeding 67, added sugar* 2009.79.91 - *added sugar content exceeding 30 % by weight* 2009.79.98 – *other*	0 7.28 0 0.57 0 0 0.74

Source: Author's calculations based on European Commission Statistics (2016).

For the years 2002 to 2012, the frozen orange juice TRQ had, on average, a fill rate of +/- 80%, as shown in the more detailed analysis on quota fill rates presented in Section 5.1.1.

The available data on tariff quota imports indicate that for strawberries (HS0811.10), the EU28 did not record imports from South Africa for the years 2007 to 2015. The record of tariff quota imports in the TARIC database indicates that Mexico, like South Africa, has preferential tariff quota access for frozen strawberries. In this instance, the recorded EU28 imports for strawberries are based on the Mexican arrangement which competes with the TDCA TRQ and other likely imports outside any preferential arrangement. South Africa, however, exports strawberries elsewhere, other than the EU28, under that heading (HS0811.10) according to ITC Trade Map data. In US dollar value terms, the strawberry exports amounted to US$72 000 in 2012 and US$315 000 in 2015 (Trade Map, 2016).

At the CN 8-digit level, the pears, apricots and peaches TRQ shows that the highest value of the EU28 import value for South Africa is contributed through tariff lines describing a net content of less than 1 kg and sugar content exceeding 15% by weight. This value contribution for pears is 66.8%, apricots is 86.6% and peaches is 89.8% (Table 3.10). The highest contribution of 89.8% is at the 8-digit tariff line CN2008.70.71 (peaches). Israel supplied this tariff line to EU28 under a TRQ, as indicated in Table 3.7 (Section 3.6), and enjoyed a 0% tariff rate in contrast to the 10.1% in-quota tariff imposed on South African imports into the EU28 for that tariff line. For the tariff lines of apricots (CN2008.50.71) and pears (CN2008.40.71), contributing 86.6% and 66.8%, respectively, an examination of the competing countries shows that these two products are only supplied by South Africa under preferential TRQs with only apricots (CN2008.50.71) additionally supplied under a non-preferential TRQ (European Commission Statistics, 2016).

South Africa performs well for apricots and peaches, even though the relevant tariff lines are in competition with those from Turkey, Tunisia and Israel enjoying an in-quota tariff rate of 0%. The least value contributions are from the mixtures of fruit, pineapple and apple juice TRQs, with apple juice recording only 0.5% at the HS 6-digit level (Table 3.10). Coincidentally, for the apple juice HS 8-digit tariff lines, Ukraine, Colombia and Peru (contenders to supply the EU28 for the tariff lines under this TRQ) all enjoy a 0% (Table 3.7) in-quota tariff rate in comparison to the TDCA (Table 3.5 in Section 3.5.2) where the tariffs range from 9% (*ad valorem* 0% to 15% + 9.8 EUR/100kg (non-*ad valorem*).

The same is observed for orange juice and the mixtures of fruit, that the countries in competition to supply the EU enjoy a 0% or a much lower in-quota tariff than what South Africa obtained under the TDCA. A European Commission report indicates that whilst the demand for imports of frozen strawberries by the EU has grown since the mid-1990s, only China and Morocco (among the main producers) have exported significantly to the EU (European Commission, 2006). The frozen strawberries market in the EU is most likely not an attractive market for South Africa.

Frozen orange juice, for which the TRQ consists of a single tariff line at the CN 8-digit level, is selected to show (Table 3.11) the allocation of TRQ quantities to South Africa as a percentage of total quantities imported by the EU28 per given year from 2012-2015 (European Commission Statistics, 2016; TARIC, 2016). Frozen orange juice is among the least value share contributors, as noted in Table 3.10. Table 3.11 shows notified TDCA quota quantities, the exported TRQ quantities as well as a record of EU28 imports. The exported TRQ quantity enables the linking of EU28 import quantities to the export regime for South African fruit products. For 2012, the tariff reduction was available up to a limit of 952 000 kgs for frozen orange juice. However, for the out-of-quota exports it may not be so clear-cut whether those exports paid the MFN rate or the tariff preference rate (European Commission Statistics, 2016; TARIC, 2016).

Table 3.11: Allocation of frozen orange juice (CN2009.11.99) TRQ quantities (kgs) to South Africa per total Extra-EU28 imports (2012-2015)

Year	Notified TDCA TRQ quantity	Exported TRQ quantity	Total recorded imports by EU28 at CN 8-digit level		Total recorded imports by EU28 at 6-digit level		Orange juice TRQ as % of HS 6-digit extra-EU total
			South Africa	Extra-EU	South Africa	Extra-EU	
2012	952 000	788 723	847 000	40 284 000	847 000	40 448 000	2.4
2013	973 000	973 000	1 317 000	53 597 000	1 317 000	53 643 000	1.8
2014	994 000	994 000	202 1000	42 446 000	2 021 000	42 575 000	2.3
2015	1 015 000	1 015 000	1 287 000	35 477 000	1 300 000	35 590 000	2.9

Source: Author's calculations based on European Commission Trade Statistics (2016) and TARIC (2016).

The quantities indicated in Table 3.11 show that in 2012, the 8-digit tariff line CN2009.11.99 for frozen orange juice recorded the same quantities at the HS 6-digit level, implying that the total recorded TRQ imports from South Africa were contributed at the 8-digit tariff line. Non-TRQ imports of frozen orange juice from South Africa are, therefore, assumed to have accounted for the 58 277 kg difference in the TRQ quantity exported and the total recorded at the CN 8-digit level. The calculations presented in Table 3.11 show that the TDCA TRQ for frozen orange juice accounted for only 2.35% of the total imports of frozen orange juice by EU28 in 2012 and roughly the same (below 3%) for the rest of the years 2014 and 2015. In 2013, less than 2% of the total imports was recorded.

Exports outside the TDCA quota, especially when the quota is not being filled, may be explained due to imperfect information available to the exporters such that they become unable to use the TDCA TRQ facility. It may also be that in such instances the tariff quota is prohibitive in terms of technical barriers to obtaining permits. A 100% use of the notified quota quantity was noted for the years 2013 to 2015. For those years, a record of exports outside the TRQ notified quantity is observed, given that the total recorded imports by EU28 are higher than the exported quantities under TRQ. There is a good indication, therefore, that for this TRQ, a policy to increase the quota volume may induce more exports. The situation observed for 2012 warrants the further analysis given through a presentation of Figures 3.7 and 3.8 (Section 3.8.3.).

Table 3.12 shows the contribution of TRQ exported quantities to South Africa's total exports to the EU28 as well as the contribution of TDCA notified TRQ quantities to total Extra-EU imports for each of the HS 6-digit tariff lines for the years 2012 and 2015. A comparison of 2012 and 2015 contributions shows a decline in the exported TRQ contribution to total South African exports to the EU28. The greatest decline is observed for the canned mixtures of fruit that contributed 72% in 2012 and only 29% in 2015. In 2015, therefore, about 70% of canned mixtures of fruits were exported outside the quota. For 2012, the calculations show that the TRQ quantity for frozen orange juice (exported by South Africa) made up 93.1% of total exports to the EU28 under the tariff line CN2009.11.99. The notified TRQ only contributed 2.9% of total extra-EU imports at the HS 6-digit level (European Commission Statistics, 2016; TARIC, 2016).

Table 3.12: Contribution of TRQ exports (in quantity terms) to the total South African and Extra-EU exports to EU28

TDCA fruit TRQ	Notified TRQ quantity (kgs)		Exported quantity under TRQ (kgs)		Exported TRQ contribution to total South African exports to EU28 at HS 6-digit level (%)		Notified TRQ contribution at HS 6-digit level of total Extra-EU exports to EU28 (%)	
	2012	2015	2012	2015	2012	2015	2012	2015
Frozen strawberries	340 000	362 500	0	0	0	0	0	0
Pears, apricots, peaches	55 919 000	59 629 250	39 052 870	33 191 929	100	99.5	45.7	43.2
Mixtures of non-tropical fruit	24 901 600	26 552 200	4 574 654	2 333 972	72.2	29.1	34.6	27.4
Mixtures of tropic fruit	2 720 000	2 900 000	3 399	0				
Frozen orange juice	952 000	1 015 000	788 723	1 015 000	93.1	78.9	2.4	2.9
Pineapple juice, apple juice	6 800 000	7 250 000	1 129 539	546 506	29.0	15.6	1.7	1.7

Source: Author's calculations based on European Commission Statistics (2016) and TARIC (2016).

The pineapple and apple juice TRQ contributed 29% and 16% in 2012 and 2015, respectively, to the total South African exports to the EU28. This TRQ's notified quantity contribution (for 2012 and 2015) is only 1.7% of the total extra-EU imports to the EU28. The pineapple and apple juice TRQ was not filled. It was found, by analysing the exported TRQ contribution percentage, that the pineapple and apple juice TRQ shows the bulk of the exports for tariff lines under this TRQ were outside the quota for 2012 and 2015, more than 70% was recorded for both years. For the years 2012 and 2015, South Africa's total exports under the pears, apricots, peaches TRQ were all

(100%) TRQ exports. Under this TRQ, South Africa enjoyed roughly a 45% contribution to the total Extra-EU imports (European Commission Statistics, 2016; TARIC, 2016).

Table 3.13 presents the calculations for combined TRQs. The calculations consisted of adding together all the quota quantities notified for all countries per year, based on the report of tariff quota imports by the EU. The data on TRQs presented in Table 3.13 does not include non-preferential TRQs. The canned mixtures of fruit for South Africa combines two TRQs, the tropical and non-tropical mixtures. The total frozen strawberries TRQ imports by EU28 (for the years 2012 and 2015) were from Mexico. South Africa, as already noted, recorded no contribution for frozen strawberries. Israel, Mexico, Morocco, Tunisia, South Africa and Turkey and *erga omnes* represent the origin for EU28 TRQ imports for the six TRQs indicated in Table 3.13.

Table 3.13: Preferential TRQ exports by South Africa in relation to total Preferential TRQ imports by EU28 (2012 and 2015)

TRQ as defined per EU order number	TRQ exports to EU28 from South Africa (kgs)		Total TRQ imports by EU28 (kgs) from Extra-EU		RSA % contribution towards EU28 fruit TRQ	
	2012	**2015**	**2012**	**2015**	**2012**	**2015**
Frozen strawberries	0	0	257 698	4 0474	0	0
Pears, apricots, peaches	39 052 870	33 191 929	45 538 917	33 191 929	86	100
Canned mixtures of fruit	4 578 053	2 333 972	4 601 863	2 336 647	99	100
Frozen orange juice	788 723	1 015 000	48 449 326	31 557 786	2	3
Pineapple and apple juice	1 129 539	546 506	1 135 235	689 759	99	79

Source: Author's calculations based on European Commission Statistics (2016).

South Africa is the leading user of the extra-EU combined TRQ for apple, pears, and apricots, with 86% of the total extra-EU TRQ imports in 2012. For 2015, the pears, apricots and peaches TRQ as well as the combined canned mixtures of fruit TRQ contributed 100% of the TRQ imports by EU28 from Extra-EU. Mexico and Israel compete with South Africa under preferential tariff quotas for frozen orange juice (European Commission Statistics, 2016).

In terms of quantity of the total imports by EU28 per TRQ, South Africa's frozen orange juice TRQ only made up 2% and 3% in 2012 and 2015, respectively. A 100% contribution was recorded in 2015 for the pears, apricots and peaches TRQ and the canned mixtures of fruit TRQ. The pineapple and apple juice TRQ paints a different picture when quantity contributions (99% in 2012 and 79% in 2015) are compared to value contribution which is 3% or less at the HS 6-digit level for 2015 (Table 3.10). In terms of preferential TRQs, South Africa had a high quantity contribution, yet in terms of value shares that are taken for all Extra-EU imports the contribution was quite small. This also serves to show that little trade occurs under TRQs with the possibility that most of the trade is occurring under tariffs that are more prohibitive.

Further analysis in the next section focuses on frozen orange juice for which the TRQ comprises only one tariff line. The frozen orange juice TRQ is selected for the simplicity of presentation given that it represents no aggregation issues across several tariff lines, as is the case with other TRQs. For each of the TRQs, tariffs are bound at the tariff line level. Besides the frozen strawberries and frozen orange juice TRQs with one tariff line each, the other four (4) TRQs studied comprise a TRQ that has several bound tariffs dependent on the number of tariff lines making up the TRQ.

3.8.3 Three possible TRQ regimes with two tariffs and a quota

Following the standard TRQ diagrams in Skully (2001), Figures 3.7 and 3.8 illustrate different scenarios of the orange juice case under the TDCA in 2012. The TRQ diagram typically shows two (2) steps in the frozen orange juice supply function, in addition to a vertical section. The two (2) steps represent the tariff elements of the TRQ, whilst the vertical section of the supply function is the non-tariff element. The quota is binding and the fill rate is 100%, as represented along the vertical section of the supply function.

The frozen orange juice tariff line (CN2009.11.99), illustrated in Figure 3.7, shows the complexity of trade under TRQs. With a TRQ, the quantity traded decreases. The three possible regimes in which the trade for frozen orange juice can occur are the in-quota tariff rate, the quota level and the MFN tariff rate. Considering the notified TRQ quantity of frozen orange juice limits imports to 950 000 kg, this TRQ (similar to any other TRQ) affects the functioning of the market, given that exports by South Africa and imports by the EU at an in-quota tariff rate higher than 7.9% become less attractive. The TRQ administration approach (described in Section 3.4), therefore, works to ration the selected importer or exporter under TRQ. The MFN tariff rate for frozen orange juice is 15.2%, and the TDCA in-quota tariff rate imposed by the EU for frozen orange juice is 7.9%. For illustrative purposes, in Figure 3.7, the world price (P_w) of frozen orange juice is denoted as equal to one (1). The world price plus the in-quota tariff is thus 1.079 for the frozen orange juice case presented for 2012. The world price plus the over-quota tariff is 1.152.

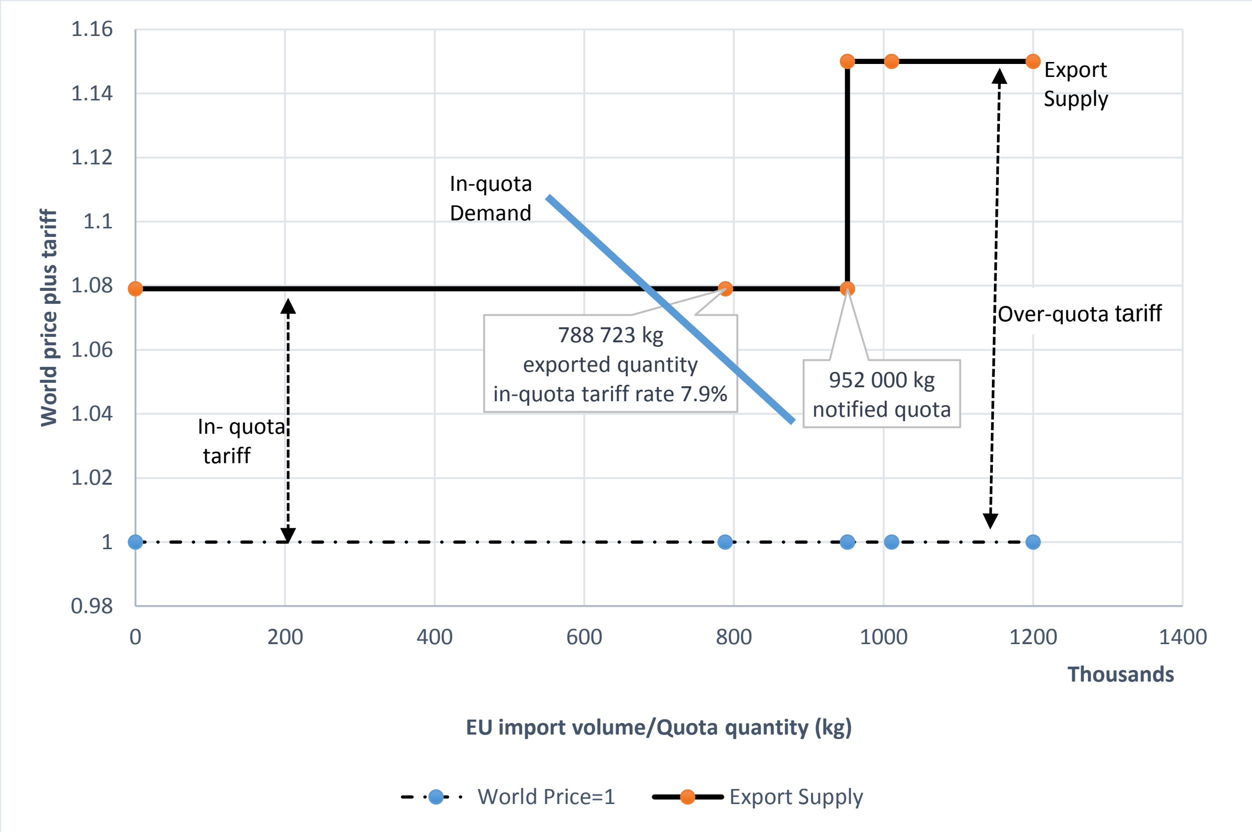


Figure 3.7: Frozen orange juice (CN2009.11.99) TRQ in-quota exports and parallel out-of-quota exports) (2012)

Source: Author’s own design using TARIC data (TARIC, 2016).

When the EU imports under quota, the TRQ is not binding with the effect that the in-quota tariff, and not the notified quota, determines the export quantity of 788 723 kg. This is depicted in Figure 3.7, which shows that for the year 2012, the quota was not binding. Below the quota quantity, normal supply and demand interactions occur because the TRQ is not binding and no quota rents are generated. Following the economic interpretation of TRQs, provided in Skully (2001), for the frozen orange juice exports to move towards filling the quota, the in-quota tariff must be reduced.

If South Africa were to fill the quota and the EU imports were at the notified quota quantity of 952 000 kg, the domestic price would be expected somewhere between the world price plus the in-quota tariff and the world price plus the over-quota tariff. Quota rents would result because of this. In this instance, the quota would be binding. South Africa exported 788 723 kg of frozen orange juice (CN2009.11.99) at the in-quota tariff rate of 7.9%. This quota was not filled to the allowable level of 952 000 kg, the level up to which the in-quota tariff would be in use. South Africa, though not filling the quota, recorded additional exports to EU28 of 58 777 kg above the reported in quota imports by EU28. These exports would, therefore, face the MFN tariff rate of 15.2% or a tariff preference of 11.7%. Recorded exports above an underfilled quota are, therefore, treated the same as over-quota exports that are subjected to the MFN tariff rate. The reasons for why such situations exist are explored in Section 5.1 – the analysis of factors that influence the filling of TRQs. Figure 3.8 is used to depict the alternative situation (European Commission Statistics, 2016; TARIC, 2016).

South Africa's supply curve intersects demand in EU28 at an in-quota quantity of 788 723 kg. The in-quota tariff was binding at 788 723 kg at an in-quota tariff rate of 7.9%. The fill rate was below 100%, given the notified quota quantity of 952 000 kg. Even though parallel exports to the in-quota exports were recorded, the allowable quota quantity was not reached, as only 847 000 kg was recorded as exports.

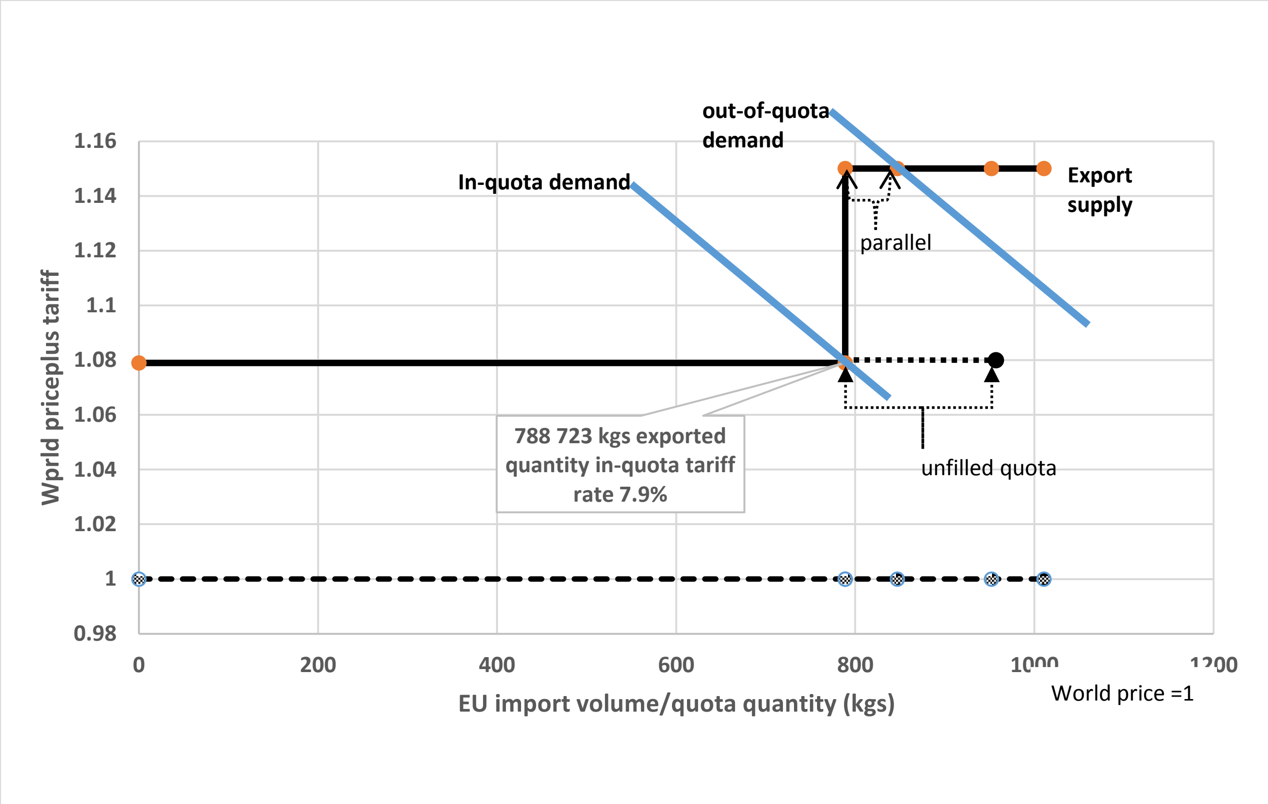


Figure 3.8: Frozen orange juice (CN2009.11.99) TRQ – parallel out-of-quota exports (2012)

Source: Author's own design based on data from TARIC (TARIC, 2016).

A thought-provoking situation arises out of the frozen orange juice TRQ: whilst the quota was not filled, parallel exports outside the quota were recorded and these would have, normally, faced the MFN tariff. Figure 3.8 depicts the total exports of 847 000 kg in 2012 that comprised an in-quota quantity of 788 723 kg with the balance exported out of quota. Regarding in-quota and out-of-quota exports, the notified quota of the TDCA of 952 000 kg would not have been met, even if all the exports arose in-quota. Without filling the quota and exporting 847 000 kg, comprising only 788 723 kg at the in-quota tariff, South African exporters of frozen orange juice fail to take advantage of the preferential arrangement that would, at least, have permitted the total 847 000 kg to be exported at the in-quota tariff. The results of the orange juice case agree with what Lim and Blandford (2009) point out: many underfilled products are imported out-of-quota. Transaction costs are suggested as a reason for underfilled quotas; this is explored further in Section 5.1. Other literature, such as Monnich (2003), suggests that quotas are underused due to supply-side conditions that include quantity insufficiency, and price and quality competitiveness. Quota management, which includes product and time specificity, is also suggested among the reasons for the quota underuse.

3.9 CHAPTER SUMMARY

In this chapter, an overview of the implementation and administration of the TDCA has been given to situate the context of the analysis on market access under the trade agreement. The overview provided on the TDCA included an analysis of the usage of TRQs for fruit products and the level of contribution of South African fruit products to EU28 imports. Country-specific trade arrangements that include the use of TRQs between the EU28 and a partner country have been highlighted. Countries with TRQs that compete with the TDCA in these arrangements have been identified as Tunisia, Turkey, Ukraine, Colombia, Peru, Mexico and Israel. The contribution of South African fruit TRQ exports, in competition with other countries benefitting under trade arrangements to supply the EU28, was also presented. The exporting arrangements for agents participating in fruit TRQ exports from South Africa to the EU market, detailing the preferential treatment and the concessions in place under the TDCA, were also detailed. The overview of fruit products' supply and demand in South Africa and the EU was provided to show the level of integration in the world economy and to make the case for the extent to which supply and demand factors might influence TRQ fill of fruit products.

This chapter has addressed the background scope and, therefore, allows the following three questions about market access in the context of the TDCA to be interrogated further in Chapter 5:

(1) Is the pattern of tariffs a likely influence on tariff quota fill?

(2) What is the quota fill rate under TDCA TRQs?

(3) What does the structure of South Africa's contribution to EU28 imports imply for any future-related negotiations?

The questions addressed in Chapter 5 will assist in the assessment of influential factors to TRQ fill.

CHAPTER FOUR

4. METHODOLOGY

The aim of this chapter is to present the data and methods used in the analysis of fruit/fruit products TRQs. A description of the secondary data used is followed by an explanation of the sampling procedure for the primary data used (as an add-on to the secondary data). Data analysis methods are then described. The methods to analyse data in this chapter comprise descriptive analysis, laying out an overview of the South African fruit products sector trading in the EU market, and the analysis of tariff quota fill rates, used to determine the TRQ export regime in operation. Likert scores – based on the primary data – were used to construct an intensity score measure, which was used to determine the level of shocks presented in the GTAP model. This was done to assess the impact of quota fill influential factors on trade and welfare.

4.1 DATA USED

4.1.1 Introduction

The main source of data used in this study was secondary data which was supplemented by primary data from a small-scale survey. Purposively sampled fruit exporting establishments as well as government officials were interviewed for the survey. The secondary data described in Sections 4.1.2 and 4.1.3 was used to achieve the first, third and fourth objectives of the study. Primary data described in Section 4.1.4 was used to achieve the second objective.

4.1.2 Secondary data

Secondary data from various years, spanning 2010 to 2016, sourced from the GTAP 9 database, the Trade Map database, the TARIC database, the European Statistics (EUROSTAT) database and the International Monetary Fund (IMF) was used. The secondary data on TRQs, available on the EU TARIC database, is identified by an order number and comprises (1) the volume in kilograms of the conceded TRQ, (2) the imported amounts by the EU, (3) the balance of the remaining quota volume and (4) the record of the last import date of the TRQ commodity. The EUROSTAT database provides information on trade flows for the different tariff lines and rates. The IMF data is on growth rate forecasts useful in projecting the GTAP database. Data sourced from the GTAP 9 database (Section 4.1.3 and 4.1.4) provides a description of the primary data appended as an input to one of the policy scenarios analysed in the GTAP model (which was used to analyse the factors that influence quota fill).

4.1.3 GTAP 9 database

The GTAP version 9 database, developed at Purdue University, is the main source of the data for CGE analysis in this study. The dataset available at the onset and end of this study was the latest version of the GTAP 9 database dated 2011, therefore, this is the year that was used. GTAP 10 dated 2014 was released in 2019. The GTAP version 9 also contains data for the years 2004 and 2007. A CGE model, such as the GTAP, contains complete bilateral trade data and protection linkages among multiple countries and commodities for a single year. Bilateral trade flows data on South Africa, EU28 and the rest of the world (ROW) aggregate was sourced from the GTAP database version 9. Narayanan, Aguiar and McDougall (2015) and Aguiar (2016) adequately document the GTAP database version 9.

4.1.3.1 Baseline tariff rates

The tariff rates existing in the 2011 GTAP database were changed to a new benchmark for the six (6) TRQs targeted in this study, namely (1) frozen strawberries (HS0811.10); (2) canned pears, apricots and peaches (HS2008.40/50/70); (3) canned tropical mixtures of fruit (HS2008.97); (4) non-tropical mixtures of fruits (HS2008.97); (5) frozen orange juice (HS2009.11); (6) pineapple juice (HS2009.41/49) and apple juice (HS2009.71/79). The importer region, which is the EU, applies the tariff on the fruit/fruit products tariff lines of the TDCA TRQs. The adjustments of the EU import tariffs in the basedata were undertaken using tariff data sourced from the TARIC database (TARIC, 2016). The TDCA tariff rates were implemented as an input to the 2011 GTAP base data before the base-case scenario simulation. The region subjected by the EU to the highest protection is ROW (as expected), given that the EU tariff rates are preferential to South Africa and not preferential to ROW region under the TDCA. Each TRQ is composed of more than one tariff line defined at the HS 8 or 10-digit level code except for the TRQs for frozen orange juice and the frozen strawberries which have one tariff line each. Tariff rates are imposed at the HS 8 or 10-digit level code thus requiring an aggregation of the tariff rates to the TRQ level. The procedure to aggregate the tariff rates is explained in Section 4.2.3.4.

4.1.3.2 Baseline growth forecasts

Given that the 2011 database is not fully representative of the economy at the full implementation of the TDCA, a projection of the database to both 2012 and 2016 was undertaken. The procedure to project the database is explained below and was based on growth forecasts, presented in Appendix 1. The GTAP 2011 data was projected to 2012 and to 2016, for use as a baseline to reflect full implementation of the TDCA in

2012 and the inception of the SADC-EU-EPA at the end of 2016. The baseline data of 2011 was without the trade liberalisation policy change. The projection, therefore, allowed for the baseline comparison in 2011 to 2012 and 2016, thereby capturing TRQ policy changes in the fruit/fruit products sectors.

Seeing as the TDCA was fully implemented in 2012, the 2011 database functioned as a relevant starting point to model tariff liberalisation. Yu and Jensen (2012) confirm this by noting that, when evaluating the potential effects of an FTA, it is typical that the year before the full implementation of the FTA is the year the database uses. What has happened in the global economy from 2011 (the GTAP model database) to 2012 (full TDCA implementation) as well as from 2011 to 2016 (the SADC-EU-EPA coming into effect) forms the baselines projected through a shock in the static model of GTAP. A macroeconomic shock to the Gross Domestic Product (GDP) was applied to project the model economies to both 2012 and 2016. When projecting the database, the assumption was made that for the years 2011 to 2016, no changes in other variables for the three (3) model regions (South Africa, EU28 and ROW) were present.

The calibration of the baseline was based on the 2017 IMF-published World Economic Outlook (WEO) 2009 to 2022 growth rate projections (Appendix 1). Typically, in a standard GTAP model closure, the variable GDP is endogenous. The variable GDP was thus made exogenous (exogenised), then shocked based on the GDP growth rates. To operationalise the database projection, cumulative growth over the projection period was imposed as a shock to the model for each respective country/region.

4.1.4 Primary data

A questionnaire comprising twenty-six (26) structured questions on influential factors affecting the level of exports, was administered to a purposively selected sample. Fourteen (14) of the twenty-six (26) questions were in the category of NTMs.The purposive sample selection, in which a total of twenty-six (26) respondents were interviewed, is detailed in Section 4.1.4.1 below, and the questionnaire is presented in Appendix 2. Exporting experiences about factors that influence tariff quota fill were the main subject of the questionnaire. The questions concerning export market access for South African fruit products were divided into four (4) categories of influential factors, namely (A) TRQ administration methods, (B) TRQ definition and use conditions, (C) TRQ supply and demand conditions of export commodity for the notified TRQ and (D) TRQ-associated tariff level conditions. Other general questions relating to the stakeholders' activities in the export market for fruit and fruit products were also included as part of the questionnaire.

A five (5) point commonly-used Likert scale was used to rate the exporter experiences regarding the intensity of each aspect's influence on the level of exports. The five (5) point rating for each influential factor was as follows: 1 = not at all; 2 = not very much; 3 = moderate; 4 = quite a bit and 5 = very much. The rating obtained through these questions was used to gather impressions and observations on the various aspects of the influential factor categories, in order to provide a realistic insight that would be used to discern the strength of each factor category (section 4.2.2 explains how this data was further analysed). Other general questions relating to the stakeholders' activities in the export market for fruit and fruit products were also included as part of the questionnaire. The general questions are shown on Page 1 of the questionnaire (Appendix 2).

4.1.4.1 Survey sample selection

Etikan, Musa and Alkassim (2016) explain that purposive sampling, which is also called judgemental sampling, is a form of sampling where elements of a population are deliberately selected based on certain practical qualities/criteria and their willingness to participate. The selection of interviewees for this study was deliberate and focused on incumbents with exposure to fruit/fruit products and with knowledge about issues regarding export market access. Purposive sampling is also indicated to be typically useful in qualitative studies. The method thus fits the purpose of the supplementation of this primary data to the GTAP secondary data in the study. The aim is to achieve an in-depth understanding into the extent of influential TRQ fill factors not provided by the main source of data in this study which is secondary and quantitative. Interviews included sixteen (16) exporting establishments, two (2) representatives within the SAFVCA and the SAFJA umbrella associations as well as eight (8) key informants in government departments (interviewed October 2016 to December 2017).

The respondents were purposively drawn based on the sampling frame of a service provider list of the 2016 Food Trade SA directory, prepared by the DAFF Directorate of International Trade. The directory lists four (4) produce groups: citrus fruit, deciduous fruit, subtropical fruit and exotic fruit. From this, three (3) fruit groups relevant to the study were selected, namely citrus, deciduous and subtropical. Etikan *et al.* (2016) emphasise that purposive sampling is undertaken with the aim to distil subjects with particular, relevant characteristics to contribute to the study. In addition, Teddlie and Yu (2007) indicate that a sample relevant to the research question is targeted and that the sample size is typically small: 30 cases or less. Table 4.1 shows the number of establishments classified, for this study, under different produce groups (selected in the first sampling stage) and the total number of establishments involved in the fruit juice/puree and canning industry, from which the participants were drawn in Stage 2.

Table 4.1: Sampling frame of establishments in different produce groups

Produce Groups	Exporter/Trader/Agent		
	Juice/Puree/Canned fruit	Other	Total
Citrus	8	52	60
Deciduous	5	50	55
Sub-tropical	10	23	33

Source: Author’s compilation based on Food Trade SA directory (Food Trade SA, 2016).

Some of the establishments indicated in Table 4.1 engage in overlapping activities across the fruit/fruit products export chain and a few of those establishments engage in activities in more than one commodity group. The nature of the study dictates a sample selection focused on fruit juice and canned fruits thus limiting the population size to twenty-three (23) establishments recorded in the 2016 Food Trade SA directory. The information presented in Table 4.1 shows that the total number of cases is small but meets the criteria relevant to this research and that it is relevant to the specific tariff lines. Table 4.1 also presents the sampling frame of twenty-three (23) establishments. Typical to the nature of processed agricultural exports, and as demonstrated in this sampling frame (Table 4.1), only a few establishments have a comparative advantage, as noted in Brooks (2018). Hence, only a few firms concentrate the processed sector. The sample size, representing the targeted export establishments, was adequate for the purpose of the information required to indicate the stringency of influential factors to quota fill in a Likert Scale.

Teddlie and Yu (2007) remark that a purposive sampling frame is an informal sampling frame, larger than the purposive sample selected; Table 4.1 illustrates this observation. Using the informal sampling frame in the second stage of sampling for this study, the author presented representatives from the twenty-three (23) exporting establishments (comprising the eight (8) citrus juice/puree, five (5) deciduous canned fruit and ten (10) subtropical fruit juice and canned fruit exporting establishments) with questionnaires (Table 4.1). Sixteen (16) questionnaires were returned; 69.6% of the total sample population. Thus, these 16 respondents were selected and interviewed based on their availability and willingness to participate.

Eight (8) key informants from the relevant government departments (DAFF, DTI and SARS) were interviewed. The fruit and fruit products export sector is represented under two (2) umbrella associations, the SAFVCA and the SAFJA, and two (2) representatives within these umbrella associations were interviewed.

4.2 DATA ANALYSIS METHODS

Various approaches were taken in the analysis of data. Secondary data on TRQs, obtained from the TARIC database (2011 to 2016), was used in the calculation of TRQ fill rates. The TRQ fill rates were calculated to achieve the study objective of distinguishing the tariff quota export regime in use during a specific time period. To further understand the factors that influence quota fill, this study relied on exporters' experiences compiled from interviews regarding the intensity of tariffs and NTMs influencing quota filling. The Likert Score values collected from the exporter survey (indicated in Section 4.1.4), were summarised for each influential factor and then used in the construction of a weighted intensity score of influence. The intensity score of the influential factors was the tool developed to achieve the second study objective.

The weighted intensity score was used as an input in the trade liberalisation scenarios in the GTAP model analysis for the third and four study objectives. The analysis of trade liberalisation scenarios of fruit products TRQs, including the removal of identified NTMs, was simulated in a static GTAP CGE model, which was solved in General Equilibrium Modelling PACKage (GEMPACK) software. The specific data analysis methods are further elaborated in Sections 4.2.1 to 4.2.6.

4.2.1 Tariff quota composition, fill analysis and tariff quota regimes

The tariff data for 2016 was compiled, based on data sourced from the EU TARIC database, to indicate the tariff preferences for the TDCA fruit products tariff lines in comparison to MFN tariffs. Import value shares at the HS 6- and 8-digit tariff lines were calculated for products exported to the EU28 by South Africa. For the purposes of calculating percentage import shares, the calculations were restricted to all recorded/reported imports by the EU28 from South Africa for the year 2015 (a year representing the TDCA fully and leading to the inception of the SADC-EU-EPA in 2016). Shares were then calculated at HS 6- and 8-digit level tariff lines as a percentage of total South African imports in the relevant categories. The total imports by the EU28 whose value shares are analysed include TRQ and non-TRQ imports from South Africa for the year 2015. The following expressions show the basis of the calculations of the composition and contribution of South African TRQ fruit products in EU imports:

$$Tariff\ line\ import\ value\ share^{8} =$$

$$\frac{Product\ Import\ Value\ by\ EU28\ from\ South\ Africa\ for\ relevant\ HS\ code}{Total\ Imports\ by\ EU28\ valued\ per\ relevant\ HS\ code}\ x\ 100 \tag{4.1}$$

$$TDCA\ TRQ\ as\ a\ \%\ of\ total\ Extra\ EU^{9}\ imports\ by\ EU28\ at\ HS6\ digit\ level =$$

$$\frac{Notified\ TDCA\ TRQ\ quantity}{Total\ EU28\ recorded\ imports\ at\ HS6\ digit}\ x\ 100 \tag{4.2}$$

$$Notified\ or\ Exported\ TRQ\ Contribution =$$

$$\frac{Notified\ or\ Exported\ TRQ\ quantity}{Total\ South\ African\ exports\ at\ the\ relevant\ tariff\ line}\ x\ 100 \tag{4.3}$$

$$South\ Africa\ contribution\ to\ EU\ fruit\ TRQ =$$

$$\frac{Volume\ of\ TRQ\ exports\ by\ South\ Africa}{Total\ TRQ\ imports\ by\ EU28\ from\ all\ competing\ countries}\ x\ 100 \tag{4.4}$$

The level to which the TRQs are filled is an indicator of market penetration and also informs the reader about the TRQ export regime in which trade is occurring. In order to distinguish one TRQ export regime in place from another, the TRQ fill rate was calculated for each TRQ. The export regime informs about the actual policy instrument in place whether it is the in-quota, at quota or the out-of-quota (MFN) tariff. The fill rate was calculated as follows:

$$TRQ\ fill\ rate\ (\alpha) = \frac{Actual\ TRQ\ Import\ Volume}{Scheduled\ TRQ\ volume} \tag{4.5}$$

[8] The import value share percent is a share of the total extra-EU imports. Extra-EU imports refers to all the imports into the EU excluding intra-EU trade.

[9] This analysis is made for frozen orange juice as a case to illustrate the TDCA TRQ as a % of total Extra-EU imports of frozen orange juice.

A ratio between 0 and 1 represents an underfill of the TRQ and above 1 it represents an overfill of the TRQ. The fill rate can also be indicated as a percentage such that above 100% is an overfill. The calculation of the TRQ fill rate also provides important information, which is useful for characterising the TRQ regime in the reference (year), for the GTAP CGE analysis (Chapter 5). The TRQ fill rate is important for the analysis of quota rents and is also relevant in determining the choice of TRQ liberalisation likely to have the desired market access impacts.

4.2.2 Calculation of Likert scale values and intensity scores of influential factors to quota fill

The following equations were used in the calculations to determine the intensity of the influence that identified factors have on preventing quota filling:

$$M_k = \frac{\sum_{1}^{\mathrm{n}} F_k}{n} \tag{4.6}$$

$$\lambda_k = \frac{M_k}{\sum_{\mathrm{k=1}}^{\mathrm{m}} M_k} \times 100 \tag{4.7}$$

$$W_k = \sum_{\mathrm{k=1}}^{\mathrm{m}} \lambda_k \tag{4.8}$$

Where:

- F_k, the Likert score value of the k^{th} factor influencing TRQ fill.
- M_k, score of intensity of influence of the k^{th} factor influencing TRQ fill
- λ_k, the weighted average score of intensity of influence of the k^{th} factor influencing TRQ fill
- W_k, sum of weighted average scores λ_k in a given category of factors influencing TRQ fill.

- n is the number of interview responses received for each influential factor
- m is the number of factors influencing quota fill

The intensity score for each factor's influence on quota fill was calculated as the average/mean of Likert score responses for each influential factor (Equation (4.6)). To determine each factor's weight in influencing quota fill, the calculated mean intensity score was divided by the sum of mean intensity scores obtained for the 26 influential aspects identified for the study (Equation (4.7)). Sixteen (16) of the twenty-six (26) aspects identified as factors that influence quota fill are NTMs.

To calculate the total contribution of the intensity of factors preventing quota fill for each category A to D (Section 4.1.4), the sum of the weighted averages was taken in each category (Equation (4.8)). To calculate the total contribution of NTMs, the sum of the weighted averages for the sixteen (16) NTMs was taken. The NTMs identified as influencing exports were then included in the GTAP model (Section 4.2.3) to simulate a scenario where all the NTMs (except SPS measures) preventing quota fill are removed. The aspect relating to SPS measures was excluded from the contribution of NTMs when the shock value for the simulation of the removal of NTMs in the GTAP model was calculated. The exclusion of the SPS measure is in recognition of the fact that certain SPS measures are necessary and their removal might pose health risks to consumers.

4.2.3 GTAP 9 model and CGE modelling in analysing fruit TRQ sectors

The GTAP model developed by the GTAP team at Purdue University provides a detailed presentation of sectors of the global economy. Trade is represented by bilateral matrices based on the Armington assumption (Armington, 1969) that all commodities are differentiated based on origin (Brockmeier and Pelikan, 2008). The GTAP model houses a database containing Social Accounting Matrices (SAMs) for 140 countries/regions and 57 sectors. The GTAP-based SAMs are available for the years 2004, 2007 and 2011. The SAM relevant in this study is for the year 2011.

Production, resource endowment, bilateral trade data and values for all parameters in the GTAP model are also contained in the GTAP database. The economic agents in the GTAP model are producers, consumers and government. The model assumes perfect competition and that prices will adjust to clear all markets. The basic GTAP model is a static general equilibrium model with no time dimension (Plummer, Cheong and Hamanaka, 2010). This is opposed to dynamic models that analyse lagged transmissions and adjustment processes over time. For a static CGE model, when simulating impacts in the future, the time path followed in the period of intervention is not subject to analysis. In order to simulate policy outcomes in this regard, what is needed are exogenous inputs for the expected conditions in the year of interest (Burfisher, 2011; Burrell *et al.,* 2011).

The target sector in this study is the food products sector referring to the food products not specified elsewhere in the other 57 GTAP sectors. The food products sector is abbreviated as OFD and is number 25 of the 57 GTAP sectors in the GTAP model. The OFD sector is split into several tariff lines for the 6 TRQs of this study, thus creating additional GTAP sectors. The procedure to create the additional GTAP sectors is explained in Section 4.2.3.1, which details the modifications to the GTAP model to suit this study. Plummer *et al.* (2010) note that, given the coverage of multiple sectors in FTAs, the FTAs are often simulated using CGE modelling. The GTAP model is the most commonly used CGE model for analysing trade policy, as explained in Plummer *et al.* (2010). Given that the basic GTAP model is a comparative static analytical tool for evaluating 'what if' scenarios, it is well fitting for this study to use the static model as it aims to simulate 'what if' scenarios allowing for the subsequent comparison of equilibria.

The GTAP CGE model, in which TRQs for fruit/fruit products are introduced as sectors defined at HS 6-digit tariff lines (as detailed in Section 4.2.3.3), enables a detailed analysis of the TDCA fruit/fruit products. The CGE model was solved to determine the impact of the TRQ liberalisation policy on prices, consumption, and output. This approach, in a CGE model, enables the modelling of the fruit sector with as much detail as possible and takes advantage of the flexibility of the GTAP model in order to tailor it to answer the specific question of this study achieved through analysing the third and fourth study objectives.

The basic CGE model, which closely links with this study, is described by Devarajan *et al.* (1997). The outline of the functions, presented in Box 4.1, can be stated for one country with two production sectors and three goods. The basic CGE model equations are converted into a global CGE model, like the GTAP model, by use of subscripts '*r*' and '*s*' referring to the country source of imports/exports and destination country of imports/exports, respectively. The equations comprise behavioural equations describing consumer and producer behaviour, identity equations imposing market clearing conditions and macro closure rules governing savings and investment balance.

Concerning the macro-closure rules, Devarajan, Lewis and Robinson (1990) note that the macro closure of the CGE model is based on a savings-investment determination termed the neo-classical closure. In that basic model, Devarajan *et al.* (1990) further note that the balance of trade is fixed together with real government expenditure and that government deficit is the difference between expenditure and net receipts. Devarajan *et al.* (1990) further clarify that aggregate savings is calculated from the sum of household savings, government savings and the balance of trade; therefore, indicating that there is no separate investment function. In this instance, the aggregate savings and investment are deemed equal; thus, the neo-classical closure. To this end, no additional rule is included in Box 1.

Box 4.1: Basic CGE model functions

FLOWS

- (1) $Q = f(X,\ D^s, \alpha)$ (2) $Q^s = f(M, D^D, \delta)$
- (3) $Q^D = \frac{Y}{P^c}$ (4) $\frac{X}{D^s} = f(P^e, P^d)$ (5) $\frac{M}{D^D} = f\ (P^m, P^d)$
- (6) $Y = P^Q.Q + R.B$

PRICES

- (7) $P^m = R.P^{w^m}$ (8) $P^e = R.P^{w^e}$ (9) $P^Q = f(P^e, P^d)$
- (10) $P^c = f(P^m, P^d)$ (11) $R \equiv 1$

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- (12) $D^D - D^s = 0$
- (13) $Q^D - Q^s = 0$
- (14) $P^{w^m}.M - P^{w^e}.X = B$

where: Q= Aggregate production; X= Export good; M= Import good; D^s= Supply of domestic good; D^D= Demand for domestic good; Q^s= Supply of composite goods made of domestic goods (D) and import goods (M); Q^D= Demand for composite goods; α = export transformation elasticity; δ =import substitution elasticity; Y= Total income; P^c= Price of composite good; P^e= Domestic price of export good; P^d= Domestic price of domestic good; P^m= Domestic price of import good; P^Q= Price of aggregate output; R= Exchange rate; B= Balance of trade; P^{w^m}= World price of import good; P^{w^e}= World price of export good

Source: Devarajan *et al.* (1997).

4.2.3.1 Description of modifications to the GTAP model

The GTAP model is not an off-the-shelf, ready-to-use model. Modifications and innovations that are specific to the research question have to be applied before simulations can be implemented. This subsection, therefore, explains the modifications involving region aggregation, sector aggregation of the 57 GTAP sectors, addition of new fruit/fruit products sectors and tariff rates aggregation at TRQ level as well as the innovations in linking the survey-based analysis factors that affect quota fill with the GTAP analysis. The TDCA TRQs introduced to the GTAP model as new sectors are mostly underfilled; hence, an innovation to move TRQs to a 100% fill level for further analysis is also explained as a model innovation in Section 4.2.3.6.

4.2.3.2 Region and sector aggregation in the GTAP model

The aggregation scheme for the regions and sectors facilitating the analysis to simulate liberalisation effects on fruit/fruit TRQ products sectors of South Africa is indicated in Tables 4.2 and 4.3, and in Table 4.4 for the frozen orange juice case. Such aggregation of regions and sectors is tailor made for the research problem of this study, which requires the isolation of South Africa and the EU28 as trading partners with a focus on fruit/fruit products TRQs presented as sectors in the GTAP CGE model. Three (3) regions, South Africa, EU28 and the ROW are aggregated from the 140 GTAP regions, as shown in Table 4.2. The EU28 region contains twenty-eight (28) EU countries and the ROW region comprises the remainder of the 111 GTAP regions in the model.

Table 4.2: Aggregation of regions in model database applied for fruit product TRQ analysis

Three-region aggregation in modified GTAP model	Countries/regions of the GTAP version 9 database included in the aggregated regions of the modified model
South Africa	South Africa
EU 28	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom
ROW	Australia, New Zealand, Rest of Oceania, China, Hong Kong, Japan, Korea, Mongolia, Taiwan, Rest of East Asia, Brunei, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Philippines, Singapore, Thailand, Viet Nam, Rest of Southeast Asia, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Rest of South Asia, Canada, USA, Mexico, Rest of North America, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Rest of South America, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Rest of Central America, Dominican Republic, Jamaica, Puerto Rico, Trinidad and Tobago, Caribbean, Switzerland, Norway, Rest of EFTA, Albania, Belarus, Russian Federation, Ukraine, Rest of Eastern Europe, Rest of Europe, Kazakhstan, Kyrgyzstan, Rest of Former Soviet Union, Armenia, Azerbaijan, Georgia, Bahrain, Iran Islamic Republic of, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Turkey, United Arab Emirates, Rest of Western Asia, Egypt, Morocco, Tunisia, Rest of North Africa, Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Guinea, Nigeria, Senegal, Togo, Rest of Western Africa, Central Africa, South Central Africa, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe, Rest of Eastern Africa, Botswana, Namibia, Rest of South African Customs, ROW

Source: Own aggregation based on GTAP version 9

South Africa is treated as a single region to allow for the analysis of TRQ liberalisation effects on South Africa. The EU28 is taken as an aggregate region given its trade agreement as a union of 28 countries with South Africa. The ROW region is not party to EU fruit TRQs concessions of the TDCA.

An extension was made to introduce fruit TRQ products to the GTAP database model. The extension focuses on the trade flows of canned fruits (HS2008) and fruit juice (HS2009) tariff lines. All the other information in the database is preserved and thus not altered.

Table 4.3: Mappings of GTAP sectors modelled

GTAP sectors (57) Description of expanded sectors	Sectors modelled (9)		Aggregated mapping of the fruit TRQ sector in model
	Abbrev. in model	Description	
Processed fruit products	FROZJUCE	Frozen orange juice	TRQCOM
	PAP	Canned pears, apricots and peaches	
	STRAWBRY	Frozen strawberries	
	APLEPINE	Apple and pineapple juice	
	FRUITMIX	Canned fruit mixtures	
Processed food products (OFD) excluding: HS0811.10; HS2009.11; HS2008.40/.50/.70; HS2008.97 and HS2009.41/.49/.71/.79	OTHER_OFD	Other processed food products	OTHER_OFD
Paddy rice, Wheat, Cereal grains nec, Vegetables-fruit,-nuts, Oil seeds, Sugar cane-sugar beet, Plant-based fibres, Crops nec, Cattle-sheep-goats-horses, Animal products nec, Raw milk, Wool- silk-worm cocoons, Forestry, Fishing, Meat: cattle-sheep-goats-horse, Meat products nec, Vegetable oils and fats, Dairy products, Processed rice, Sugar, Beverages and tobacco products	OTHER_AGRIC	Other agriculture	OTHER_AGRIC
Coal, Oil, Gas, Minerals nec, Textiles, Wearing apparel, Leather products, Wood products, Paper products, publishing, Petroleum-coal products, Chemical-rubber-plastic prods, Mineral products nec, Ferrous metals, Metals nec, Metal products, Motor vehicles and parts, Transport equipment nec, Electronic equipment, Machinery and equipment nec, Manufactures nec	NON_AGRIC	Non-agriculture	NON_AGRIC
Electricity, Gas manufacture-distribution, Water, Construction, Trade, Transport nec, Sea transport, Air transport, Communication, Financial services nec, Insurance, Business services nec, Recreation and other services, PubAdmin/Defence/Health/Educat, Dwellings	SERVICES	Services	SERVICES

Source: Own aggregation based on GTAP version 9

The GTAP OFD sector comprises 262 HS 6-digit tariff lines. Splitting the OFD sector enables the introduction of fruit TRQ products as sectors in the model. The TDCA canned fruit and fruit juice TRQs are made up of various HS 6-digit tariff lines. The mapping of the TRQ sectors from the GTAP sectors is shown in Table 4.3.

In the broad HS 4-digit level groups, canned fruit tariff lines (HS2008) and fruit juice tariff lines (HS2009) have been granted the preferences under the TDCA and are modelled in this study at the HS 6-digit level. For purposes of this study the tropical and non-tropical fruit mixtures TRQs, which are classified under the same HS 6-digit level, are analysed as a single canned fruit mixture TRQ. Five (5) instead of six (6) TRQs are subsequently referred to in the analysis.

The combined canned fruit mixtures TRQ was coded ‘FRUITMIX’. The disaggregation into HS 6-digit tariff lines, defines the sub-sectors targeted in this study which are: (1) HS0811.10 – frozen strawberries; (2) HS2008.40 – canned pears, HS2008.50 – apricots and HS2008.70 – peaches; (3) HS2008.97 – canned mixtures of fruit; (4) HS2009.11 – frozen orange juice; (5) HS2009.41; HS2009.49; – pineapple and HS2009.71; HS2009.79 – apple juice. The remainder of the other tariff lines from the OFD sector were aggregated and reassigned into an “other-OFD” sector. The rest of the GTAP sectors were aggregated into other agriculture, non-agriculture and services making up nine (9) sectors in the model.

In the first stage of the process of aggregating the database, it was aggregated into four (4) sectors. The processed food products sector, which is a GTAP defined sector, was kept as a standalone sector, whilst 21 GTAP-defined agricultural-based sectors were grouped to make a single other agricultural sector. A non-agricultural sector totalling 20 GTAP defined sectors aggregated into one sector was also defined, and 15 services were also grouped into one services sector. To isolate five (5) fruit/fruit products TRQs, the GTAP defined processed food products sector was split into six (6) sectors in a procedure that was tantamount to introducing five (5) new sectors into the GTAP database. The procedure carried out to split the GTAP-defined processed food products sector into five (5) fruit/fruit products TRQ sectors and an "other-processed food products" sector is detailed in Section 4.2.3.3.

An expanded database with 62 sectors was, effectively, aggregated to nine (9) sectors (frozen orange juice; canned pears, apricots and peaches; frozen strawberries; apple and pineapple juice; canned fruit mixtures; other processed food products; other agriculture; non-agriculture; and services). The final result of the aggregation process was a database with nine (9) sectors and three (3) regions. To this end, a 9 x 3 CGE model representing nine (9) sectors and three (3) regions was used in the analysis in this study. Five (5) factors of production were used by each of the sectors in the model. In this case, each of the three (3) regions in the model contained the following five (5) factors: land, unskilled labour, skilled labour, capital and natural resources.

To analyse the frozen orange juice tariff line (HS2009.11), a version of the GTAP model was built to three (3) regions/countries, five (5) sectors and five (5) factors using data supplied in the GTAP version 9 database. In the GTAP database, the 2011 world economy was represented and enabled the analysis of 140 regions and 57 sectors. The aggregation procedure entailed initially aggregating the 57 GTAP sectors into four (4) sectors (processed food products, other agriculture, non-agriculture and services) and then subsequently introducing the frozen orange juice tariff line as a sector to make five (5) sectors in the model. The three (3) regions of the model (South Africa, EU28 and ROW) were aggregated in the same manner (Table 4.2). The aggregation scheme for the sectors facilitating the analysis (in the simulation of liberalisation effects on the frozen orange juice sector of South Africa) is indicated in Table 4.4.

Table 4.4: Aggregation of sectors in model database applied for frozen orange TRQ

Five-sectors/industries aggregation in modified GTAP model	Description of original GTAP sectors making up the aggregated sectors of the modified model
Frozen orange juice (newly introduced)	HS2009.11 - A tariff line split from processed food products (OFD) sector of the GTAP sectors
Other processed food products	Processed food products (OFD) sector excluding tariff line HS2009.11
Other agricultural	Paddy rice, Wheat, Cereal grains nec, Vegetables-fruit,-nuts, Oil seeds, Sugar cane-sugar beet, Plant-based fibers, Crops nec, Cattle-sheep-goats-horses, Animal products nec, Raw milk, Wool- silk-worm cocoons, Forestry, Fishing, Meat: cattle-sheep-goats-horse, Meat products nec, Vegetable oils and fats, Dairy products, Processed rice, Sugar, Beverages and tobacco products
Non-agricultural	Coal, Oil, Gas, Minerals nec, Textiles, Wearing apparel, Leather products, Wood products, Paper products, publishing, Petroleum-coal products, Chemical-rubber-plastic prods, Mineral products nec, Ferrous metals, Metals nec, Metal products, Motor vehicles and parts, Transport equipment nec, Electronic equipment, Machinery and equipment nec, Manufactures nec
Services	Electricity, Gas manufacture-distribution, Water, Construction, Trade, Transport nec, Sea transport, Air transport, Communication, Financial services nec, Insurance, Business services nec, Recreation and other services, PubAdmin/Defence/Health/Educat, Dwellings

Source: Own aggregation based on GTAP version 9

In the standard GTAP sector aggregation, the frozen orange juice tariff line (HS2009.11) formed part of the aggregated processed food products sector (OFD). In the sector aggregation in the model, only the frozen orange juice tariff line was split from the OFD sector which contrasts the sector aggregation in Table 4.2, where all the fruit products of focus in this study were split from the OFD sector. Therefore, an expanded database with 58 sectors was aggregated to 5 sectors, in which the frozen orange juice tariff line (HS2009.11) is included as an HS 6-digit defined sector. To this end, a 5 x 3 CGE model representing five (5) sectors (frozen orange juice, other processed food products, other agriculture, non-agriculture, services) and 3 regions (South Africa, EU28, ROW) was used in the analysis. The factors of production remain, as described above.

4.2.3.3 Splitting of the GTAP OFD sector and addition of new sectors

To enable tariff liberalisation simulation impacts to be traced to the fruit/fruit products TRQs, the TRQ products tariff lines were isolated/extracted from the GTAP OFD sector. This sector comprised a total of 262 HS 6-digit tariff lines from which 10 HS 6-digit fruit/fruit products tariff lines were extracted. In order to separate the 10 HS 6-digit fruit/fruit products tariff lines from the OFD sector, the splitting weights were sourced from a utility program, designed by Horridge and Laborde (2010), called Tariff Analytical and Simulation Tool for Economists (TASTE). The TASTE program is based on the Market Access Map (MACMAP) HS6 dataset described in Guimbard *et al.* (2012). The MACMAP HS6 dataset contains detailed HS6 bilateral trade data and other data such as tariffs for countries presented in the GTAP version 9 database for the years 2004, 2007 and 2011.

The TASTE program was, therefore, used to generate the matrices with weights used to split a GTAP sector. The splitting proportions sourced from TASTE are based on trade flow weights. A GTAP utility called SPLITCOM, developed by Horridge (2008), was then used to extract the fruit/fruit products tariff lines from the GTAP OFD sector based on the trade weights. The SPLITCOM program allows for inputs based on user-determined weights in the splitting process of flows and activities in GTAP. The SPLITCOM program, subsequently, adjusts the distribution of flows and activities between the newly created GTAP fruit/fruit products sectors and the remainder of the GTAP OFD sector in the database. The fruit/fruit products tariff lines were split from the GTAP OFD sector in the proportions shown in Table 4.5.

Table 4.5: Trade flow weights of fruit/fruit products tariff lines in the GTAP OFD sector

TDCA Fruit TRQ	New GTAP sector code	HS 6-digit tariff line code	Trade flow weights in the GTAP OFD sector
Frozen orange juice	FROZJUCE	HS2009.11	0.00535
Canned pears, apricots and peaches	PAP	HS2008.40	0.000597
		HS2008.50	0.000519
		HS2008.70	0.002323
Frozen strawberries	STRAWBRY	HS0811.10	0.002347
Apple and pineapple juice	APLEPINE	HS2009.41	0.000761
		HS2009.49	0.001561
		HS2009.71	0.001142
		HS2009.79	0.006999
Canned fruit mixtures	FRUITMIX	HS2009.92	0.002496
TOTAL weight for OTHER_OFD			0.975905

Source: Author compilation based on sector trade flows sourced TASTE program

Where a TRQ comprises more than one tariff line (PAP, APLEPLINE, FRUITMIX), the proportion for each TRQ is an aggregate of the tariff line proportions contributing to a particular TRQ. In creating the new fruit/fruit products sectors, an assumption was made that the consumption shares preserve the proportions of the GTAP OFD sector and were, thus, not altered in the newly introduced sectors. Splitting of the fruit/fruit products tariff lines from the GTAP other processed food products sector enabled the introduction of those tariff lines as new sectors into the GTAP database. Thus, by introducing the new sectors, the GTAP database was, effectively, expanded to include the HS 6-digit tariff lines as sectors. The TRQ trade pertaining to the new sectors was taken to be the trade flows represented in the GTAP database. No additional data on the flows was required given that most of the trade for the TDCA TRQs (which comprise the newly introduced sectors) was within quota limits under the TDCA or SADC-EU-EPA.

To detach the frozen orange juice tariff line, the GTAP-defined 'processed food products' sector was split into two (2) sectors in a procedure that is tantamount to introducing two (2) new sectors into the database. The procedure carried out to split the GTAP-defined processed food products sector into a frozen orange juice sector and an other processed food products sector follows the procedure defined for sector aggregation in Table 4.2 (Section 4.2.3.2); however, the splitting weights are 0.005: 0.995 for the frozen orange juice and the reminder of the OFD sector, respectively.

4.2.3.4 The model calibration and tariff rates aggregation at the TRQ level

The trade elasticities in the GTAP database are taken as given in 2011 and are thus assumed without modification in this study. Hence, the substitution elasticities for the GTAP OFD sector were adopted for all the new fruit products sectors introduced in this study. The existing tariff rates in the GTAP database were calibrated to the TDCA fruit products tariff levels (Table 4.6), thereby creating a base case for the analysis. As described in Section 4.1.3, the GTAP database version 9 is the source of data for the 2011 base year. However, the tariff rates available in the GTAP database are not the TDCA tariff rates for the fruit/fruit products. Tariff data on TDCA fruit TRQs was sourced from the TARIC database (2011-2016), as indicated in Section 4.1.3.1.

Further elaboration on the shocks implemented in the model to input the TDCA tariff rates is presented in Section 4.2.6.

Aggregated in-quota and out-of- quota tariff rates for fruit TRQ imports by the EU from South Africa and the ROW are presented in Table 4.6. The TDCA agreement maintained the tariff rates at unchanged levels for the 2011 to 2016 period.

Table 4.6: TDCA tariff rates (%) imposed by the EU on South African exports

Fruit TRQ	TDCA tariff (2011-2016)	
	In-quota	MFN (out-of-quota)
Frozen orange juice	7.9	15.2
Canned pears, apricots and peaches	9.29	17.8
Frozen strawberry	0	14.4
Apple and pineapple juice	9.98	22.24
Canned fruit mixtures	8.95	17.2

Source: Own aggregation based on TARIC database (TARIC, 2016).

An aggregation of HS 8-digit tariff lines to the HS 6-digit level TRQs was conducted in order to transform the tariff rates implemented in the model simulations. To aggregate tariff rates from the tariff line level to a TRQ level, the median tariff rate was used, as suggested in Dal Bianco *et al.* (2015). Within each TRQ, exporters trade at any of the HS 8-digit tariff lines in any combination to fill the TRQ; hence, a simple median of the tariff rates is used.

The traded value of exports in the GTAP CGE model were taken, in this study, and adopted in the GTAP model as the TRQ use levels. The tariff rate that applies in the model is the in-quota tariff rate. There are no out-of-quota exports since the quotas in the model are unfilled. Therefore, none of the exports attract the out-of-quota tariff rates. Based on the TDCA tariffs, the most protected sector is the apple and pineapple juice sector followed by the canned pears, apricots and peaches sector. An adjustment – to account for quota fill and the presence of influential factors preventing quota fill, including NTMs – was undertaken through counterfactual simulations, as described in Section 4.2.3.6.

4.2.3.5 Equations targeted in the GTAP model

The following linearised Equations (4.9) to (4.11) of the GTAP model form the basis from which the simulation results of this study are discussed. The variables presented in Equations (4.9) to (4.11) signify percentage changes of the quantity levels.

$$qxs_{i,r,s} = -ams_{i,r,s} + qim_{i,s} - ESUBM_i * [pms_{i,r,s} - ams_{i,r,s} - pim_{i,s}] \tag{4.9}$$

$$pms_{i,r,s} = tm_{i,s} + tms_{i,r,s} + pcif_{i,r,s} \tag{4.10}$$

$$pim_{i,s} = \sum_k (MSHRS_{i,k,s} * [pms_{i,k,s} - ams_{i,k,s}]) \tag{4.11}$$

In the same convention of variable description in the GTAP model, *r* and *s* represent the region or country in the model where *r* is the source country and *s* is the destination country. The source country *r*, is South Africa and the destination country *s,* is the EU. The sectors in the model are represented by *i*. The demand for imported commodities (Equation (4.9)), disaggregated at sectoral level is $qxs_{i,r,s}$ which depends on *ams*, a technical change variable; *qim*, quantity of imports of commodity *i* imported by region *s*; *pms*, market price of commodity from *r* to *s*; and *pim*, market price of aggregate imports of commodity *i* in region *s*. In Equation (4.10), the market price of the commodity is determined through *tm*, power of the import tariff on all imports of *i* by *s*; *tms,* power of tax (1 plus *ad valorem* tariff) on imports of *i* from *r* and *pcif*, world *cif* price of *i* imported from *r*. ESUBM presented in Equation (4.11) is the elasticity of substitution of imports among different sources and MSHRS (market shares) is the share of imports from different regions, *k* in import bill of *s*.

The innovations made to import demand Equation (4.9) to analyse quota fill are detailed in Section 4.2.3.6. The innovations involve the introduction of a fill parameter that generates filled TRQ sectors in the GTAP model used for this study.

4.2.3.6 TRQ fill coefficient and the NTMs proportion in TRQ fill influential factors

In order to model the full use of TDCA TRQs in the GTAP model, a TRQ fill coefficient that targets the *qxs* Equation (4.9) in Section 4.2.3.5 was formulated. In calculating the TRQ fill coefficient, the full component of factors influencing quota fill was calculated to be a coefficient equal to the proportion of the unfilled quota that must be used to shock exports to bring quota fill levels.

The shocks to each TRQ needed to bring a 100% fill rate is a calculated fill coefficient, α^{-1} (the inverse of Equation (4.5)). The proportion α represents the proportion of the exported quantities in relation to the notified available quota level. The proportion 1- α is the component of unfilled TRQ that can be accounted for by the presence of influential factors preventing quota fill (including NTMs). The fill coefficient was added as a shock in the *qxs* Equation (4.9) to capture the changes as can be brought about by the removal of all factors influencing quota fill. The new variable added by this study in the new database is *fqxs*, which is the filled quota in Equation (4.12) and α^{-1} the fill parameter that brings the original GTAP variable *qxs* to TRQ fill level *fqxs*.

$$fqxs_{i,r,s} = \alpha^{-1}\{-ams_{i,r,s} + qim_{i,s} - ESUBM_i * [pms_{i,r,s} - ams_{i,r,s} - pim_{i,s}]\} \quad (4.12)$$

The shock to *qxs* shifts the underfilled TRQ trade flows to new levels; thus, generating flows that fill each of the shocked TRQs.

As shown in the literature, reviewed in Section 2.3.3, the approaches in studies analysing NTMs have a basis in estimating a tariff equivalence measure (AVE). The AVE of an NTM indicates the level of trade restrictiveness of the NTM. The two main approaches to estimating the AVEs of NTMs identified in the literature are the gravity analysis and the price-wedge approach. For this study, a simple measure based on an alternate to a tariff equivalence measure was developed, in departure from the studies reviewed (Section 2.3.3).

The measure of intensity of influential factors preventing TRQ fill, developed in this study, was based on the results of the Likert score analysis of the exporter experience survey. The Likert scale analysis complemented the analysis of NTMs in the GTAP model. NTMs were quantified as a part component of the identified influential factors preventing quota fill. The NTMs removal/reduction was implemented in a GTAP CGE model as a counterfactual simulation where the trade cost reducing variable *ams* was shocked by the calculated contribution of NTMs. The calculated contribution of NTMs was based on Equation (4.8) (Section 4.2.2). Further details are presented in the policy case scenarios in Section 4.2.5.

Removing the influential factors preventing quota fill (such as NTMs) can shift export supply to an extent that equals an exporter's ability to comply with a given NTM influential factor. This is the fact considered in this analysis which includes the removal of NTMs in a GTAP CGE model as a direct or indirect shock to the supply curve. NTMs are considered to be barriers to quota fill (Monnich, 2003); hence; all forms of NTMs, except the portion attributed to the SPS measures, were targeted in this analysis. The reasoning behind this is that there is uncertainty surrounding the removal of some SPS measures, as this might have health implications.

Well-known approaches to modelling NTMs in a GTAP model involve introducing an NTM via the power of a tariff based on a calculated tariff equivalent and the iceberg approach[10]. The iceberg approach models the reduction of NTMs through shocking a technology parameter to reduce trade costs in the GTAP model. This study adopted the iceberg approach to modelling and modified/innovated the basis upon which the shock size was calculated. The calculated shock size incorporated the proportion of NTMs measure of influence to fill fruit products TRQs. Furthermore, to enrich the discussion on factors influencing quota fill, the study simulated quota fill of fruit TRQs by introducing a shock via the export demand variable. The shock to the export demand variable was calculated as the proportion that accounts for the unfilled portion of the quota and is required to fill the TRQ. The results were also interpreted in the context of the limitation that not all of the resulting unfilled quota was due to the presence of NTMs, given that there could be capacity constraints arising from time to time.

[10] Iceberg costs are based on the idea of some trade being lost between one country and another, and, where NTMs are envisaged, they are considered as generating the loss in trade since exporters need to comply or deal with NTMs. In that context, the NTMs use the exporter's resources, leading to efficiency losses. Such a loss in trade is likened to an iceberg melting away (Bekkers, Francois and Rojas-Romagosa, 2018). The iceberg approach applied in the GTAP model, therefore, simulates changes in the productivity of products to foreign markets as a way to remove NTMs (Rau and Verma, 2015).

4.2.4 Welfare measured in EV and in-quota rent changes

Welfare impact depends on the extent of influence of the influential market access factors for each TRQ. This manifests from the weighted contribution of each factor preventing quota fill. Two approaches to analyse welfare were employed in this study: the measure of EV and a measure based on calculated quota rents.

4.2.4.1 EV measure of welfare

Welfare change measured in EV is described as the change in money income that would produce the same effect on the country's utility as the policy shock (Plummer *et al.,* 2010; Jensen and Sandrey, 2013). The EV allows for the conducting of welfare analysis of multilateral trade liberalisation. By simulating TRQ liberalisation scenarios, welfare changes measured in EV are observed against the baseline. The EV used in this study measured the difference in income pre and post the scenarios of interest under the TDCA.

Bowen, Hollander and Viaene (2012) explain that welfare change in EV can be determined by finding the difference between the utility level that a country achieves under its current set of trade policy instruments and the utility level under a new set of trade policies. This is represented by the following equation:

$$EV = S(P_d, P_m, P_w, U_1) - S(P_d, P_m, P_w, U_0) \tag{4.13}$$

where:

S = expenditure function

P_d= domestic price of domestic goods

P_m= domestic price of imported goods

P_w= world prices of domestic goods

U_o= country utility level at current trade policies

U_1= country utility level under a new set of trade policies

There is a welfare gain when EV is positive, and when it is negative there is a welfare loss. Bowen *et al.* (2012) explain that CGE models perform this calculation by deriving the associated expenditure function from the assumed form of the utility function in the model. The GEMPACK software used in the GTAP CGE analysis in this study allows for the calculation of the welfare measured in EV. Bowen *et al.* (2012) describe two (2) sources of net change in welfare namely, (1) change in terms of trade (TOT) and (2) price distortion or trade volume effect, which measures the change in tariff revenue or quota rents as the volume of imports change. Welfare impacts would, therefore, factor in quota rent changes under the effect of trade liberalisation. Section 4.2.4.2 explains the framework used in this study to analyse quota rents as a measure of welfare.

4.2.4.2 Framework to calculate welfare based on quota rents

The binding export regime (whether in-quota, at-quota or over-quota) is expected to be different for each fruit/fruit products TRQ. The OECD (2002) notes that when the export regime is at quota, then in-quota rates play the role of allocating rents among exporters and the government. The change in welfare for exporters, measured by the change in quota rents in this study, applies to TRQs exported at quota regime. Elbehri and Pearson (2005) explain that under preferential access, exporters receive higher domestic prices in quota-restricted import markets and are able to capture the quota rent generated by the difference between domestic and world price. Per unit quota rents are represented by the following equation:

$$Quota\ Rent\ (QR) = P_d - R.P_w\left(1 + t^{in}\right) \quad (4.14)$$

where:

P_d = domestic price in import market

P_w = world price

R = exchange rate

t^{in} = in-quota tariff

The analysis of the quota rent supports the analysis of the impact of TRQs on welfare. The administration of TDCA fruit/fruit products TRQs (described in Chapter 3) explains how exporters are in a position to collect quota rents. The TRQ as a policy instrument impacts welfare due to the restrictive nature of the quota component as well as the tariff. Furthermore, a welfare loss arises when exporters fail to take advantage of the available market access through filling of TRQs which results in the loss of potential quota rent. To establish welfare loss due to unfilled quotas, an expansion of TRQ exports was implemented in the model to reach the allowable quota level of the TDCA /SADC-EU-EPA, so as to enable the calculation of quota rents in a quota fill scenario. Data sourced from the European Commission reports on tariff quota imports (Section 4.1.2) was used in the calculations of the level to which the TRQs are not filled. An explanation of the implemented trade policy liberalisation scenarios in this study is presented in Section 4.2.5. A detailed analysis of fill rates has been presented in Chapter 5. The unfilled TRQ rate (*uTRQ*) was calculated as shown in Equation (4.15).

$$uTRQ = \frac{unfilled\ quota\ portion}{notified\ allowable\ quota} \times 100 \qquad (4.15)$$

The percentage calculated in Equation (4.15) is the percentage gap that the actual exports under a TRQ fail to fill a quota in any given annual quota period.

Welfare evaluation (EV) in the GTAP model failed to account for the additional welfare loss (which in this study is defined as a loss in quota rents arising from unfilled quotas). Figure 4.1 presents a framework that assists in analysing the potential quota rent which has not been gained due to unfilled quotas. The case of the frozen orange juice TRQ was selected for application based on the reason that it is the only traded fruit product TRQ of the TDCA covered by one tariff line and, therefore, does not present any TRQ aggregation biases. The frozen strawberries TRQ also represents a tariff line but there have been no exports recorded for that TRQ.

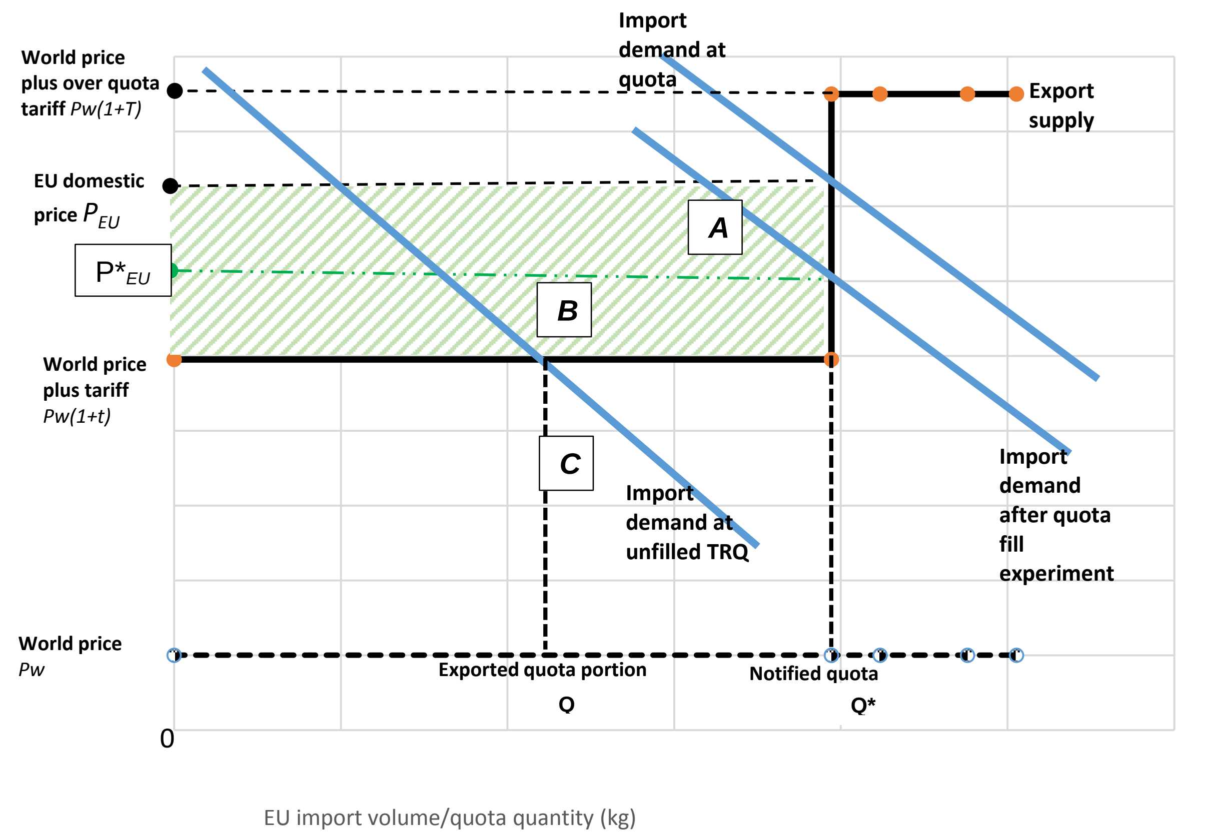


Figure 4.1: Depiction of the TRQ instrument and quota rents derivation
Source: Author's own depiction

The in-quota tariff limits the size of the difference between the world price and the domestic price. With full liberalisation, there is no in-quota tariff; therefore, quota rents accrue to exporters. Quota rent calculations were carried out for scenarios PC3*(a)*, PC4*(b)* and PC4*(c)*, which are defines and elaborated on in Section 4.2.5.

In Figure 4.1, *T* denotes the over-quota tariff and *t* denotes the in-quota tariff. The price paid for the TRQ commodity is the world price plus tariff, $P_w(1+t^{in})$. The difference between $P_w(1+t^{in})$ and the EU domestic price (P_{EU}) for the TRQ commodity multiplied by the quota quantity, forms the shaded rectangle *(A+B)* representing the quota rents that would accrue at quota fill. If South Africa had to supply the TRQ commodity out of quota at *Pw(1+T),* which is the world price plus the over quota tariff, supply would be less than what is gained when the supply is at the in-quota tariff. There are no quota rents when the quota is not binding, as can be seen on Figure 4.1 where import demand of unfilled quota intersects export supply (represented by the 2-step curve). At quota fill, the EU28 domestic price is at P_{EU}; hence, a quota rent of the area *(A+B)* is gained. However, that gain in market access at P_{EU} at filled quota is eroded when the quota is unfilled. The eroded quota rent is interpreted in this study to be a loss in welfare. The eroded quota rent for the frozen orange juice case TRQ was analysed and has been presented in Section 5.3.

The loss in welfare was calculated as the expected change to the quota rent when TRQ liberalisation scenarios PC3*(a)*, PC4*(b)* and PC4*(c)* (Section 4.2.5) were simulated to fill the TRQ. The quota rents would have been gained by the exporting establishments in South Africa. This is because the TRQ is administered by South Africa (the exporter) under the TDCA or SADC-EU-EPA (Chapter 3). In order to demonstrate the potential welfare changes in quota rents in Figure 4.1, the TRQ is extrapolated to fill level at Q^*. The effect of expanding the TRQ from Q to Q^* is shown in Figure 4.1 where the EU price becomes P^*_{EU} in order to clear the market. $\mathrm{P}^*_{\mathrm{EU}}$ is the price arising after the quota expansion has been simulated in the TRQ liberalisation scenarios. When the expanded quota volume together with the relevant in-quota tariff liberalisation leads to a decrease in the EU domestic price, the amount of quota rent arising is represented by the area covered in rectangles *B+C* (Figure 4.1). Analytically, for the quota volume to increase to Q^*, the exporting establishments in South Africa are expected to grow their exports at the level equivalent to the quota volume increase.

This lowers the EU domestic price for the TRQ commodity to P^{*}_{EU} (which was calculated from the model for each of the scenarios PC3*(a)*, PC4*(b)* and PC4*(c)*. The growth in exports is expected to offset the reduction in quota rents that might accrue due to the decreased EU domestic price for the TRQ commodity.

The potential quota rent calculated is treated as a loss in welfare since the quota rent is not accrued due to unfilled TRQs. The extent to which the TRQ is not filled (the gap) will result in the loss of potential quota rents, which can be viewed as a form of welfare loss. Welfare loss is therefore interpreted on the basis of potential quota rents not gained. This approach of calculating welfare based on quota rents is intended to show the effects arising when the TRQ commodity sector exports do not fill the TRQ. The actual unfilled portion of the notified quota is used to calculate welfare loss/change. The unfilled portion of the TRQ (Equation (4.15)) is a market access loss based on the fact that South Africa does not take advantage of the preferential export trade. Implied or potential quota rent is represented as per unit quota rent in Equation (4.14), where the world price (P_{w}) plus in-quota tariff (t^{in}) is subtracted from the domestic price (P_{d}).

Scenario PC3*(a)*, PC4*(b)* and PC4*(c)* were solved for changes in price; the result was used to calculate the welfare in quota rent changes. The market access loss measured in potential quota rents not gained as a result of unfilled quota is assumed as the welfare loss.

4.2.5 Policy scenarios

In this section, a description of the model simulations is given on the basis of base case growth forecasts, tariff rates, NTMs and TRQ expansion policies. Alternative liberalisation approaches for the fruit/fruit product TRQs were implemented based on realistic and expected policy changes and proposed policy changes. The negotiation priority for increasing market access under the TDCA was analysed based on the export regime for each TRQ, namely in-quota, at-quota or over-quota. Hence, the proposed policy scenario for increasing market access. The policy scenarios were also implemented to assess if a removal of the in-quota tariff would improve exports of fruit and fruit products more than the yearly quota expansion of 3% or if the simultaneous liberalisation of the in-quota tariff and quota expansion or NTMs removal performs better. A quota expansion of 3% is a provision of the TDCA; therefore, it is the actual/realistic scenario of the status quo. In addition, the welfare implications of diverting exports between under-quota and at-quota were assessed. The policy scenario analysis also enabled the assessment of whether or not the benefits of quota expansion by 3% also improves overall welfare, in addition to the increased market access emanating from that quota increase. Welfare was also assessed by analysing the change in TRQ rents.

Presenting the case, in 2011, of when the TDCA was the status quo, the following scenarios were simulated to quantify the changes in domestic prices, production/output, consumption and exports as well as welfare. Fruit/fruit product TRQ policy liberalisation was implemented, via shocks, to estimate the GTAP CGE model for the designed fruit TRQ liberalisation scenarios. The scenarios were labelled Policy Case (PC) 1 to 5, and are detailed below. The shocks to the relevant variables for each simulation are presented in Section 4.2.6. The results of the price changes in the scenarios for frozen orange juice in PC3*(a)*, PC4*(b)* and PC4*(c)* were used to calculate welfare measured in quota rents, as explained in Section 4.2.4.2.

PC1: TRQ commodity export expansion – There were two (2) sub-simulations created to evaluate export expansion. The power of the tax (*tms*) and quantity of exports (*qxs*) were shocked in PC1*(a)* and PC1*(b),* respectively. PC1*(a)* represents a realistic scenario in which the TDCA provides for annual expansion of the quota by a growth factor of 3%. PC1*(b)* assumes a scenario of export expansion by the actual rate of exports where exports of fruit products from South Africa to the EU increase/decrease. The two (2) sub-simulations are presented below.

PC1*(a)* – An expansion of the quota by 3% is a realistic scenario of the TDCA. The quota is annually expanded based on the provisions of the TDCA agreement at this rate. The equivalent of the power of the tariff rate (*tms*) that would cause a 3% increase in exports was implemented in the GTAP analysis. The same approach – using the equivalent of the power of the tariff rate to increase exports – is followed in Gilbert, Furusawa and Scollay (2018). The value of the equivalent shock on *tms* to a 3% shock to the exports in the model brings 2011 TRQ export levels to an increase of 3%. This simulation, in the same manner of the TDCA, assumes that South African exporters would have expanded their in-quota exports by the same amount (3%) provided for in the trade agreement, resulting in the 2012 TRQ export levels. The simulated quota expansion in this scenario does not expand exports to the full available quota, because in the database the actual trade flows are not at the full quota level.

PC1*(b)* – Each TRQ is expanded by the rate at which the actual exports within the different TRQs have grown from 2011 to 2012. The shock for this simulation differs from the shock in PC1*(a)* (3% on the notified TRQ quantities of 2011). Whilst the TDCA provision of an annual growth factor increases the potential market access for South

Africa, that increase is not translated into actual exports at the same rate of 3%. This shock to exports enables the comparison of the results of the rate of growth of actual exports to the 3% annual growth factor from 2011 to 2012.

PC2: Free trade condition under TDCA (abolition of in-quota tariff). In-quota tariff removal of 100% – a complete tariff liberalisation in this scenario which is made up of three (3) sub-simulations. One of the key aims in trade negotiations is to remove trade distortions due to trade barriers, such as tariffs. A 100% tariff removal, therefore, means that the in-quota tariff becomes zero percent (0%). This scenario, aiming at full liberalisation, is a reality of one of the outcomes of the SADC-EU-EPA negotiated concessions (realised only in 2016 for some TRQs) The scenario also seeks to compare the impacts of complete tariff liberalisation occurring earlier in 2011 or in 2012. This scenario, therefore, makes the case for free trade conditions, where trade becomes free for the fruit products covered under the TDCA, in the base year (2011) and at the end of 2012. If South Africa in 2011 and 2012 had successfully negotiated for the abolition of in-quota tariffs, this scenario paves the way to simulate the likely welfare impacts when trade liberalisation is timely. The power of the tariff (*tms*) was shocked to bring the target rate to 0%. The analysis in PC2*(b)* and PC2*(c)* focuses on the frozen orange juice tariff line case. The three (3) sub-simulations are presented below.

PC2*(a)* – Pre full implementation of the TDCA in 2011. The year 2011 represents the base case scenario regarding TDCA tariffs being implemented. The simulation experiment involves a 100% tariff liberalisation for all TRQs except frozen strawberries which already have a 0% in-quota tariff. The impacts of the base case scenario liberalisation experiment were examined for selected trade variables. The trade liberalisation policy scenario focused on the liberalisation by the EU on South African exported fruit TRQ products. This represented a realistic scenario in the agreement which, however, was not implemented in 2011. The base case scenario experiment involved the EU28 completely eliminating the tariff on TDCA fruit products for imports from South Africa. Hence, the base case scenario compared the impact of fully implementing tariff liberalisation by 2011 as opposed to implementation in 2012 and 2016.

PC2*(b)* – Full implementation of TDCA in 2012. Full tariff liberalisation on frozen orange juice imports from South Africa by the EU28 in 2012. This policy case scenario used the updated database generated after GDP growth forecasts to 2012 were made. In 2012, at the full implementation of the TDCA, the frozen orange juice TRQ in-quota tariff remained at 7.9% as negotiated. The tariff was not fully liberalised in 2012; hence, this scenario aimed to analyse what would have occurred in terms of welfare impacts with full liberalisation in 2012.

PC2*(c)* – Inception of SADC-EU-EPA in 2016. Full tariff liberalisation on frozen orange juice imports from South Africa by the EU28 in 2016. This policy case scenario used the updated database of 2016 after the growth forecast simulation. The policy shock of a full tariff liberalisation in 2016 coincides with the signing and coming into effect of the SADC-EU-EPA in 2016. Welfare analysis findings, based on this scenario, helped to assesses the likely implications of the delayed conclusion of SADC-EU-EPA negotiations.

PC3: Removal/reduction of influential factors preventing quota fill – this scenario consisted of two (2) sub-simulations: pre TDCA full implementation and excludes the frozen strawberries TRQ in PC3*(a)* for which no trade occurs. The two (2) sub-simulations are presented below.

PC3*(a)* – Quota fill to 100% at 2011 baseline with the 2011 TDCA tariffs. The NTMs and other influential TRQ fill factors are impeding the filling of quotas. The quota fill assumption for all TRQs is that the quotas will be filled to 100%, due to the absence of influential factors preventing TRQ fill (Table 2.1, Section 2.3.1), including NTMs,. There are several enablers (Sections 3.7.1 to 3.7.3) that make this simulation plausible: (1) existence of demand in the EU, (2) already low tariffs and (3) adequate supply capacity by South Africa. The filling of quotas is within the exporter's ability, because South African exporters have adequate capacity in this sector and are equipped with the knowledge that tariffs are already lowered under the TDCA provisions. The variable *qxs* (quantity of exports) was shocked in this scenario. The unfilled component of the quota was exogenous in this analysis. The basis for shocking *qxs* to quota fill level (using the parameter elaborated in Section 4.2.3.6) was that when the impediments influencing the level of exports are removed, the quota fill level is reached.

PC3*(b)* – Partial removal of NTMs. The unrealised export value due to unfilled TRQs is a trade cost. Part of the missing trade is due to NTMs. The resulting trade cost is thus a proxy for the NTMs and other influential factors preventing quota fill that are in place. Beghin and Xiong (2016) propose that trade costs (like NTMs) explain trade flows. This study tested that proposition by shocking the technical change variable *ams* (Equation (4.9)) by 64%, which is the value of the weight of intensity of influence of NTMs on quota fill. The basis of the 64% calculated weight is presented and explained in Table 5.4 (Section 5.1.5).

There are sensitivities in removing some NTMs, so the calculations for the value of the shock took this into consideration. The SPS measures contribution was excluded in the value of the 64% shock value. This is in line with Kierzenkowski *et al.* (2018) who note that trade costs related to NTMs will always be incurred and cannot be completely removed, like tariffs can. This scenario was, therefore, a partial removal of NTMs whilst accounting for other NTMs, like SPS measures, that were necessary and remained in place. The shock to *ams* was intended to improve quota fill by removing the trade costs due to the presence of NTMs.

PC4: Quota fill and 100% tariff removal. Three (3) sub-simulations were used in this scenario. PC2 and PC3(a) were combined in three different periods: pre full implementation of the TDCA in 2011, full implementation of the TDCA in 2012 and SADC-EU-EPA inception in 2016. PC4*(b)* and PC4*(c)* were implemented for the analysis of the frozen orange juice tariff TRQ only. The results were further used for the calculation of welfare measurements in quota rent losses, as explained in Section 4.2.4.2. The three (3) sub-simulations are presented below.

PC4*(a)* – Pre-TDCA quota fill and 100% tariff removal. In this scenario, a combination of PC2*(a)* and PC3*(a)* was simultaneously implemented. After the shock in PC3*(a),* which brings the TRQ to 100% fill, the updated database was employed in the 100% tariff liberalisation scenario. The export demand '*qxs'* was, thus, endogenously determined.

PC4*(b)* – Quota fill at full implementation of TDCA combined with a 100% tariff removal. In this scenario, the unfilled TRQ for frozen orange juice was extrapolated to quota fill level, which entails an expansion of the quota quantity variable by the amount of underfill in 2012. A database with the filled frozen orange juice TRQ was produced after which the 100% tariff liberalisation was implemented.

PC4*(c)* – Quota fill at full SADC-EU-EPA inception, together with a 100% tariff liberalisation, in 2016. The unfilled TRQ for frozen orange juice was extrapolated to quota fill level in 2016 followed by a 100% tariff liberalisation.

PC5: NTM removal coupled with a 100% tariff liberalisation – This scenario was made up of a combination of PC2*(a)* and PC3*(b)*.

4.2.6 Model closures and shocks for selected simulations

The specification of endogenous and exogenous variables, ensuring the closure of the model, was specific to each experiment. This is illustrated in Table 4.7 on the next page.

Table 4.7: Model closures and shocks for selected simulations

Experiment	Endogenous variables and Swaps	Exogenous variables	Shock
GTAP standard closure	Rest Endogenous[11]	pop psaveslack pfactwld profitslack incomeslack endwslack cgdslack tradslack ams atm atf ats atd aosec aoreg avasec avareg afcom afsec afreg afecom afesec afereg aoall afall afeall au dppriv dpgov dpsave to tp tm tms tx txs qo(ENDW_COMM,REG)	pfactwld = uniform 10

Altertax simulation to create 2011 benchmark database with TDCA fruit TRQ in-quota and out-of-quota tariffs	dtbalr("SOUTH_AFRICA")
	dtbalr("EU_28")
	cgdslack("RestofWorld")
	Rest Endogenous
		pop psaveslack pfactwld profitslack incomeslack endwslack tradslack
		ams atm atf ats atd aosec aoreg avasec avareg afcom afsec afreg afecom afesec afereg aoall afall afeall au dppriv dpgov dpsave to tp tm tms tx txs qo(ENDW_COMM,REG)
			tms("FROZJUCE","SOUTH_AFRICA","EU_28") = 1.6369;
			tms("FROZJUCE","RestofWorld","EU_28") = 8.0110;
			tms("PAP","SOUTH_AFRICA","EU_28") = 2.9462;
			tms("PAP","RestofWorld","EU_28") = 10.4487;
			tms("STRAWBRY","SOUTH_AFRICA","EU_28") = -5.8045;
			tms("STRAWBRY","RestofWorld","EU_28") = 7.2610;
			tms("APLEPINE","SOUTH_AFRICA","EU_28") = 3.5962;
			tms("APLEPINE","RestofWorld","EU_28") = 14.6117;
			tms("FRUITMIX","SOUTH_AFRICA","EU_28") = 2.6260;
			tms("FRUITMIX","RestofWorld","EU_28") = 9.8862;

[11] Narayanan *et al.* (2010) indicate the rest of the endogenous variables in the standard GTAP closure as all other variables relating to slack, price changes and quantity changes.

Experiment	Endogenous variables and Swaps	Exogenous variables	Shock
TRQ expansion using the rate of growth of actual export **(PC1(*b*))**	Rest Endogenous swap tms(TRAD_COMM,REG,REG) = qxs(TRAD_COMM,REG,REG);	pop psaveslack pfactwld profitslack incomeslack endwslack cgdslack tradslack ams atm atf ats atd aosec aoreg avasec avareg afcom afsec afreg afecom afesec afereg aoall afall afeall au dppriv dpgov dpsave to tp tm tms tx txs qo(ENDW_COMM,REG)	qxs("FROZJUCE","SOUTH_AFRICA","EU_28") = 60.97; qxs("PAP","SOUTH_AFRICA","EU_28") = -8.53; qxs("STRAWBRY","SOUTH_AFRICA","EU_28") = 0; qxs("APLEPINE","SOUTH_AFRICA","EU_28") = -66.10; qxs("FRUITMIX","SOUTH_AFRICA","EU_28") = -17.56;
100% TRQ fill **(PC3(*a*))**	Rest Endogenous swap tms(TRAD_COMM,REG,REG) = qxs(TRAD_COMM,REG,REG);	pop psaveslack pfactwld profitslack incomeslack endwslack cgdslack tradslack ams atm atf ats atd aosec aoreg avasec avareg afcom afsec afreg afecom afesec afereg aoall afall afeall au dppriv dpgov dpsave to tp tm tms tx txs qo(ENDW_COMM,REG)	qxs("FROZJUCE","SOUTH_AFRICA","EU_28") = 1.82; qxs("PAP","SOUTH_AFRICA","EU_28") = 1.34; qxs("APLEPINE","SOUTH_AFRICA","EU_28") = 2; qxs("FRUITMIX","SOUTH_AFRICA","EU_28") = 4.97;
Reduction of trade costs accounted for by NTMs **(PC3(*b*))**	Rest Endogenous	pop psaveslack pfactwld profitslack incomeslack endwslack cgdslack tradslack ams atm atf ats atd aosec aoreg avasec avareg afcom afsec afreg afecom afesec afereg aoall afall afeall au dppriv dpgov dpsave to tp tm tms tx txs qo(ENDW_COMM,REG)	ams("FROZJUCE","SOUTH_AFRICA","EU_28") = 64; ams("PAP","SOUTH_AFRICA","EU_28") = 64; ams("STRAWBRY","SOUTH_AFRICA","EU_28") = 64; ams("APLEPINE","SOUTH_AFRICA","EU_28") = 64; ams("FRUITMIX","SOUTH_AFRICA","EU_28") = 64;

Experiment	Endogenous variables and Swaps	Exogenous variables	Shock
Quota expansion by 3% through an equivalent shock to the power of the tariff **(PC1(*a*))**	Rest Endogenous	pop psaveslack pfactwld profitslack incomeslack endwslack cgdslack tradslack ams atm atf ats atd aosec aoreg avasec avareg afcom afsec afreg afecom afesec afereg aoall afall afeall au dppriv dpgov dpsave to tp tm tms tx txs qo(ENDW_COMM,REG)	tms("FROZJUCE","SOUTH_AFRICA","EU_28") = -0.75221; tms("PAP","SOUTH_AFRICA","EU_28") = -0.75219; tms("STRAWBRY","SOUTH_AFRICA","EU_28") = -0.752218; tms("APLEPINE","SOUTH_AFRICA","EU_28") = -0.75225; tms("FRUITMIX","SOUTH_AFRICA","EU_28") = -0.75216;

Source: Own compilation based GTAP model

Each model closure ensures that the endogenous variables can be determined given the required number of equations to explain the exogenous variables, as indicated for the GTAP standard closure. Exogenous and endogenous variables are listed, in abbreviated form, in Table 4.7. The abbreviations are presented in full in Appendix 3.

To adjust the GTAP database tariff rates to the TDCA tariff levels, a shock to the variable *tms* (power of tax on imports) was implemented. To implement the shock in GTAP, a modelling convention of 'altertax closure' was used. The altertax simulation preserves the shares in the model to ensure that the trade flows remain balanced after a tax shock. The specific tax rate shock to each TRQ is indicated in Table 4.7. A new equilibrium was established and the new database generated was used to carry out the subsequent liberalisation simulations.

The TRQ expansion and TRQ fill experiments required a swap given that *qxs,* the variable of interest to be shocked, was endogenous in the standard GTAP closure.

To make *qxs* exogenous (in order for it to be shocked), the variable was swapped with *tms*, making *tms* endogenous. The other shocks to the model and the relevant closures adopted for the different experiments are also illustrated in Table 4.7.

4.2.6.1 Model closure in the frozen orange juice policy liberalisation experiments

In Table 4.8, the model closure, which refers to how the model variables are handled in terms of which are exogenous and which are endogenous to the model, is presented. Other relevant model descriptions are also indicated in Table 4.8, including the model innovations that this study has contributed. The additional data that was supplied to the GTAP database is also indicated in the table. The closure for the base case was different to that of the policy case, in which the tariff liberalisation simulation was run. The policy simulation run reverted back to the GTAP standard closure once a new relevant database had been generated in the base case. The closure assumptions in the model for the 100% tariff liberalisation experiment were standard in the GTAP model, as illustrated in Table 4.8.

The model innovations contributed by this study include the isolation/detachment of the frozen orange juice tariff line from the GTAP OFD sector to represent a TRQ sector, baseline data projection to 2012 and 2016, and a coefficient to simulate TRQ fill. Additional data provided consisted of TDCA tariffs relating to the frozen orange juice tariff line and TRQ fill rates used in the calculation of an expansion factor to simulate TRQ fill.

Table 4.8: Model innovation, closure and additional data

	Base Case Scenario PC2*(a)*	**Scenario PC2*(b)***	**Scenario PC2*(c)***	**Scenario PC3*(a)***	**Scenario PC4*(b)***	**Scenario PC4*(c)***
Model innovation	Tariff line sector representing TRQ isolated	Tariff line sector representing TRQ isolated; Baseline projection to 2012	Tariff line sector representing TRQ isolated; Baseline projection to 2016	Tariff line sector representing TRQ isolated; TRQ fill	Tariff line sector representing TRQ isolated; Baseline projection to 2012; TRQ fill	Tariff line sector representing TRQ isolated; Baseline projection to 2016; TRQ fill
Closure in model prior to standard closure for policy experiment	Standard	GDP exogenous for baseline projection to 2012	GDP exogenous for baseline projection to 2016	Export quantity exogenous	Export quantity exogenous	Export quantity exogenous
Additional data from outside GTAP database	TDCA tariffs of 2011	TDCA tariffs of 2011	TDCA tariffs of 2011	TDCA tariffs of 2011; TRQ fill rates to calculate expansion factor to fill TRQ	TDCA tariffs of 2011; TRQ fill rates to calculate expansion factor to fill TRQ	TDCA tariffs of 2011; TRQ fill rates to calculate expansion factor to fill TRQ

Source: Author's own elaboration

4.3 CHAPTER SUMMARY

The data and data analysis methods have been elaborated in this chapter. The data used included both primary and secondary data. The primary data described was specifically collected with the objective of calculating a stringency measure of influential factors to TRQ fill, which served as an input to the GTAP CGE model analysis of the liberalisation of NTMs. The author also discussed the secondary data that was sourced from various databases such as that of IMF, European Commission Statistics, DAFF, TARIC, TASTE, Trade Map and GTAP database version 9, which is the main source of data for this study. A range of data analysis methods that include tariff quota fill analysis, scenario analysis in the GTAP model as well as welfare analysis have been described in this chapter.

CHAPTER FIVE

5. RESULTS AND DISCUSSION

Parts of this chapter have been published in an Agrekon special issue and parts accepted for publication in The International Trade Journal.

Muchopa, C.L., Bahta, Y.T. and Ogundeji, A. A. (2019). TRQ impacts on export market access of South African fruit products into the EU market. Agrekon (on-press) https://doi.org/10.1080/03031853.2019.1593865.

Muchopa, C.L., Bahta, Y.T. and Ogundeji, A. A. (2019). Trade and welfare impacts of frozen orange juice tariff rate quota of South Africa. The International Trade Journal (accepted for publication).

In this chapter, the tariff quota fill rates are analysed to distinguish the TRQ export regimes under which South African exporting establishments access the EU fruit products TRQ market. In addition to this, factors influencing fruit products TRQ fill are also analysed. Distinguishing the TRQ regime in force is important to establish the TRQ regime in the reference year (2011) in the GTAP CGE model. An analytical presentation of the quota rents captured is given based on the TRQ export regime in place for the frozen orange juice case. When the TRQ regimes were being studied, an analytical presentation of the frozen orange juice TRQ case was selected on the basis that only that specific TRQ had been filled and that it could be used to illustrate welfare based on quota rents changes. The frozen orange juice TRQ also comprised one tariff line; thus, removing any potential biases that could arise in the aggregation of several tariff lines to make up a TRQ.

Likert scores observed in the survey on influential factors preventing quota fill were transformed into a weighted measure of the intensity of influence of each factor preventing quota fill and thus served as an input in the GTAP model analysis of the impacts of TRQs. To answer the third and fourth study objectives, the findings of the GTAP model are presented. The findings are organised into sub-sections, starting with the linking of the results on the influential factors preventing quota fill to the analysis in the GTAP model. A presentation and discussion of the results on policy scenarios implemented for all fruit products (to establish the impacts of the TRQ liberalisation scenarios on production, consumptions exports and welfare measured in EV) is given. In the frozen orange juice case, in addition to welfare analysis measured in EV, the analysis of welfare ascertained from the forgone quota rents is presented.

This study, through the analysis of Likert Scale responses on influential factors preventing quota fill, determined the weight of influence of each factor. The current knowledge in the field of market access under TRQs provides information on TRQ administration methods as well as on the performance of TRQs in improving market access when in-quota tariffs are altered. This study adds to the approaches of market access analysis taken by other studies. It further increases knowledge on the subject by analysing TRQ market access from the perspective of influential factors preventing tariff quota fill, as reported by fruit products exporters and other industry stakeholders. The construction of the weighted measure of the intensity of each factor's influence offers additional understanding of the influential factors' strength.

The responses and expert opinions of fruit sector participants are key to the index construction. This approach makes the analysis of TRQ market access influential factors under the TDCA/SADC-EU-EPA unique. Currently, there is no known study of the TDCA (regarding the analysis of factors influencing tariff quota fill) specifically aimed at designing a weighted measure of intensity of factor influence. Studies on the analysis of the TDCA, as reviewed in Chapter 2, demonstrate that none of the studies took this approach.

5.1 INFLUENTIAL FACTORS PREVENTING QUOTA FILL: THE CASE OF SOUTH AFRICAN FRUIT/FRUIT PRODUCTS EXPORTS TO THE EU MARKET

5.1.1 Analysis of quota fill rates to distinguish TRQ export regimes

Figure 5.1 shows the six (6) TRQs studied. A comparison is provided of the total exported quantities of fruit products, TRQ exports to the EU market by South Africa as well as the notified quota quantity conceded by the EU to South Africa under the agreement. The comparison is for the years 2012 to 2015 for each of the fruit TRQs of focus. The total exported quantity is a sum of the fruit products exports by South Africa to the EU market. Within that total, the TRQ component of the exports is also included. All the comparisons in Figure 5.1 are made at the 8-digit CN level. Figures 5.1(b), (c) and (d) each represent a TRQ comprising a combination of tariff lines defined at the 8-digit level to make up that single TRQ.

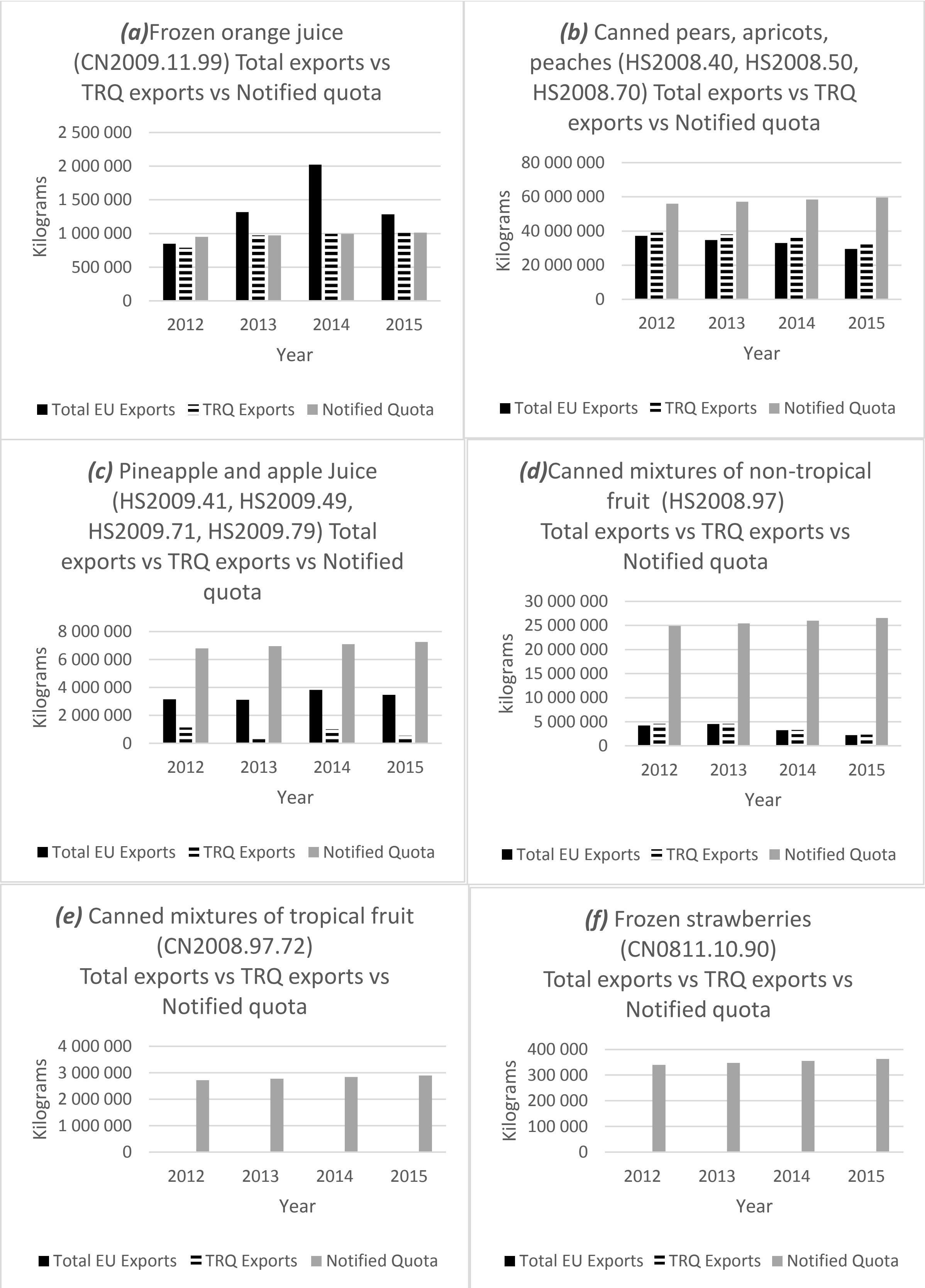


Figure 5.1: South African fruit TRQ Notified quota and exports (2012-2015)

Source: Author's own design based on TARIC and European Commission Statistics (TARIC, 2016; European Commission Statistics, 2016).

Figure 5.1(a), (e) and (f) are TRQs that are composed of only one specific tariff line. The canned pears, apricots and peaches TRQ (Figure 5.1(b)) comprises 17 tariff lines for pears, apricots and peaches each defined at the 8-digit CN level. The pineapple and apple juice TRQ (Figure 5.1(c)) comprises nine (9) tariff lines, whilst the canned non-tropical fruit mixtures TRQ (Figure 5.1(d)) comprises four (4) tariff lines, all defined at the 8-digit CN level.

The frozen orange juice (CN2009.11.99) TRQ is the only one that achieved exports above the notified quota, after the quota had been filled (Figure 5.1(a)). An enormous spike in total EU exports is noted for frozen orange juice in 2014. This is expected, especially when it is analysed with statistics on fruit purchased for processing (Figure 3.5, Section 3.7.2) that show an increase from 2013 to 2015. This particular finding confirms that the quota restriction limits the level of exports that access the EU market at the preferential tariff rate. The finding is supported in the literature (Campo, 2003; United States International Trade Commission, 2011) that note that TRQs are quantitatively restrictive. The policy implication that arises from this finding informs the position in the trade negotiations specifically targeting the requests or concessions for improved quota volumes. The frozen orange juice TRQ must be factored in the negotiations for greater market access beyond the 3% agreed annual quota expansion. The TRQs, frozen strawberries (Figure 5.1(f)) and canned mixtures of tropical fruit (Figure 5.1(e)) show the lowest use of the conceded quota. The canned mixtures of tropical fruit TRQ recorded a negligible amount of exports to the EU market in 2012. For the rest of the years assessed in Figure 5.1(e) and (f), both TRQs recorded zero exports. An analysis of TRQs in Figure 5.1(b), (c) and (d) show an identical configuration in that neither of the total exports nor the TRQ exports reached the notified quota level. The pineapple and apple juice TRQ is an exception because total exports to the EU market exceeded the level of TRQ exports, but those total exports did not reach the notified quota level. This means that whilst the quota was not filled, parallel out-of-quota exports occurred. The reasons for this phenomenon, in which fruit products are exported out of quota even when the quota is underfilled, could be associated with the presence of transaction costs in accessing the market under TRQ.

Findings from interviews held with industry representatives and government officials reveal these underused (Figure 5.1(b), (c), (d)) or unused (Figure 5.1(e), (f)) TRQs cover tariff lines for which South Africa may have had no adequate export capacity in the conceded tariff lines. The implication of this finding is that greater or improved market access will not be achieved, because annual quota expansion provisions do not necessarily address trade flows. In the interviews conducted, the lack of TRQ use has been mainly attributed to the legacy of the TDCA, especially for the tropical fruit (CN2008.97.72) TRQ. Explanations advanced in the interviews point to the fact that during initial trade negotiations for the TDCA trade chapter, the trade statistics available as a reference point were only what the EU had collected on the import side, as South Africa had just gained independence and did not have trade statistics to rely on during negotiations at that time. This situation is purported to have given the EU negotiators an upper hand regarding negotiated quantities, and South Africa ended up with concessions from the EU on TRQs that South Africa had no meaningful export capacity. This finding has trade policy implications where this knowledge can serve as a measure for trade policy negotiators to designate tariff lines with trade potential. This indicates the need for reliable and adequate trade statistics to direct trade policy negotiations at the tariff line. This finding also attests to the phenomenon that the playing field concerning trade is not level, as the developed nation counterparts seem to have greater powers of negotiation, either in bilateral or multilateral trade negotiations. In this respect, Francois *et al.* (2005) has long identified this asymmetric nature of trade agreements. The phenomenon is also supported in Pal (2008), who notes that regional trade agreements do not always lead to increased market access in a developed country.

The canned pears, apricots and peaches (Figure 5.1(b)) as well as the canned mixtures of non-tropical fruit (Figure 5.1(d)) TRQs showed total exports to the EU market roughly equalled TRQ exports, which means that South Africa’s exports for these TRQs were all being made within the specified quota. Mixtures of non-tropical fruit TRQ (Figure 5.1(d)) exports were far below the notified quota for all the years indicated. Further analysis of the canned pears, apricots and peaches TRQ, revealing each of the 17 tariff lines that make up the TRQ, is given in Figure 5.2. It is worth noting that the dominant tariff line, in terms of total exports to the EU market, for the canned pears, apricots and peaches TRQ (Figure 5.2) was CN2008.50.61 (apricots) for all the years (2012 to 2015) followed by CN2008.70.71 (peaches) and CN2008.40.79 (pears), respectively. The tariff line CN2008.50.61 (apricots), therefore, made a greater contribution towards the filling of this particular TRQ – except in 2013 when CN2008.70.71 (peaches) contributed more.

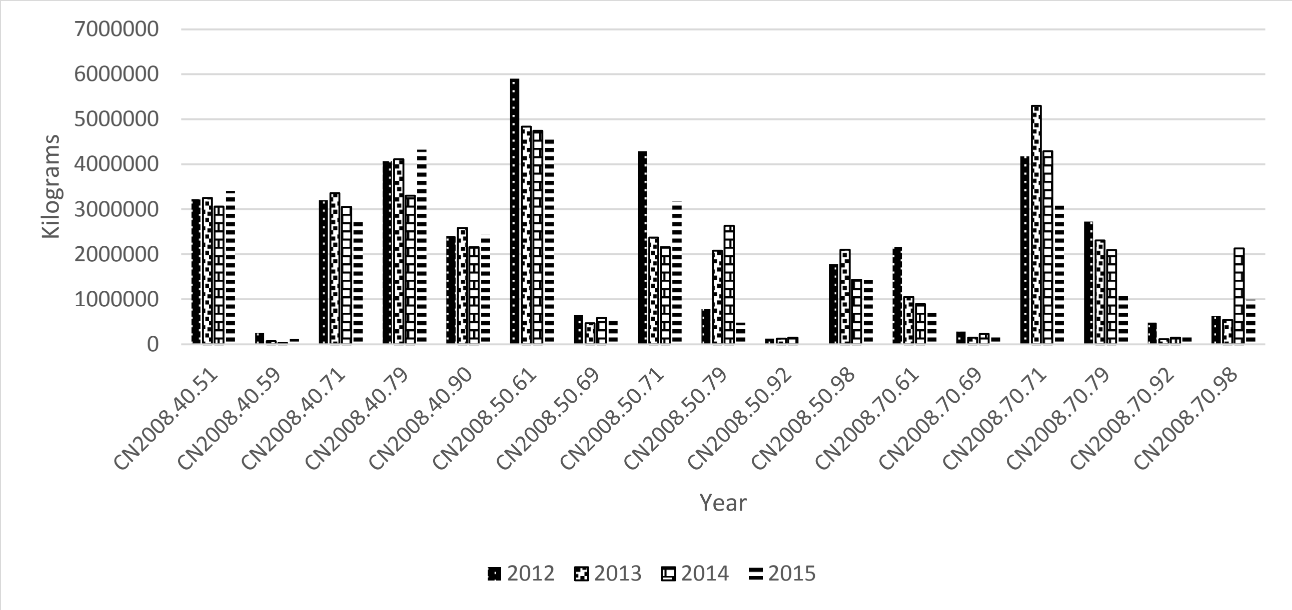


Figure 5.2: South African canned pears, apricots and peaches tariff line total exports to the EU market (2012-2015)

Source: Author's own design based on TARIC and European Commission Statistics (TARIC, 2016; European Commission Statistics, 2016).

This is also consistent with an increase in the volume of fruit purchased for processing in 2013. Figure 3.5 (Section 3.7.2) shows the upward trend for peaches during the 2012/13 to 2013/14 season and the slight decline for apricots for the same season. Unpacking the contributions of the tariff lines at the HS 8-digit level code enables the identification of performing and non-performing tariff lines within a particular TRQ. This finding empowers South African trade policy negotiators to form an informed policy. The implication of the finding is that annual quota expansion provisions of the TDCA do not necessarily address the trade flows per specific tariff line and suggest inefficiencies with the blanket 3% quota expansion provision.

The administration of the TRQ at the disaggregated HS 8-digit level means that there can be many exporters contributing various forms of products that make up a TRQ. Yet, at the same time, the narrow HS 8-digit product definition limits the products qualifying for preferences under the TRQ for canned pears, apricots and peaches. Figure 5.2 demonstrates that a few of the tariff lines included in the TRQ were redundant in contributing to the level of exports towards filling the TRQ; thus, concurring with the finding of Monnich (2003). The policy implication is that if the TRQ was defined at the broad HS 4- or HS 6-digit level, the possibility of filled quotas might have been plausible, as more forms of products making up a TRQ could be accommodated and, thus, could benefit from the market access preferences.

The lowest levels of exports were recorded for the pears (CN2008.40.59) and apricots (CN2008.50.92) tariff lines. It is worth noting that whilst apricots (CN2008.50) had the greatest contribution to filling the TRQ, at the 8-digit CN level, the contributory apricots tariff line CN2008.50.92 recorded the least exports. This result is potentially important for TRQ administration policies or methods, specifically regarding the level of definition of tariff lines that contribute to a TRQ. The implication is that, at a narrow product definition (8-digit), there is less scope to fill the TRQ given the restriction imposed that only certain specified tariff lines can contribute towards the TRQ. The alternative is to allow tariff lines to contribute to a TRQ defined at a broader HS 6-digit or HS 4-digit. This will allow tariff lines excluded from the negotiated agreement to be included. Although the EU's TRQs concession creates predictable preferential market access into the EU market for South African fruit products exporters, the observation is that quotas have generally not been filled. The definition of TRQs at a HS 8-digit level (which is a narrow product level) as a way to administer TRQs has implications on quota fill, in this case contributing to underfill. Brink (2014) supports the argument that the methods used in the administration of TRQs lead to underfill.

Table 5.1 highlights fill rates calculated for each TRQ for 2012 and 2015 and indicates the TRQ export regime applied. The 2012 and 2015 TRQ application periods refer to the full implementation of the TDCA in 2012, and the year (2015) in which the TDCA was fully implemented (prior to the TRQs being implemented under the SADC-EU-EPA in late 2016).

Table 5.1: South African TRQ exports to EU28 and TRQ fill rates (2012 and 2015)

TDCA fruit TRQ	2012		2015	
	Fill rate %	***TRQ export regime***	***Fill rate %***	***TRQ export regime***
Frozen strawberries *frozen strawberries:* CN 0811.10.90	0	In-quota tariff	0	In-quota tariff
Pears, apricots and peaches *canned pears:* CN 2008.40.51 ; 2008.40.59; 2008.40.71; 2008.40.79; 2008.40.90 *canned apricots* CN 2008.50.61; 2008.50.69; 2008.50.71; 2008.50.79; 2008.50.92; 2008.50.98 *canned peaches:* CN 2008.70.61; 2008.70.69; 2008.70.71; 2008.70.79; 2008.70.92; 2008.70.98	69.8	In-quota tariff	55.7	In-quota tariff
Mixtures of non-tropical fruit *canned non-tropical fruit mixture:* CN 2008.97.59; 2008.97.74; 2008.97.78; 2008.97.98	18.4	In-quota tariff	8.8	In-quota tariff
Mixtures of tropical fruit *canned tropical fruit mixture*: CN 2008.97.72	0.1	In-quota tariff	0.0	In-quota tariff
Frozen orange juice *frozen orange juice:* CN 2009.11.99	82.8	In-quota tariff	100*	Quota
Pineapple juice, apple juice *pineapple juice:* CN 2009.41.92; 2009.49.30 *apple juice:* CN 2009.71.20; 2009.71.99; 2009.79.11; 2009.79.19; 2009.79.30 2009.79.91; 2009.79.98	16.6	In-quota tariff	7.5	In-quota tariff

Source: Author's calculations based on European Commission Statistics (European Commission Statistics, 2016).

**There is an overfill of this TRQ if the total of frozen orange juice exports in and out of quota is taken into consideration*

The fill rates generally deteriorated for the 2015 TRQ application period, in comparison to the 2012 period, possibly due to exporters exploring other export markets because of the uncertain period of finalisation of the SADC-EU-EPA negotiations. None the fruit products exports to the EU market reached their quota limit, except for frozen orange juice which filled the TRQ in the 2015 application period. The TRQs are further discussed in Sections 5.1.1.1 to 5.1.1.4. The export regimes illustrated in Table 5.1 are discussed in Section 5.1.2.

5.1.1.1 Fill rates and associated tariff reductions

Except for the frozen strawberries that faced a 100% reduction in tariff, all other TRQs faced a 50% reduction (Table 3.6, Section 3.6) in the tariffs for the years in which the TDCA was implemented. The difference in fill rates for these TRQs cannot necessarily be attributed to the extent of duty reduction, given that the reduction in tariff rates was the same for all the TRQs. With the exception of the frozen orange juice TRQ (which had high fill rates at the 50% reduction of tariff rates), the results of market access for the other TRQs may show that a reduction of the in-quota tariff (to 50% of the MFN tariff) cannot promote market access across the board. The findings suggest that policy emphasis should be redirected and that the policy should take into consideration that other TRQs might require greater tariff concessions to enable improved market access. Li and Carter (2009) state that the reduction of in-quota tariffs significantly improves market access, whilst Lim and Blandford (2009) indicate that full tariff removal is preferable to small tariff reductions. Simulations to determine the level of in-quota tariff that would promote greater market access (measured in higher fill rates) are discussed in Section 5.2.

The level of tariff reductions, therefore, do not have an obvious distinguishing feature that explains the level of TRQ fill rates observed in Table 5.1. The full use of TRQs also depends on market signals. Regarding quotas that are not filled, the question asked is whether underfill occurs due to a lack of domestic demand from the

EU market (under the prevailing market conditions) or whether other factors played a role. The discussion of supply and demand of fruit products (Section 3.7.3) indicates that there is enough potential demand in the EU and that South Africa has some capacity to increase exports to the EU (with the exception of the frozen strawberries). The CBI (2009), Kwasowski (2009), European Commission (2011), TradeMap (2016) and CBI (2018) support this finding. In contrast to this, Kareem (2011) concludes that inadequate capacity explains the inability of many African countries to take advantage of the market access provided by the EU. The findings related to the frozen strawberries TRQ could be an example of what Kareem (2011) advances. As an example, an increase in the domestic supply in the EU market could be expected to affect TRQ imports in the EU market. Contrary to this, if the domestic price in the EU continues to be greater than the world price inclusive of the relevant tariff, then it is expected that there should be demand by the EU market. However, if the TRQ is still underfilled, then other factors influencing quota fill may be why the quota remains underfilled. The factors influencing quota fill are deemed a trade cost which is, therefore, an addition to the in-quota tariff. To address unfilled quotas, a policy focused on strategies to increase fruit products exports from South Africa to EU is required. The DAFF Directorates of International Trade and Marketing need to embark on an awareness program to promote and increase the participation of non-historical and other disadvantaged exporting establishments and to encourage them to take advantage of market access preferences now afforded by the EU under the SADC-EU-EPA. This proposition falls in line with the initiative outlined in the trade permit system of DAFF, which encourages BBBEE participation.

TRQs expansion (in which the quota is increased) is intended to increase market access to the EU as per the TDCA TRQ liberalisation provisions. During the 2012 to 2015 period, the expansion of TRQs was clearly not matched with an expanded quota fill rate for all the TRQs (except for frozen orange juice, which had a 100% fill rate in 2015). The changes in fill rates for the two application periods differ, with the data showing a decline in fill rates for all TRQs; again, with the exception of frozen orange juice. The three canned fruit TRQs were not filled in either 2012 or 2015. The policy implication is that the EU TRQ expansion of 3% as an annual provision is not matched by TRQ fill. There is, clearly, a mismatch between the negotiated provision of a quota expansion and the actual trade data. It is vital that negotiated positions for trade provisions should have a basis in well researched trade statistics. There is no consensus among studies, such as Van der Mensbrugghe *et al.* (2003), Decreux and Ramos (2007) and Meade *et al.* (2010), regarding TRQ expansion impacts on trade flows. This study's findings on unfilled TRQs, which suggest more positive trade gains from tariff reduction rather than quota expansion, is also portrayed similarly in Meade *et al.* (2010).

5.1.1.2 Pears, apricots and peaches (HS2008.40/.50/.70), and non-tropical (HS2008.97) TRQs

Though the canned pears, apricots and peaches TRQ contains several tariff lines, the determined TRQ export regime is not for each specific tariff line in this TRQ but for the TRQ as a whole. The annual exported quantities in this TRQ did not exceed the annual notified quota quantities available. The pears, apricots and peaches TRQ recorded more than 50% fill rate, but the fill rate actually declined from 69,8% in 2012 to 55,7% in 2015. The canned non-tropical fruit mixture TRQ performed dismally in terms of fill rates. It barely reached 20% in 2012 and dropped below a 10% fill rate in 2015. This is a clear indication that no significant advantage, offered by the market access preference granted under the TDCA, for these two TRQs was taken. Several reasons can be advanced for this, namely, low levels of export product, unfavourable tariff rates, problematic quota administration methods and inadequate demand in the EU market. The implication for policy is, therefore, that the TRQ and the associated annual quota expansion concessions do not automatically lead to increased market access in terms of improved levels of exports. Ingco and Winters (2008) support this study's findings on unfilled TRQs by noting that, on a global scale, the majority of TRQs are not being filled. Monnich (2003), regarding the fill rates of TRQs, notes that quota size is a determinant of fill rates. Support policies and strategies matter, and, thus, government support initiatives to boost output in the fruit products sector could address the gap in filling quotas.

Interviews with government officials (in DAFF and DTI) involved with the fruit sector (Section 4.1.4.1) reveal that the negotiations of the TDCA were a challenge in terms of the TRQs that the EU would finally concede on, under the SADC-EU-EPA. Some of the challenges arising during the negotiations were alluded to having a basis in the dismal performance that had been recorded for these two TRQs (under the TDCA). Eventually, as part of the negotiations, the pears, apricots and peaches TRQ and the non-tropical fruit mixture TRQ were combined into one TRQ and capped to a certain quantity (under the SADC-EU-EPA). This could be viewed as a loss of market access. This could also potentially be a substantial loss if, in the future, South Africa improves the export capacity for these combined TRQs and is faced with having to export to the EU market at out-of-quota tariff rates. However, under the SADC-EU-

EPA, the combined TRQ will have a 100% tariff liberalisation (Table 3.6, Section 3.6) effective at full implementation in 2026. This duty-free access might eventually offset any potential welfare loss that might arise due to the loss in market access. The findings highlight the policy implication that revised trade provisions should, ideally, not create market access losses and that tariff liberalisation alone is not a panacea to quota use. Whilst trade partners expect gains from trade agreements, the lack of filled quotas indicate some inherent influential factors. The liberalisation scenarios of the TRQs are analysed in Section 5.2.

5.1.1.3 Canned mixture of tropical fruit (HS2008.97.72) TRQ

The canned mixtures of tropical fruit had a 0% fill rate in 2015. This TRQ's performance has been attributed to the lack of adequate product supply, and South Africa, therefore, was not be able to benefit from the preference. The reasons provided in the interviews with government officials in DAFF, engaged in trade negotiations, point to the fact that this TRQ was never going to be of advantage to South Africa. They also highlight the fact that the TRQ arose due to lack of available data at the beginning of TDCA negotiations, when the only trade statistics available were the EU imports statistics. Naturally, the EU negotiators had the upper hand as they were able to concede this TRQ (which would count towards the total number of TRQs conceded) even, if in South Africa's point of view, the exporters could not obtain a market access advantage on a product that has no supply. Whilst the situation of the records of trade statistics has improved over the years, the process of the TDCA negotiations have been complex. To change concessions is not an easy task; thus, this TRQ (though clearly not based on South Africa's strongest fruit product export potential), has remained a concession by the EU under the SADC-EU-EPA. The presence of unfilled quotas has consequences on the trade policy negotiating position of South African trade negotiators who seek a revision of the trade agreement provisions – because unfilled quotas dictate the concessions ultimately granted.

5.1.1.4 Pineapple (HS2009.41/49), apple (HS2009.71/79) juice TRQ

An assessment of the pineapple and apple juice TRQ (which has an in-quota tariff as export regime), if analysed together with Figure 5.1(c), reveals a peculiar situation: a substantial number of exports outside the in-quota tariff occurred in parallel to the in-quota exports. A deliberate choice was made to export at the out-of-quota tariff even when the conceded quota has not been filled. Such a situation can be explained by the existence of other preferential arrangements that may be available for exporting pineapple and apple juice, other than at the out-of-quota MFN tariff rate. This is a phenomenon that other studies, like Monnich (2003), have termed ‘parallel imports’. The exported quantities occurring outside the in-quota tariff are not out-of-quota exports that would necessarily face the MFN tariff. Therefore, in the assessment, it becomes irrelevant whether the quota was filled or not. The exports were not outside the quota because the quota was filled; they were out of quota because that is the choice that was made. Thus, the analysis of whether a quota was filled or not might be irrelevant for this TRQ. However, the inability to fill quotas will have negative implications for exporter welfare, in response to the trade liberalisation policies of the TDCA.

5.1.2 TRQ export regimes and quota rents

The TRQ export regimes are presented in Table 5.1 (Section 5.1). Quota TRQ regimes (described in this study as the situation in which the quota level is the policy instrument limiting exports) generate rent, whilst in-quota TRQ regimes do not generate rent.

When the quota is not filled, there is no quota rent that is generated. The frozen orange juice TRQ ranked high in TRQ market access, as measured by quota fill rates, and was able to generate quota rents when the quota was filled. In terms of TRQ market access, the canned pears, apricots and peaches TRQ occupied the second position followed by canned mixtures of non-tropical fruit TRQ, pineapple and apple juice TRQ and canned tropical fruit TRQ. These four (4) TRQs did not generate quota rents. As expected, the frozen strawberries TRQ ranked last in terms of market access. An assessment of the quota fill rates clearly indicates that for all the TRQs, except the TRQ for frozen orange juice, the in-quota tariff was the TRQ regime which limited exports. So, for the underfilled quotas, both the quota level and the MFN (out-of-quota) tariff were not the policy instruments influencing the equilibrium market conditions. The in-quota tariff rate was, therefore, the instrument restricting exports for all the TRQs that were not filled. Research, by scholars (Barichello, 2000; Pouliot and Larue, 2012) contributing to the export market access debate, has highlighted the challenge of the ineffectiveness of TRQs as instruments of trade liberalisation. The implication for policy is that despite the fact that TRQs should ensure market access, the exporters, due to unfilled TRQs, ultimately fail to gain quota rents potentially availed by the trade agreement. The effectiveness of the TRQ policy instrument will seen in exporting establishments boosting their output with the aim to serve the EU market through full TRQ use. Hence, government should formulate support policies that promote innovations that break down the supply barriers.

Under the TDCA, the provisions were such that all TRQ quantities were annually increased by 3%. The EU offer (accepted by South Africa) of increasing the quotas annually by a growth factor of 3% was somewhat ineffective in increasing market access, given that the unfilled TRQs were limited by the in-quota tariff and not the quota level. It stands to reason that a policy instrument of quota expansion, in the context of TRQs, brings gains when imports match the quota and not when the quota is underfilled. The decreasing fill rates of the application period 2012 to 2015 may be a good indicator that market access did not increase as quotas were expanded annually. The annual growth factor is, therefore, most likely only beneficial to the frozen orange juice TRQ that fills the quota. Expanding the frozen orange juice quota would, therefore, encourage greater market access, especially given that over the years the TRQ has also had an out-of-quota export component. With an increased quota level, the out-of-quota exports would now be absorbed in the quota. The implication for the trade policy is that the negotiated outcomes, which are not based on the actual trade flows, do not necessarily avail the gains in preferential market access, largely due to a mismatch of the policy and the problem being addressed. However, there is no need to refrain from the TRQ expansion policy. The TRQ expansion policies need to be refocused to be product specific and, at the same time, to harmonise the negotiated provisions with the TRQ regime.

For the in-quota tariff regime, indicated for all TRQs except frozen orange juice, the intervention that would likely improve market access is the reduction of the in-quota tariff (this is explored in the scenario analysis in Section 5.3). In the analysis of the in-quota tariff regime (which was the restriction on market access), the annual growth factor of 3% granted under the TDCA (which worked to increase the quota level) showed that the increment did not contribute to more market access, as it did not assist in improving fill rates and, consequently, did not assist in increasing exports to the EU market. Grant *et al.* (2009), Tsigas and Mora (2009), Meade *et al.* (2010)

and Arita *et al.* (2017) all contribute different findings regarding the impacts of TRQ trade liberalisation policies on market access, because each result obtained is dependent on the commodity and the limiting TRQ trade factor. To, therefore, assess whether the negotiations leading from the TDCA to the SADC-EU-EPA succeeded in achieving improved market access, the simulations (Section 5.3) were run to determine if a reduced in-quota tariff would better improve market access, when compared to an expanded quota.

5.1.3 Percentage shortfalls in filling of TRQs

As indicated, the fruit TRQs have generally not been filled by South African exporters under the TDCA. The fill rate of the fruit TRQs could be an indicator of the extent to which certain influential factors (discussed in Section 5.1.5) reduce the given market access. In Table 5.2, fill rates (proportions) of the notified quota are indicated for 2011 (the year before full implementation of the TDCA), 2012 (full implementation of the TDCA) and 2016 (inception of the SADC-EU-EPA).

Table 5.2: Notified TRQ and fill proportion of the TRQ (2011, 2012 and 2016)

Fruit TRQ	2011		2012		2016	
	Notified TRQ level (kg)	Fill proportion (%)	Notified TRQ level (kg)	Fill proportion (%)	Notified TRQ level (kg)	Fill proportion (%)
Frozen orange juice	931 000	55	952 000	86	1 036 000	99
Canned pears, apricots and peaches	54 682 250	74	55 919 000	67	60 866 000	49
Frozen strawberry	332 500	0	340 000	0	37 0000	0
Apple and pineapple juice	6 65 0000	50	6 800 000	17	7 400 000	6
Canned fruit mixtures	27 011 400	20	27 621 600	16	30 062 400	7

Source: TARIC database (TARIC, 2016) and author calculations

The apple and pineapple juice sector, which was the most protected sector, showed the greatest decline in the fill rates: from a fill proportion of 50% in 2011 down to below 10% in 2016. The notified TRQ levels, therefore, are not an immediate limiting factor of the level of market access seeing as, regarding quota levels, the exporters were not exporting at maximum allowable quotas. If other influences on quota fill are removed, as demonstrated in Section 5.2, the quota levels might ultimately become limiting factors when overfill occurs. The unfilled quota percentages (Table 5.3), which represent the shortfalls in filling a TRQ, indicate the extent of the effect of factors influencing quota fill. Given that some TRQs were not filled under the TDCA, market access had not been to the level stipulated and envisioned with the notified TRQ quantities. Regarding market access, this points to the policy implication that TRQs with relatively higher in-quota tariff rates, which were thus more protected, experienced the lowest fill rates. Beckman and Arita (2016) support the finding that TRQs with higher in-quota tariff rates have low TRQ use/fill rates.

The discussion on the supply and demand factors (section 3.7.3) has shown that for selected fruit products, South Africa has the capacity to fill EU TRQs given the larger volume of total exports elsewhere to the world. Could the unfilled quota percentage therefore, relate to the level of intensity of influential factors preventing quota fill? The percentage shortfalls in filling a TRQ for the years 2010 to 2016 are illustrated in Table 5.3.

Table 5.3: Unfilled TRQ exports versus total notified TRQ by EU28 (2010 to 2016)

TRQ as defined per EU order number	Quantity by which the quota was not filled (kg) *(Unfilled quota as percentage of notified TRQ)*							
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Average unfilled quota (%)**
Frozen strawberries	325000 *(100)*	332500 *(100)*	340000 *(100)*	347500 *(100)*	355000 *(100)*	362500 *(100)*	370000 *(100)*	*100*
Pears, apricots and peaches	5852450 *(11)*	13748715 *(25.1)*	18478409 *(33.0)*	19156851 *(33.5)*	22398395 *(38.4)*	26437321 *(44.3)*	31305929 *(51.4)*	*33.8*
Mixtures of non-tropical fruit	15247255 *(64.1)*	18912613 *(77.7)*	20417860 *(82.0)*	20871740 *(82.0)*	22710328 *(87.3)*	24218228 *(91.2)*	25053349 *(92.4)*	*82.4*
Mixtures of tropical fruit	2600000 *(100)*	2660000 *(100)*	2716601 *(99.9)*	2780000 *(100)*	2840000 *(100)*	2900000 *(100)*	2960000 *(100)*	*100*
Frozen orange juice	441232 *(48.5)*	420049 *(45.1)*	129541 *(13.6)*	0 *(0.0)*	0 *(0.0)*	0 *(0.0)*	3602 *(0.3)*	*15.4*
Pineapple and apple juice	3962992 *(61.0)*	3319358 *(49.9)*	5671055 *(83.4)*	6436239 *(92.6)*	6081274 *(85.7)*	6703494 *(92.5)*	6974380 *(94.2)*	*79.9*

Source: Author's calculations based on European Commission Statistics (European Commission Statistics, 2016).

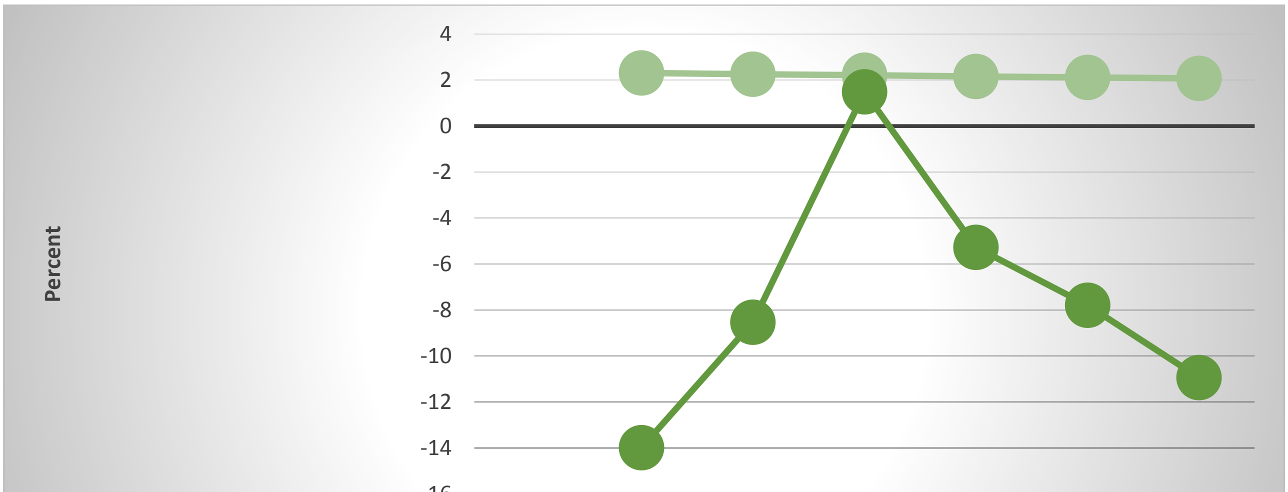
The unfilled quota percentage in Table 5.3 shows the forgone preferential trade for the years 2010 to 2016. A comparison of the unfilled quotas shows that the frozen strawberries TRQ had the largest forgone trade of 100%. This is expected, given that no trade occurred under this TRQ for the marketing years 2010 to 2016. The minimum access commitment granted by the EU for frozen strawberries is all forgone. The implication is that the TDCA negotiations had either not been informed by research or that the influential factors inhibiting quota fill are so great that they prohibit exports. From a policy point of view, the inability to fill TRQs signals a loss in trade under guaranteed market access preferences for South Africa, as a result of a TRQ concession not reflecting the trade shares. It is clear that more research is needed in the lead up to negotiations, so that meaningful concessions for tariff lines can be garnered in order to give South Africa a comparative advantage. The finding (concerning the frozen strawberries tariff line) that the allocation of TRQs should reflect trade shares is supported by the research of Péréz-Lopez and Alvarez (2005).

During period 2010 to 2016, there was a general increase in the forgone preferential trade, with most of the TRQs recording higher percentages of unfilled quotas as the years progressed. The frozen orange juice TRQ is the exception, as it showed a decline in unfilled quotas from 48.5% in 2010 to 0% in 2013 to 2015. The missing trade, or forgone trade, was somewhat consistent for each of the TRQs during the assessed period. From 2010 to 2016, the average unfilled percentage for the pears, apricots and peaches TRQ was 34%, and for the frozen orange juice TRQ it was 15%. These are the two TRQs that performed better in terms of quota exports among all the TRQs considered. The implication of the finding of unfilled quotas regards the need for policies to strengthen strategies in order to improve trade in underused TRQs. In addition, the trade-negotiated concessions should reflect the export level of the tariff line exported by South Africa to the EU.

Factors influencing market access for South African fruit products in the EU markets are assessed in Section 5.1.5 and give insight into explanations regarding the missing preferential trade. Given that a number of TRQs remained unfilled throughout the years, it is not clear whether the in-quota tariff rates were low enough to promote quota fill. In-quota tariffs are further analysed in GTAP CGE model scenarios, developed in Section 5.2.

5.1.4 Annual growth factor comparison of exported and notified quota

The lack of performance in TRQ trade is further illustrated in Figure 5.3, which shows the example of the pears, apricots and peaches TRQ which, in turn, shows that the notified quota increased by an average of 2% annual growth factor. The growth factor for the notified quota was compared to the percentage by which the filled quota grew during the same period, year-on-year.



	2011	2012	2013	2014	2015	2016
Notified quota annual growth factor	2.31	2.26	2.21	2.16	2.11	2.07
Filled quota annual growth factor	-13.99	-8.53	1.49	-5.28	-7.79	-10.94

Figure 5.3: Comparison of the annual growth factor of notified quota and the exported quota (Pears, apricots and peaches TRQ) (2011 to 2016)

Source: Author's own calculations based on TARIC, European Commission Statistics (TARIC, 2016; European Commission Statistics, 2016).

Figure 5.3 clearly shows that the percentage annual growth factor is not the same for the notified quota and the exported quota. If South African exports had been taking full benefit of the market access preference granted by the EU, then the annual growth factor for the notified and exported quota would be on par. The implication of this finding is that the TDCA provision of a 3% annual quota expansion is heavily dependent on the assumption South Africa would have a growth of 3% in the fruit products TRQs of the TDCA. Trade policy negotiators need to ensure the negotiating position for quota expansion is aligned with the actual export growth.

Moving from 2012 (full implementation of the TDCA) to 2013, the growth factor of the exported quota improved tremendously but then declined thereafter. The annual growth factor of exported quota was on the decline from 2013 to 2016. The reason that can be advanced for the widening gap between the notified TRQ annual growth factor and the exported quota annual growth factor is that the annual growth factor of the notified TRQ was beyond the available supply of processed fruit products that South Africa could export to the EU. At the same time, even if production could have been increased, the South African exporters may have destined their produce for other markets outside of the EU. Production could also have been low in South Africa for those processed commodities. Therefore, the annual growth factor of exported quota could not catch up to the annual growth factor of the notified quota. An emerging reality under the TDCA is that most of the EU fruit products TRQs extended to South Africa were not filled. Various reasons can be advanced for the underfilled quotas, which are supported in studies such as Monnich (2003) and Beckman and Arita (2016). Some underlying factors, including the TRQ administration frameworks, actual quota quantities, in-quota tariff levels and other associated NTMs, are seen as contributors to quota underfill. The implication for the TRQ policy instrument is that even though TRQs are aimed at providing preferential market access, due to various reasons the TRQs do not always result in market access in terms of quota fill. The plausibility of these reasons is assessed in the analysis of exporter experiences of the influential factors, as presented in Section 5.1.5 below.

5.1.5 Results and discussion of exporter experiences with TRQ fill factors

Where a quota is not filled, the assumption advanced by this study is that the unfilled component of the quota is due to factors influencing TRQ fill. These influential factors are elaborated in terms of the weighted intensity of influence of each factor preventing quota fill. Thus, an indicator/index of TRQ fill has been constructed in this section. The survey respondents (sixteen (16) of the twenty-three (23) sampled representatives of exporting establishments elaborated in Section 4.1.) were asked to relate their experiences regarding the strengths of identified aspects in respective categories of influential factors preventing quota fill or export market access. Respondents indicated the scale to which they considered a particular aspect to have an effect on preventing quota fill or export market access. The responses were coded as follows: 1 = not at all; 2 = not very much; 3 = moderately; 4 = quite a bit; 5 = very much. The aspects of quota fill influential factors were drawn from various studies (Chapter 2) emphasising aspects that have an influence on the level of exports directed at filling quotas. Table 5.4 captures the survey responses on the investigated aspects.

Column 2 of Table 5.4 summarises the aspects influencing TRQ fill as an average of the responses given. The results presented in Column 2 treat each of the aspects as an average of the individually assessed influences experienced by each respondent. Further analysis on the influential aspects was conducted, based on Equation (4.7), to arrive at an indicator score, presented in Column 3 as a weighted factor showing the relative contributions of the influential aspects preventing quota fill. Column 4 (influential factor % in category) shows the factor weights within the predetermined categories.

Table 5.4: Observed influential factors and intensity scores affecting TRQ fill

NTM types, tariff factors and other aspects influencing TRQ fill assessed for this study	*Average Likert Score Value*[a]	Influential factor weight (%)		Influential factor weight (%) in category	
		NTM	*Other*	*NTM*	*Other*
A. The following TRQ administration aspects influence the level of exports towards filling of fruit/fruit products quotas					
1. *Implementation mechanisms not guaranteeing quota access*	4	5.27		2.76	
2. Export license allocation procedures for TRQs	2	2.49		1.30	
3. Costly and cumbersome administration procedures requiring documentation	3	4.42		2.31	
4. Associated transaction costs, such as permit fees	3	4.21		2.20	
B. The following aspects of TRQ definition and use conditions influence the level of exports towards filling of fruit/fruit products quotas					
5. Size of notified TRQ	3	4.63		2.42	
6. Time validity of allocated quota	2	3.56		1.86	
7. Stringent safety standards and SPS measures	4	5.15		2.69	
8. Packaging and labelling requirements	3	4.42		2.31	
9. Definition of TRQ at broad HS level	1	2.10		1.10	
10. Narrow product definition	2	2.73		1.43	
11. Amount of quota applied for by all applicants, which imposes smaller individual allocations	5	7.11		3.72	
12. *Condition of total number of applicants for quota, which poses competition*	5	6.62		3.46	
C. The following TRQ supply and demand aspects influence the level of exports towards filling of fruit/fruit products quotas					
13. Inadequate supply	3		4.64		2.43
14. Low demand for imports	3		3.88		2.03
15. Unattractive market conditions in export markets	3		3.92		2.05
16. High freight charges	3	4.68		2.45	
17. High communication costs	2	2.65		1.38	
18. High transport costs	3	4.15		2.17	
19. Requirements on how products should be processed	3	4.42		2.31	
20. Discrimination of exporters by importers	2		3.39		1.77
21. Indirect trade from developing countries through the EU	2		3.43		1.79
22. Distance between South Africa and EU market	3		4.29		2.24
23. Rules of origin	3	4.78		2.50	

NTM types, tariff factors and other aspects influencing TRQ fill assessed for this study	***Average Likert Score Value***[a]	**Influential factor weight (%)**		**Influential factor weight (%) in category**	
		NTM	*Other*	*NTM*	*Other*
D. The following aspect of TRQ associated with tariff level conditions influence the level of exports towards filling of fruit/fruit products quotas					
24. *Binding in-quota tariffs*	2		3.06		1.60
25. Other trade arrangements offering better tariffs than TDCA in-quota tariffs	2		2.82		1.47
26. TRQs competing with TDCA	3		3.92		2.05
TOTAL	**73**	**68.75**[b]	**31.25**		

Source: Author's own investigations.

[a] 1 = not at all; 2 = not very much; 3 = moderate; 4 = quite a bit; 5 = very much.

[b] the value is 63.92 when the SPS score is excluded

Two (2) aspects (indicated in Table 5.4) as reported by the participants, can be singled out as exhibiting the greatest intensity in preventing quota fill. They are the amount of quota applied for by all applicants, which imposes smaller individual allocations; and the condition of the total number of applicants for the quota, which poses competition. When taken together, the identified aspects (in the categories of influential factors) have policy implications as trade costs that influence market access or TRQ fill. These results and other influential aspects' results are discussed in detail in Sections 5.1.5.1 to 5.1.5.5.

5.1.5.1 TRQ administration aspects

The TRQ implementation mechanisms were reported by interviewees to have 'very much' influence in preventing quota fill, as the mechanisms did not guarantee quota access. Export license allocation procedures for TRQs were indicated (by interviewees) as not having much influence on quota filling, whilst associated transaction costs and costly and cumbersome administration procedures were considered to have a moderate influence. Among the TRQ implementation aspects and export license procedures considered are

- the opinions regarding DAFF as the institution mandated with quota administration,
- the twelve (12) months validity of export permits,
- the BBBEE criteria and compliance requirements,
- classification of enterprises,
- historical export data,
- the first-come, first-served TRQ administration method, and
- the permit allocation system that forms the basis for the provisional allocation of quotas and market shares,
- The associated transaction costs related to obtaining a EUR1 movement certificate, exporter registration requirements with DTI and SARS, obtaining of the export clearance certificate as well as the payment for the export permit fee.

The export license procedures for the TRQs were generally deemed not to be costly given that the application fee for permits ranged between R435 in 2010 to R820 in 2016. The administration procedures were deemed as moderately cumbersome, given that the exporting establishments internalised the requirements of the TRQ administration processes. Barichello (2000) views the requirement to apply for a permit as an administrative constraint that works to reduce market access. The results (indicating ‘not very much’ to ‘moderate’ influence of TRQ administration aspects on TRQ fill) illustrate that the exporting establishments had adapted to the aspects they deemed a part of their day-to-day business. TRQ administration aspects are, therefore, inherent aspects of TRQ fill.

5.1.5.2 TRQ definition and use conditions

In the category of TRQ definition and conditions, the survey results indicate the following aspects were considered to have ‘not very much’ influence on quota fill: time validity of allocated quota, and definition of TRQ at either the broad or the narrow level. Stringent safety standards and SPS measures, packaging and labelling requirements as well as the size of the conceded TRQ had ‘moderate’ to ‘quite a bit’ of influence in preventing quota fill. These findings show that the aspects influencing TRQ fill indicate the presence of significant barriers impacting exporting establishments’ decisions to export to the EU market. Within the same context, importer requirements need to be addressed to lessen export impediments. These factors presenting ‘moderate’ to ‘quite a bit' of influence in preventing quota fill are classified among NTMs, which Nimenya *et al.* (2012) describe as all government-imposed international trade restricting measures other than tariffs or customs taxes. NTMs, as defined in Beghin and Xiong (2016), cover the expansive sets of policy instruments issuing from border control measures, marketing requirements and product standards.

The EU sets some SPS and TBT measures that occasionally present barriers to accessing the EU market, therefore this result of NTMs presenting barriers would be expected. The Citrus Growers Association of Southern Africa (2011) notes that, for example, CBS measures imposed by the EU are unnecessarily harsh. The amount of quota applied for by all applicants and the total number of applicants competing for the quota were considered to have ‘very much’ influence in preventing the filling of TRQs. The quota component of the TRQ itself is an NTM, which under the TDCA is employed as a trade policy tool.

5.1.5.3 TRQ supply and demand aspects

The survey results indicate the following aspects of TRQ supply and demand deemed to ‘moderately’ prevent the filling of quotas:

- low demand of imports,
- transport costs,
- requirements of how products should be processed,
- rules of origin,
- unattractive conditions experienced in export markets,
- inadequate supply,
- high freight charges, and
- the distance between the EU market and South Africa.

The findings imply that preferential market access provisions in a trade agreement do not necessarily address the prevalence of NTMs. The full use of TRQs also depends on market signals. These findings agree with those of Monnich (2003). Monnich notes demand as a probable cause for quota underfill and identifies that low demand can result temporarily but consistently links to a situation that can result from the TRQ product definition being too narrow. The findings of the ‘moderate’ influence of demand and supply conditions is plausible, since inadequate demand from the EU market is ruled out, as the level of demand and supply of fruit/fruit products between South Africa and the EU (Section 3.7.3) shows that demand exists in the EU. Only communication costs, discrimination of exporters by importers and indirect trade from developing countries through the EU were considered to have ‘not very much’ effect on the prevention of quota filling.

5.1.5.4 TRQ associated tariff level aspects

The survey results of in-quota tariffs and other trade arrangements offering better tariffs indicate that these aspects have 'not very much' influence on quota fill. Competing TRQs with the TDCA/SADC-EU-EPA was considered as having a 'moderate' effect on quota fill. An important policy implication of the finding is that improved market access in the EU can be gained, given that the TDCA preferences are competitive with preferences offered elsewhere by the EU. Beckman and Arita (2016) discuss the concept of free trade agreements between the EU and other countries where the EU makes concessions through increasing or introducing TRQs as opposed to complete tariff elimination. The survey finding on in-quota tariffs having 'not much' influence on TRQ fill indicates that the TRQ expansion provision in the TDCA may be the right one.

5.1.5.5 NTMs intensity of influence on quota fill

The survey study results of underfill (Tables 5.1 to 5.3 in Section 5.1.1) contextualises the presence of NTMs and other influential factors. Respondents acknowledged the presence of NTMs, among other factors influencing quota fill. The factors' intensity in influencing quota fill were analysed from the perspective and experience of the interviewed participants, and is presented in Columns 3 and 4 of Table 5.4. Discussions with survey participants revealed that market access that had been granted was not used fully and that this was not because of high tariffs. The tariff rates were viewed as low enough when compared to those of other export destinations. The tariff related influences (Category D of influential factors in Table 5.4), contributed a total 9.8% of the influences preventing quota fill. This finding implies that tariff influence on quota fill presents minimal barriers; hence, trade policy negotiations should equally focus on the liberalisation of non-tariff influences. Arita *et al.* (2017) indicate that in many of the agricultural sectors, tariff removal leads to gains which depend on the size of the tariffs. This supports the findings of this study in which survey participants deemed the tariffs as low enough and not greatly impacting market access.

The respondents reported that most of the NTMs, as identified in this study, were present. They also reported that, depending on their nature, the NTMs, had 'not very much' influence or had, occasionally, 'moderate' influence on the prevention of quota filling. The Likert score weighted measure of intensity for each influential aspect indicates that NTMs, excluding the SPS measures, accounted for 63.9% of the influences preventing quota fill. The remaining 36.1% is accounted for by other influential factors, such as supply and demand and SPS measures. The results point to issues of compliance, such as the cost of compliance likely increasing trade costs and potentially reducing market access. Non-compliance would further reduce market access; hence, the findings imply that NTMs have to be addressed, and, in addition, mechanisms must be put in place to detect whether the NTMs are not being used by importers as barriers to market access. Where fruit products exporting establishments invested in standards compliance in the past, the design of future provisions in the trade agreement should build systems to fund and increase the capacity of monitoring systems for EU standards. The trade cost reduction of 63.9% was simulated to reduce NTMs via the trade cost reducing variable *ams* in the GTAP model (Section 4.2.5). The results thereof are reported in Section 5.2.

This observation of NTMs as a barrier to export level has also been documented in Gebrehiwet *et al.* (2007), Koch and Peter (2007), Kareem (2011), Nimenya *et al.* (2012), Dal Bianco *et al.* (2015) and Disdier *et al.* (2015). In the survey findings of this study, none of the identified NTM types' influence on quota filling was reported at either extreme, except the aspect relating to the definition of TRQs at the broad HS classification level, which was reported as having no influence at all. This result is expected seeing that any of the HS 8-digit level tariff lines covered by a TDCA fruit TRQs can be exported in any combination in order to fill the quota. In addition, the fruit sector exporting establishments adapted in order to comply; thus, limiting the negative impacts of NTMs. Given the presence of NTMs, such as packaging and labelling requirements, the exporters devised systems to cope. The exporters' capacity to comply is, thus, inherent to their export business.

The NTMs experienced by the exporters as having a 'moderate' intensity score in preventing quota fill were found in the category of TRQ administration methods and the TRQ definition and use conditions categories. Amongst these fall stringent safety standards, SPS measures, packaging and labelling requirements, and rules of origin. The policy implication of these findings is that more effort must be directed towards the facilitation of compliance regarding SPS measures and packaging requirements, whilst, at the same time, trade policy negotiators must push for the harmonisation of safety standards and rules of origin. Research-based policy formulation becomes imperative to ensure that safety standards are not implemented as a protection barrier rather than as a safeguard to consumer health. These findings are supported in the studies of Gebrehiwet *et al.* (2007), Lim and Blandford (2009) and in Kareem *et al.* (2018). The authors found that quota administration methods impact fill rates, SPS measures limit trade and some standards in the EU are protectionist.

The rules of origin, which in Khorana (2008) and Kareem (2011) are reported to be a common influence, are reported in this study as only occasionally impacting the quota filling. Such is a consequence of the bilateral arrangement that the rules of origin are an important determinant of whether or not an exporter qualifies for preferential treatment. The fruit production sector in South Africa is, however, adequately resourced and does not rely on imported inputs to the fruit sector for the rules of origin to be of much concern. However, the implication for a policy based on this finding is that the rules of origin (used as a policy instrument of the TDCA) are not a major barrier to trade in the context of the TDCA fruit products. This means that there are no major concerns regarding whether any specific tariff line may not qualify towards contributing to quota fill. The trade facilitation measures regarding the certification of the rules of origin must, however, constantly be refined in favour of TRQ fruit products, because the associated burdensome documentation requirements may compromise the filling of quotas. It is also important for government departments, upon which exporting establishments rely, to provide adequate information on completing the documents and complying to the requirements of the EUR1 movement certificate (Section 3.3.2).

NTMs imposed through implementation mechanisms in the TRQ administration methods category are, on average, reported as having some effect. NTMs manifesting through TRQ supply and demand influences, such as the requirements on how products are processed, 'moderately' influence quota fill. The findings imply that the presence of NTMs cannot be ruled out as factors affecting the filling of TRQs. The identification of the category from within which NTMs have a greater influence enables the planning of targeted support strategies geared towards promoting greater compliance in processing requirements as well as other export standards. The TRQ administration methods are more within the grasp of the exporting nation that administer the TRQs. Therefore, immediate efforts can be focused on such NTMs by closely linking the TRQ implementation with measures that boost the fruit products supply chain functioning. Some studies (Lim and Blandford, 2009; Cadot and Gourdon, 2016) also observe that TRQs, as well as NTMs, by their nature restrict trade. This study differs from the study of Khorana (2008) which focuses on the analysis of TRQ administration methods from the importer's perspective. This study conducts the analysis of TRQ administration and allocation methods, as well as other TRQ impediments, from the viewpoint of the exporter. The Khorana (2008) study focuses on the meat sector; however, those results do converge with this study's results, from both the importer and exporter perspectives.

5.2 GTAP MODEL ANALYSIS OF TRQ IMPACTS ON EXPORT MARKET ACCESS OF SOUTH AFRICAN FRUIT PRODUCTS TO THE EU MARKET

This section begins with a presentation of the impacts of fruit products TRQ liberalisation scenarios on production, consumption, exports and prices. The TRQ liberalisation scenarios involve

- quota expansion of 3% for each TRQ (PC1*(a)*),
- quota expansion by the actual rate of growth of exports for each TRQ (PC1*(b)*),
- abolition of in-quota tariff pre-TDCA implementation in 2011 (PC2*(a)*),
- quota fill to 100% in 2011 baseline with TDCA tariffs (PC3*(a)*),
- partial removal of NTMs influencing quota fill (PC3*(b)*),
- abolition of in-quota tariffs combined with quota fill to 100% in 2011 (PC4*(a)*), and
- removal of NTMs coupled with the abolition of the in-quota tariffs (PC5).

Thereafter, the welfare impacts under the different TRQ liberalisation scenarios are compared.

5.2.1 Changes in production, consumption, exports and prices

The changes discussed here pertain to the policy case scenario experiments, PC1*(a)* and *(b)*; PC2*(a)*; PC3*(a)* and *(b)*; PC4*(a)* and PC5 (Section 4.2.5). The results of the changes due to these experiments are illustrated in Figures 5.4 to 5.6 and explained via mechanisms described in Equations (4.9) to (4.11).

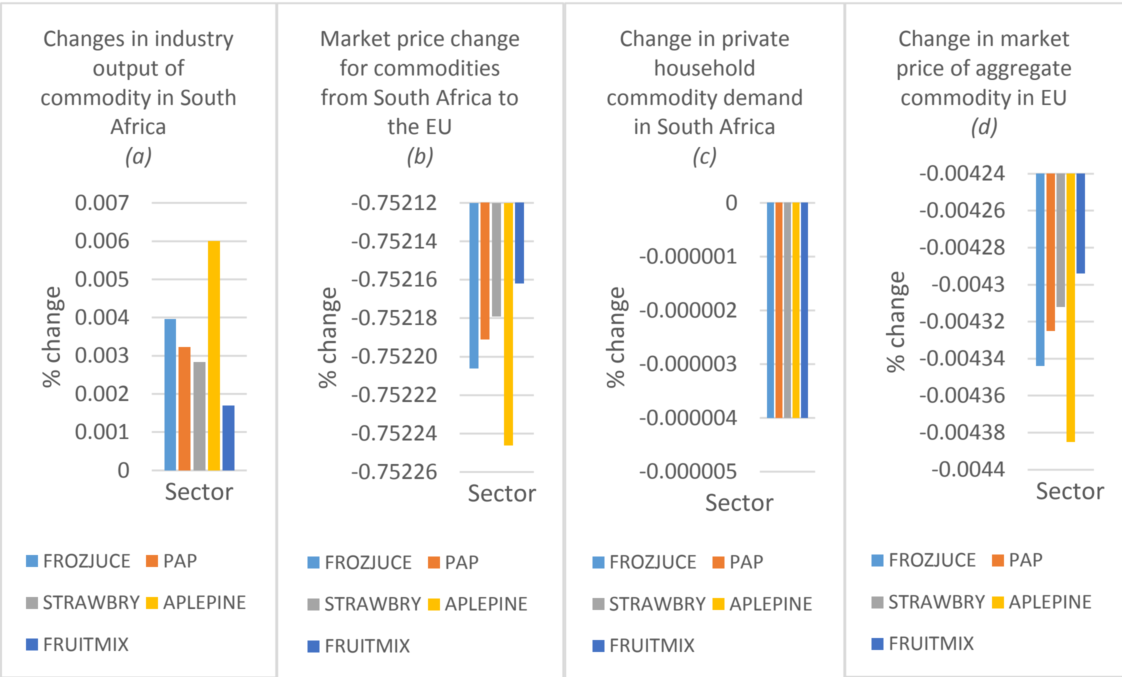


Figure 5.4: Percentage changes in industry output, market prices and consumption due to a 3% quota level expansion (PC1*(a)*)

Source: Author's computation based on GTAP simulations

A 3% export expansion (variable *qxs* in Equation (4.9)) leads to a negligible but positive change in industry output in South Africa (Figure 5.4a). The 3% export expansion simulated through the shock to *qxs* enables the simulation of an export expansion whose basis is upon the 3% annual quota expansion granted in the agreement. If the exporters use the full 3% of the annual quota expansion of the TDCA, then the expectation is that the actual exports would increase by 3%, as the simulation implies. The simulation, as expected, results in a decrease in the market price of the aggregate TRQ product in the EU (Figure 5.4d) and results in a decrease in the market price for the South African fruit products in the EU (Figure 5.4b). The market price decrease for TRQ commodities from South Africa to the EU (*pms*) is greater than the price decrease exhibited in the market price decrease of the aggregate TRQ commodity in the EU (*pim*). The implication is that the South African fruit products will be more competitive in the EU market as they are the cheaper imports into the EU. The change in household demand for all TRQ products in South Africa is relatively unaffected (Figure 5.4c), as the results show a very negligible change in the negative direction. Figure 5.4a illustrates that the greatest response in increased industry output is in the apple and pineapple TRQ. The policy implication of these results is that a quota expansion provision of the TDCA does not automatically translate to massive increases in output, so without sustained industrial output even for the apple and pineapple TRQ, underfill will continue. Van der Mensbrugghe *et al.* (2003) and Decreux and Ramos (2007) support the findings of TRQ expansion being beneficial. Hence, policymakers and trade negotiators need to factor in decisions that promote sustained exports, while at the same time strategising to promote industrial output capacity for the unresponsive TRQs.

The positive response in industry output supports the notion that the 3% annual TDCA provision to increase the quota acts as a stimulus for the exporter to increase output. The results confirm that a simulated export expansion, expected with the quota expansion provision, induced increased output in South Africa even when the quota is underfilled. The explanation behind TRQ underfill does not suggest capacity constraints given the result of potential to increase output in South Africa. Other influential factors, such as the TRQ administration mechanisms that affect a guaranteed quota access, stringent SPS measures and safety standards, are plausible to explain underfill. The results of the survey, discussed in Section 5.1.5, show that supply and demand aspects, such as the inadequacy of supply, have been reported to only ‘moderately’ prevent quota fill. The TRQ administration aspects, such as the implementation mechanisms that fail to guarantee quota access, have shown that in the exporters’ reported experience, the aspects have ‘quite a bit’ of influence in preventing quota fill.

Quota expansion was modelled as export expansion of the same magnitude as the 3% TDCA annual quota expansion. In taking this approach, the improved market access closes the gap as producers take deliberate action to increase their output (destined for exports) by the 3%, given the certainty provided by the guaranteed annual quota increase that is expected. South Africa, therefore, annually increases its output based on the TDCA provided annual growth factor of 3% quota, which signals an increase in EU import demand. The 3% annual growth factor signals demand by the EU, showing that the EU commits to increase imports of the TRQ fruit products by 3%. A shock on exports of 3% assumes South Africa expands exports by that 3%, which shows improved market access. The EU, based on the TDCA provisions, assumes that the state of restriction to market access is the quota level before the 3% expansion and, by availing a 3% expansion annually, the EU relaxes the restriction year after year. Van der Mensbrugghe *et al.* (2003), Decreux and Ramos (2007) and Meade *et al.* (2010) have also shown that quota expansion is a common provision in trade agreements intended to improve market access but all differ in the level of the quota expansion provision.

In the context of TDCA fruit products exports, the annual growth factor of 3% of the TRQ quantity in PC1*(a)* does not move at the same rate as the actual exports modelled in PC1*(b)*. Figure 5.5 indicates the results of policy case scenario PC1*(b),* in which the expansion of quota exports is based on an expansion percentage determined from a change in the actual recorded exports for each TRQ. The actual exports of fruit products from South Africa to the EU do not expand at the given rate of 3%. This has been illustrated and discussed in Section 5.1.4 for the pears, apricots and peaches TRQ. The policy implication is that there is a missed market access opportunity, due to exports being expanded by the predetermined TDCA 3% annual growth factor. Trade liberalisation scenario PC1*(b)* shows the results of the impacts based on shocking exports in the model with the actual rate at which the exports have expanded for each individual TRQ. The prices for output (not shown in the figure) in South Africa are unchanged. Given that there has been no output price changes, the policy implication is that the TRQ expansion policy informed by the actual growth rate of exports would not induce large changes in output and household demand for fruit TRQ products.

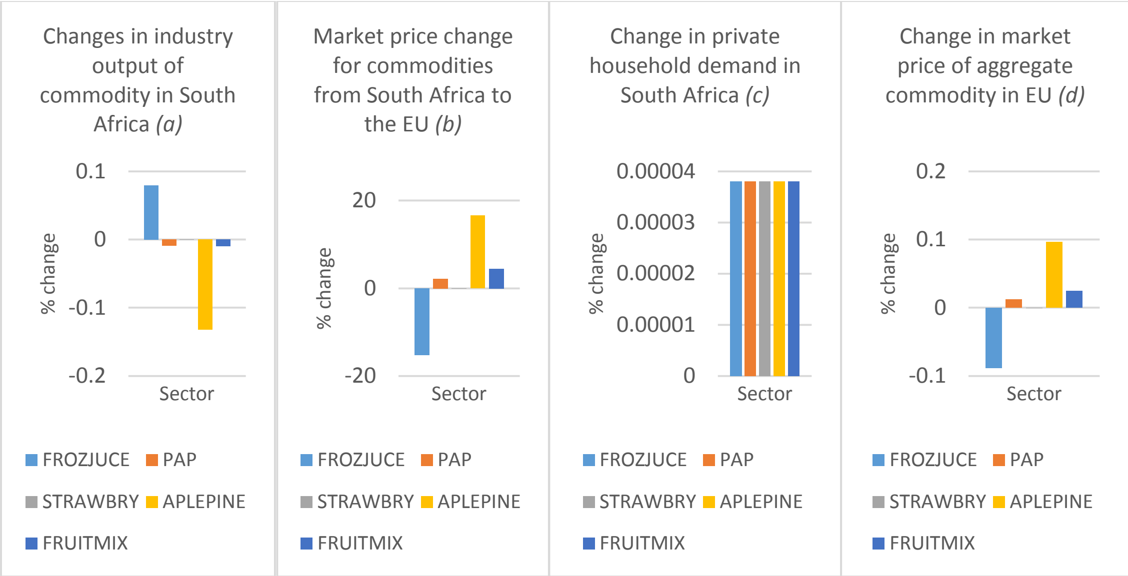


Figure 5.5: Percentage changes in industry output, market prices and consumption due to expansion by the actual recorded rate of increase in exports (PC1*(b)*)

Source: Author's computation based on GTAP simulations

The results for PC1*(b)* show that increased industry output (Figure 5.5a) is only in the frozen orange juice sector whilst other sectors record a decrease. This result is expected given that the frozen orange juice sector is the only sector in which the actual exports have increased, as indicated by the size of the model shock presented in Table 4.7 (Section 4.2.6). The explanation behind the decrease in output in the pears, apricots and peaches (PAP), apple and pineapple (APLEPINE) and fruit mixtures (FRUITMIX) sectors points to the possibility of a shift to the more productive sector of frozen orange juice. In relative terms, the demand for labour and capital increases more in the frozen orange juice sector (0.04%) than in other sectors. The frozen orange juice sector, however, receives a very small quota in tonnage under the TDCA. There is a unique situation in the 2011/12 quota period, given that the frozen orange juice sector had not been filled in 2010/11. Observations, however, indicate that in subsequent quota periods, the frozen TRQ has absorbed the improved market access opened up annually by the provision of a 3% expansion of the quota. The implication for policy is that the response in market access is greater for a TRQ that has a small quota in comparison to its output and export potential for the concerned tariff lines. The negotiated provisions for quota expansion should indeed target more market access for the frozen orange juice sector, which shows good prospects in the EU export market but is limited by the small available quota. Labour and capital demand shifts to relatively more productive sectors perpetuating the lack of increased output in the less productive sectors; hence, deliberate investment efforts should be targeted to boost the less productive sectors. The results exhibited in the frozen orange TRQ are supported by Decreux and Ramos (2007). They explained that the impact of quota expansion depends on the TRQ regime.

Scenario PC1*(b),* thus, compares results of the situation regarding the inability to fill quotas, because if quotas are fully used, the expectation is that the exports will also increase by 3%. The policy implication is that market access provision of a 3% quota expansion does not respond to the actual situation in South Africa concerning the TRQ products, given that the quotas are largely not filled, and, thus, a different and more beneficial liberalisation policy is needed. The TDCA provision of annually increasing quotas where the quotas are not fully used is counterproductive. The finding that quota expansion is counterproductive differs from findings in Van der Mensbrugghe *et al.* (2003), showing that quota expansion as a TRQ liberalisation policy impacts trade flows more positively when compared to other liberalisation options, such as tariff reduction. However, the previous studies have dealt with the expansion of filled quotas, as opposed to the unfilled TDCA fruit products TRQs of this study.

As may be expected, due to a 100% tariff removal, the market prices of the exported South African commodities decrease for the EU consumers (Figure 5.6c). Consumption is unchanged in South Africa for all the TRQs with very close to zero percentages changes (Figure 5.6d).

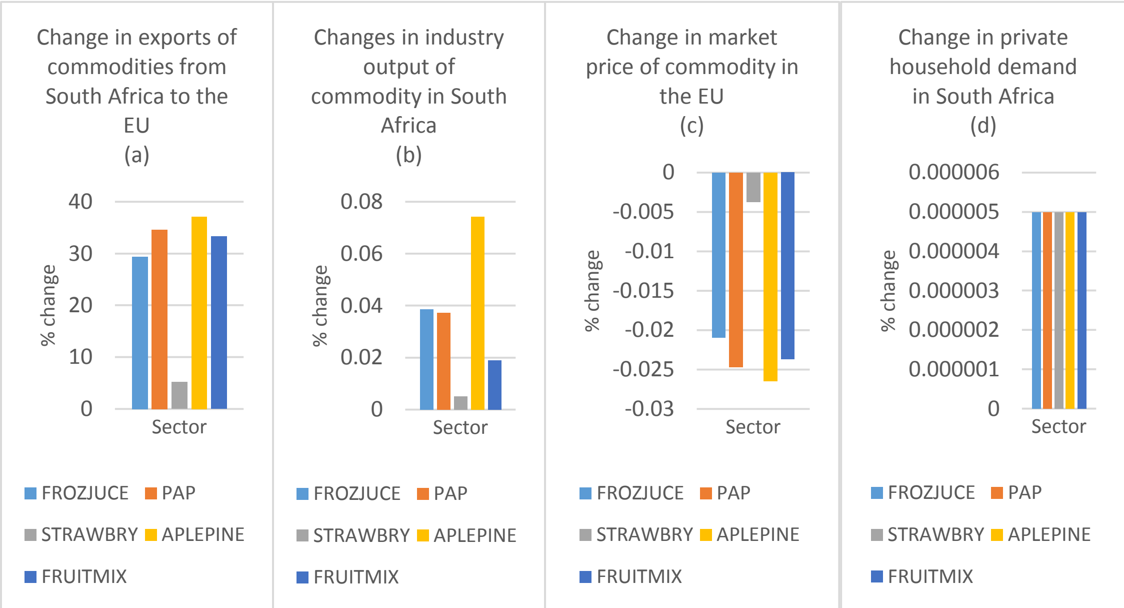


Figure 5.6: Percentage changes in industry exports, output, market prices and consumption due to a 100% tariff liberalisation (PC2*(a)*)

Source: Author's computation based in GTAP simulations

The change in industry output is less than 0.1% for all the fruit products. The most visible change in terms of magnitude is the change in exports (Figure 5.6a) which increase from between 29% for frozen orange juice to almost 40% for apple and pineapple juice. These changes in exports are greater than the changes in industry output, indicating that there is a shift in South Africa's export destinations towards the EU market, using already existing industry level capacity. The increase in industry output is much lower than the increase in exports, given that the share of each of the fruit products export sales from South Africa to the EU is less than 0.1%. The TDCA tariffs in the base year are at 50% of the MFN rate, except for the frozen strawberries

TRQ which enjoys a 0% in-quota tariff. A 100% tariff liberalisation results in the demand for exports rising about +/-30% for all TRQs except frozen strawberries. The policy implication is that tariff liberalisation is beneficial and positively impacts market access. Decreux and Ramos (2007) and Grant *et al.* (2009) support this finding and note that tariff liberalisation leads to greater market access. Sandrey and Jensen (2007), however, point to little evidence of benefits to South African exports due to EU tariff liberalisation. The findings of Sandrey (2011) support those of this study namely, agricultural exports have been promoted as a result of TDCA preferences.

Policy scenarios PC3*(a)* and PC3*(b)* enable the comparisons in exported fruit products quantities that would arise due to the removal of some NTMs. All exported quantities in PC3*(b)*, as a result of the NTMs' removal, exceed the quota fill level in PC3*(a)*. The assertions that TRQs are compounding the problems associated with market access barriers are plausible and by their existence, the TRQs are associated with other NTMs. The advocacy for TRQs removal, and, therefore, the associated NTMs removal is supported by such results which show that exports rise with removal of NTMs. The policy implication is of this finding points to the protection barrier to trade presented by the presence of NTMs; hence, policies should be revised to ensure the removal of NTMs. The findings on NTMs presented here are supported in Gonzalez-Mellado *et al.* (2010), Bureau *et al*. (2014) and Beghin and Xiong (2016), who conclude that the removal of NTMs in trade may reduce costs, ultimately expanding trade.

Price changes due to the shocks implemented, are expected to depend on the size of the fruit products sectors in the model. South African exports contribute less than 0.1% of the EU's import bill; therefore, the price changes due to trade liberalisation are small. Market price falls due to the increase in the demand for imports. As can be read from Equation (4.9) (Section 4.2.3.5), the larger component of the increase in imports by the EU arises from the substitution term comprising the elasticity of substitution and the price difference (*pms* minus *pim*). For example, the price of frozen orange juice supplied from South Africa to the EU (PC1*(a)*) has fallen by more than 7% in relation to the average price of imports into the EU. The increase in demand from the EU is relatively small in, for example, frozen orange juice sector: *qim* is 0.04%. The implication of this finding is that for a tariff line with small market shares in the export market, the liberalisation impacts on price changes are small. Trade negotiators should seek increased market shares in the export market in order for the negotiated tariff liberalisation concessions to have significant impacts on the demand for South African exported fruit products. This requires strategies to improve the competitiveness of South African fruit products in the EU market. Studies indicating low market shares of African or developing nations in the EU include Bouet *et al.* (2008), Khorana (2008) and Nicita and Rollo (2015) and, thus, support the finding of low market shares by this study.

The price of imports from South Africa in PC3 (removal or reduction of factors influencing quota fill) must fall for a quota to be filled in Equation (4.9). The price change results are traced in the decomposition of Equation (4.10), the market price equation. The total price decrease (of imports from South Africa into the EU- *pms*) required is 2.5% and is transformed through a combination of the power of the tariff (*tms*) together with the cost, insurance and freight (CIF) price of fruit products from South Africa to the EU. For PC2*(a)*, the price (*pms*) of each fruit product from South Africa to the EU falls by, approximately, the full amount of the respective shock to *tms*. This result is due to *pcif* (price of each of the fruit products from South Africa to the

EU) rising by a negligible amount of 0.000027%. The fall in prices of the composite imported (*pim*) fruit products to the EU is much smaller than the fall in prices (*pms*) of fruit products imported by the EU from South Africa. The explanation is found in the value of MSHRS (0.003) for exported fruit TRQ products, with the implication for policymakers that, some deliberate action must be taken to seek greater market share for fruit products in the EU market. As explained above, the literature supporting the finding on market shares includes Bouet *et al.* (2008), Khorana (2008) as well as Nicita and Rollo (2015).

These findings of the fall in prices of commodities due to trade liberalisation are also supported in Arita *et al.* (2017), who indicates that the EU prices for agricultural commodities decrease when the EU removes tariffs on imports from the USA. In addition, as indicated in the results in this study presented in Figure 5.6, Arita *et al.* (2017) find that price decreases result due to increased EU imports of US commodities when the EU removes tariffs. The decomposition of price mechanisms in EU tariff liberalisation scenarios show the same pattern for the USA and South Africa, although the two regions may have different trade structures.

5.2.2 Change in welfare

The EV measure is used to analyse welfare. The welfare changes (EV) in the model are not very large in terms of the US$ million values, given that the fruit products export trade is a small sector (in the model) compared to other sectors, such as other processed food products, other agriculture, non-agriculture and services. The share of industry GDP is less than 2% for the processed food products sector, in which the fruit products belong. The frozen orange juice sector, for example, has a share of 0.01

in industry GDP of South Africa. Similarly, the labour share of the processed food products sector is about 3%.

The results of the EV changes in Table 5.5 are decomposed into effects of allocative efficiency, endowment, TOT and investment savings. As indicated in the results, there are allocative efficiency losses for South Africa in all scenarios, and global welfare is positive in all scenarios except PC1*(b)*. Allocative efficiency losses result from the reallocation of resources from more productive to less productive sectors. Improvements in the TOT are experienced for South Africa in PC1*(b),* PC2*(a),* PC3*(b)*, PC4*(a)* and PC5. As expected in these scenarios, exports from South Africa to the EU become cheaper. The negative allocative efficiency in those scenarios is dominated by the TOT effects, resulting in a positive total welfare in South Africa. The implication of this finding is that South African exports become cheaper. This leads to gains in welfare as a result of TRQ liberalisation options based on quota expansion by actual growth rates of exports, full tariff liberalisation pre full implementation of the TDCA, removal of NTMs and full tariff liberalisation of filled TRQs. The decline in prices of South African fruit products exports in the EU domestic market induces the demand for imports; hence, improve market access. Gonzalez-Mellado *et al.* (2010), in a study on agricultural and horticultural products exported to the EU by South Africa and other African countries, find similar results for South Africa. Though not studying the TDCA or the fruit products TRQs, Gonzalez-Mellado *et al.* (2010) find that South Africa experiences welfare gains when NTMs are removed.

The export expansion, using the actual rate of growth of exports in PC1*(b)*, affects total welfare in South Africa more positively in comparison to the policy cases PC5*,* PC3*(b),* PC2*(a)* – complete tariff removal, and PC4*(a)* – a quota fill scenario is combined with a 100% tariff liberalisation. The expansion of the quota exports to full capacity (PC3*(a)*) does not improve the welfare situation in South Africa but improves welfare for the EU. The implication of this finding on welfare results is that trade policy liberalisation, based on informed research such as TRQ expansion using the actual export growth rate, leads to better welfare results. Van der Mensbrugghe *et al.* (2003) support the finding of quota expansion leading to better welfare results compared to those achieved with tariff removal, but other study results (Decreux and Ramos 2007; Lim and Blandford, 2009) reveals the opposite.

There is a loss in welfare in South Africa if the quotas are filled under the existing conditions of the inherent factors influencing TRQ fill, such as NTMs. The reason for this is allocative efficiency losses as the reallocation of resources to less productive sectors ensues.

Table 5.5: EV results for different simulations (US$ mil)

PC scenario	Region in the model	Welfare Decomposition – effects				Total Welfare (US$ mil)
		Allocative efficiency	*Technology*	*TOT*	*Investment savings*	
PC1*(a)* Quota expansion of 3%	South Africa	-0.001115	0	-0.02071	-0.00131	-0.02314
	EU 28	0.00426	0	0.021575	0.000836	0.026671
	Rest of World	0.000074	0	-0.00086	0.000474	-0.00046
	Total	***0.003071***	***0***	***0***	***0***	***0.003071***
PC1*(b)* Quota expansion by rate of actual exports	South Africa	0.011177	0	0.207672	0.013127	0.231975
	EU 28	-0.047287	0	-0.21615	-0.008379	-0.271811
	Rest of World	0.000744	0	0.008473	-0.004748	0.004469
	Total	***-0.035367***	***0***	***0***	***0***	**-0.035367**
PC2*(a)* 100% tariff liberalisation	South Africa	-0.00012	0	0.030426	0.001628	0.031943
	EU 28	0.023518	0	-0.02589	-0.00089	-0.00326
	Rest of World	-0.00122	0	-0.00455	-0.00074	-0.00650
	Total	***0.022179***	***0***	***0***	***0***	***0.022179***
PC3*(a)* Expansion to quota fill	South Africa	-0.00068	0	-0.01257	-0.00079	-0.01404
	EU 28	0.002675	0	0.013087	0.000507	0.016268
	Rest of World	-0.000045	0	-0.00052	0.000287	-0.00028
	Total	***0.001954***	***0***	***0***	***0***	***0.001954***
PC3*(b)* NTMs removal	South Africa	-0.0007	0	0.180917	0.009675	0.189891
	EU 28	0.157282	0	-0.14797	-0.004971	0.505006
	Rest of World	-0.00297	0	-0.03295	-0.004704	-0.040623
	Total	***0.15361***	***0***	***0***	***0***	***0.654275***
PC4*(a)* Quota fill and 100% tariff liberalisation	South Africa	-0.00013	0	0.031943	0.001708	0.033525
	EU 28	0.023138	0	-0.02719	-0.00094	-0.00499
	Rest of World	-0.00129	0	-0.00475	-0.00077	-0.00682
	Total	***0.021719***	***0***	***0***	***0***	***0.021719***
PC5 NTMs removal and 100% tariff liberalisation	South Africa	-0.00082	0	0.211353	0.011302	0.221834
	EU 28	0.180801	0.500664	-0.17386	-0.005862	0.501743
	Rest of World	-0.00419	0	-0.03749	-0.005441	-0.047124
	Total	***0.175789***	***0.500664***	***0***	***0***	***0.676453***
Base Case TDCA tariffs	South Africa	0.005472	0	-0.01015	-0.00157	-0.006247
	EU_28	-2.882312	0	3.806731	0.096735	1.021155
	Rest of World	0.234951	0	-3.79658	-0.095167	-3.656796
	Total	***-2.641889***	***0***	***0***	***0.000001***	***-2.641888***

Source: Own simulation results in GTAP version 9 model

There is an increase, ranging from 0.01 to 0.04%, in the demand for the factors of production in all TRQ sectors. The opposite effect occurs in the non-agriculture and services sectors. In addition, adverse TOT effects (reflecting the change in prices of South African fruit products exports to the change in prices of imports) are experienced in South Africa. Lower prices result as the EU imports more from South Africa in this scenario, and there are no changes in prices for imports paid by South Africa. This result confirms that South Africa's welfare changes have a basis in the price differences in exports and imports, which can be traced back to the effects manifesting through the allocative efficiency changes. Due to the limits on the expansion of output due to quotas, the prices become unresponsive, and this leads to the small changes in the demand for factors of production. Meade *et al. (*2010) explain that prices do not respond to the expansion of quotas unless the TRQ regime is on quota; thereby, supporting the findings of this study.

Whilst a 100% TRQ fill leads to a loss in welfare of US$14 040 in PC3*(a)*, this loss is not as much as the loss resulting from the 3% annual quota expansion in scenario PC1*(a)*. The 3% quota expansion is a provision of the TDCA, and in the provisions of that agreement, an annual review of a tariff reduction (that is not provided for as part of the trade deal) potentially brings more favourable welfare results, if that were adopted. Scenario PC*5* indicates that the provisions of the TDCA would be more beneficial if measures to reduce or eliminate NTMs in combination with tariff removal are the focal point of South African trade negotiators, rather than only the reduction or removal of tariffs. The results are also indicative, in terms of policy implications, of why EU negotiators would favour 100% tariff liberalisation only in PC*2* and not give further concessions. The loss in total welfare for the EU is small in PC2*,* so the 100% tariff liberalisation is the provision negotiated for under the SADC-EU-EPA. The policy implication is that, for the importing nation, tariff liberalisation is more beneficial than a quota expansion. However, trade policy formulation under the TDCA should aim for a combination of both tariff removal and quota expansion to maximise market access benefits for South Africa. Studies, such as Arita *et al.* (2017), have also indicated that combined trade liberalisation tools result in greater welfare benefits.

The TOT effects are relatively dominant compared to other effects contributing to total welfare in the implemented scenarios PC1*(a)* and PC3*(a)* which target export expansion only. When TRQs in the model are brought to the quota fill level in PC3(*a*), the scenario initially makes South Africa worse off by US$14 000 as resources are reallocated from the non-TRQ sectors to the fruit products sectors to boost export production. There should, therefore, be a motivation for South Africa to have a bilateral agreement (such as the TDCA) and to negotiate for NTMs removal in addition to complete tariff removal, given the relatively higher positive welfare results of US$213 000 in PC4*(b)*. The implication for policy, therefore, is that the right combination of tariff liberalisation brings more favourable market access benefits. As argued in Beghin and Xiong (2016), the removal of NTMs may reduce costs to exporters, but there is ambiguity in the movement of trade and welfare (as confirmed in the results of this study) at times with observations of trade and welfare moving in opposite directions.

5.3 APPLICATION OF THE GTAP MODEL TO THE FROZEN ORANGE JUICE TRQ LIBERALISATION

The focus of the simulated results in this section is on South Africa and the frozen orange juice sector. The results of simulations in the 2011 base case, as well as simulations undertaken with database projections to 2012 and to 2016, are presented here and detail the base pattern and the underlying economic structure of frozen orange juice production and trade. Secondly, findings based on trade liberalisation scenarios are presented. Welfare results measured in EV are also presented.

The results of the policy scenarios are presented to advance understanding of the potential gains from further liberalisation of the frozen orange juice tariff line as a result of the shift in fruit TRQs implementation from the TDCA to the SADC-EU-EPA. The question regarding the timing of liberalisation is important. Hence, discussion is given of which tariff quota liberalisation scenario impacts trade and welfare more positively with regard to the year 2011 (leading up to the full TDCA implementation in 2012) compared to the status quo at the end of 2016 (with the inception of the SADC-EU-EPA). The price effect, from the model results, is then used to calculate welfare loss measured in quota rents changes.

European Commission Statistics (2016) show that South Africa is a small player in the EU market for frozen orange juice, with the earnings value accounting for less than 2% of the total extra EU imports of the frozen orange juice tariff line for each of the years 2011, 2012 and 2016. Judging by the level of permissible exports of the frozen orange juice tariff line under the TDCA (1999 to 2016), the tariff line has steadily performed in improving the level of exports under the yearly quotas granted by the EU, but quotas have not been filled in the years of interest in this study – 2011, 2012 and 2016. Calculations based on European Commission Statistics (2016) detailing the allowable quotas and EU imported volumes, show that the frozen orange juice TRQ recorded use rates of 55%, 86% and almost 100% in 2011, 2012 and 2016, respectively (Table 5.6).

Table 5.6: South African frozen orange juice TRQ fill rates

	Year						
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Fill rate	0.52	0.549	0.864	1.00	1.00	1.00	0.997
Expansion factor to fill TRQ	1.941	1.822	1.157	1	1	1	1.003

Source: Author's calculations based on European Commission Statistics (2016).

The quota gap the TRQ for frozen orange would need to fill in 2011, 2012 and 2016 is 45.1%, 13.6% and 0.3%, respectively. The expansion factor to fill the TRQ was calculated and used as an input in the simulation for a 100% quota fill in policy scenarios PC3*(a)*, PC4*(b)* and *(c)* (Section 4.2.5) and based on Equation (4.12) (Section 4.2.3.6). Besides the frozen orange juice TRQ being small (± a 1000 tonnes in 2011, 2012 and 2016), the TRQ policy imposes other restrictions. The TRQ policy restrictions manifest through an in-quota tariff, an out-of-quota tariff and a quantity restriction. The policy implication of this finding is that market access for the frozen orange juice, measured by the TRQ use rates, increases over the yearly progress of the TDCA implementation. Therefore, trade policy negotiators can base trade negotiating positions for greater quota expansion on the use rates. The frozen orange juice quota availed to South Africa is small in relation to South Africa's export capacity. These findings relate to a study by Monnich (2003) who finds that fill rates are determined by quota size but Monnich (2003) does not explain increasing fill rates associated with annual quota increases.

5.3.1 Graphical analysis of quota rents – the frozen orange juice TRQ example

Exporters under the frozen orange juice TRQ are in a position to gain the full quota rents, given that the findings on TRQ fill rates in Table 5.6 shows that quotas are filled in 2013 to 2015. The full quota rent for fruit products TRQs under the TDCA is, however, not captured in aggregate, as most of the quotas are not filled due to some underlying influential factors (Section 5.1.5) that also include the in-quota tariff. Agents, exporters, government officials and processors from the fruit sector survey indicated that the quota rent accrued only to the exporter and was not shared across the value chain. The fruit farm sector is not in a position to negotiate to accrue the quota rent given that their relationship ends at selling their production to the processor.

The TRQ export regime under which frozen orange juice exports from South Africa access the EU market is the quota regime in 2013 to 2015, leading from the year after the full implementation of the TCDA (Section 5.1.1). In 2016, the quota is 99% filled. Over-quota exports not benefitting from TDCA preferences have not been included in the analysis. The exports under this TRQ are, therefore, as of 2013, controlled or limited by the quota (Table 5.6, Section 5.3). For example, in 2015, the exported amount of the frozen orange juice TRQ was equal to the granted quota amount (1 015 000 kg), leading to additional exports from South Africa to the EU being restricted. Arita *et al.* (2017) note that TRQs are barriers to agricultural trade, which agrees with this study's finding. The implication for policy is that South African trade policy negotiators should seek further improvements in the EU market access, given that the South African exporters have fully taken advantage of the TDCA preferences for the frozen orange juice TRQ (as the findings show). The frozen orange juice TRQ receives a small quota in comparison to other TDCA fruit products TRQs; therefore, an expanded quota is key to increasing the quota rent benefits.

An analytical comparison of the domestic price in the EU market with the world price gives insight into the measure of the protection level. The quota rents that arise are depicted in Figure 5.7 and explained under the figure. The depiction in Figure 5.7 is based on the generalised TRQ framework (Figure 4.1) discussed in Section 4.2.4.2.

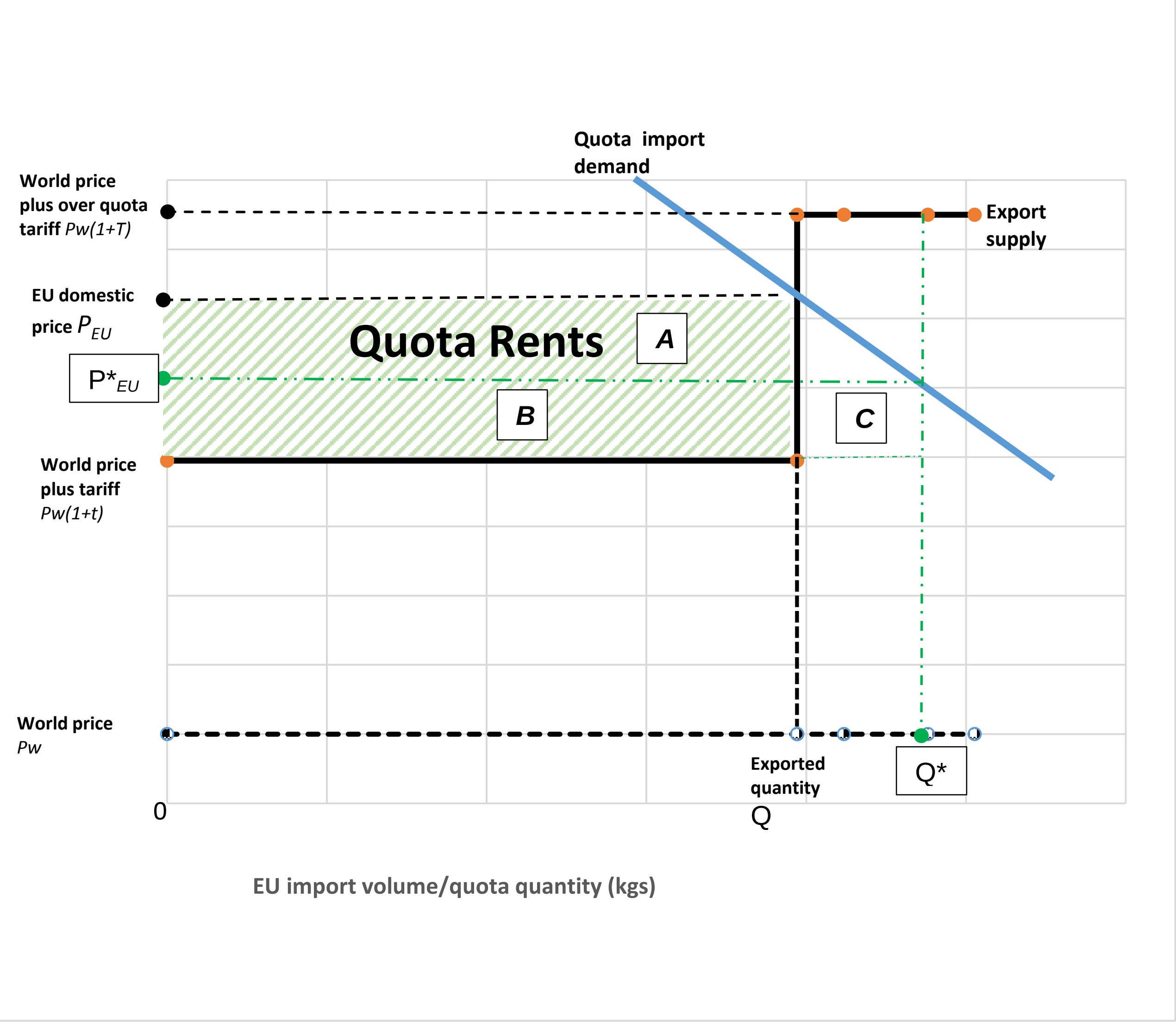


Figure 5.7: Depiction of the frozen orange juice TRQ instrument and quota rents derivation

Source: Author's own depiction

The quota rents are gained by the exporting establishments in South Africa. This is because the TRQ is administered by South Africa; hence, the quota rent losses as a result of the inability to fill quotas in 2011, 2012 and 2016 are losses for the exporting establishments in South Africa. Given that the quota has been the limiting instrument for the frozen orange juice TRQ since the full implementation of the TDCA in 2012, South Africa has managed to review the TDCA market access in order to seek greater market access under the SADC-EU-EPA (in terms of an increased quota quantity). This has, however, not been the case for other TRQs as the SADC-EU-EPA negotiations did not achieve immediate concessions on the instrument restricting imports: the in-quota tariff (Table 3.1, Section 3.3.1).

In Figure 5.7, the price paid for frozen orange juice is the world price plus tariff [*Pw(1+t)*]. The difference between *Pw(1+t)* and the EU domestic price (P_{EU}) for orange juice multiplied by the exported quantity forms the shaded rectangle (*A+B*) which represents quota rents. The calculated amount of the quota rents lost in 2011, 2012 and 2016, when the quotas were unfilled, are based on the analysis of price changes in the GTAP CGE model, and is presented in Section 5.3.11 as the expected changes to the quota rents from simulated TRQ liberalisation scenarios.

For the years 2011, 2012 and 2016 analysed in PC3*(a)*,PC4*(b)* and PC4*(c),* respectively, the improved quota volume for frozen juice would lead to an increase or decrease in quota rent which, after the export expansion (quota fill), is represented in Figure 5.7 by the rectangle *B+C*. In 2015, the exported quantity by South Africa, *Q* in Figure 5.7, is equal to the notified and granted quota quantity by the EU. For the unfilled quotas in 2011, 2012 and 2016, *Q** represents the level of the filled quota when exports expand to the granted quota level *Q** and the 2-step supply curve shifts to the dotted line. When the exporting establishments in South Africa grow their exports to Q* harmonised to the quota volume, the EU domestic price for frozen orange juice is lowered to $P^*_{EU.}$ To operationalise the quota rent calculation, potential quota rents are calculated, given that in 2011, 2012 and 2016 the frozen orange juice quota is not filled. The policy implications of the scenarios, depicted in Figure 5.7, are presented with the quota rent calculations, discussed in Section 5.3.11.

5.3.2 Base pattern and underlying economic structure for frozen orange juice

The base pattern of frozen orange juice production and trade in the GTAP database in 2011, together with the projected base patterns to 2012 and to 2016, is illustrated in Figure 5.8. South Africa, as well as the EU28, was a net exporter of frozen orange juice in 2011, 2012 and 2016. The production value minus exports equals to the value of domestic sales; and for all the regions in the model, the bulk of the frozen orange juice commodity is used domestically. The South African frozen orange juice commodity in the base year is composed of US$501 330 in imports and US$521 108 in exports. The levels of South African exports of frozen orange juice in 2011 translate to a negligible percent share (0.45%) in world exports. South Africa is indeed a small player with less than 1% share in exports compared to its trading partner, the EU28, with 45% share in exports in the world market for the frozen orange juice tariff line. This confirms a general observation that there are low levels of market access in developed country markets, especially for developing and emerging country manufactured products (De Sousa *et al.,* 2012). The implication for policy is that the South African exports of frozen orange juice will not impact on world prices given the small share in the world exports.

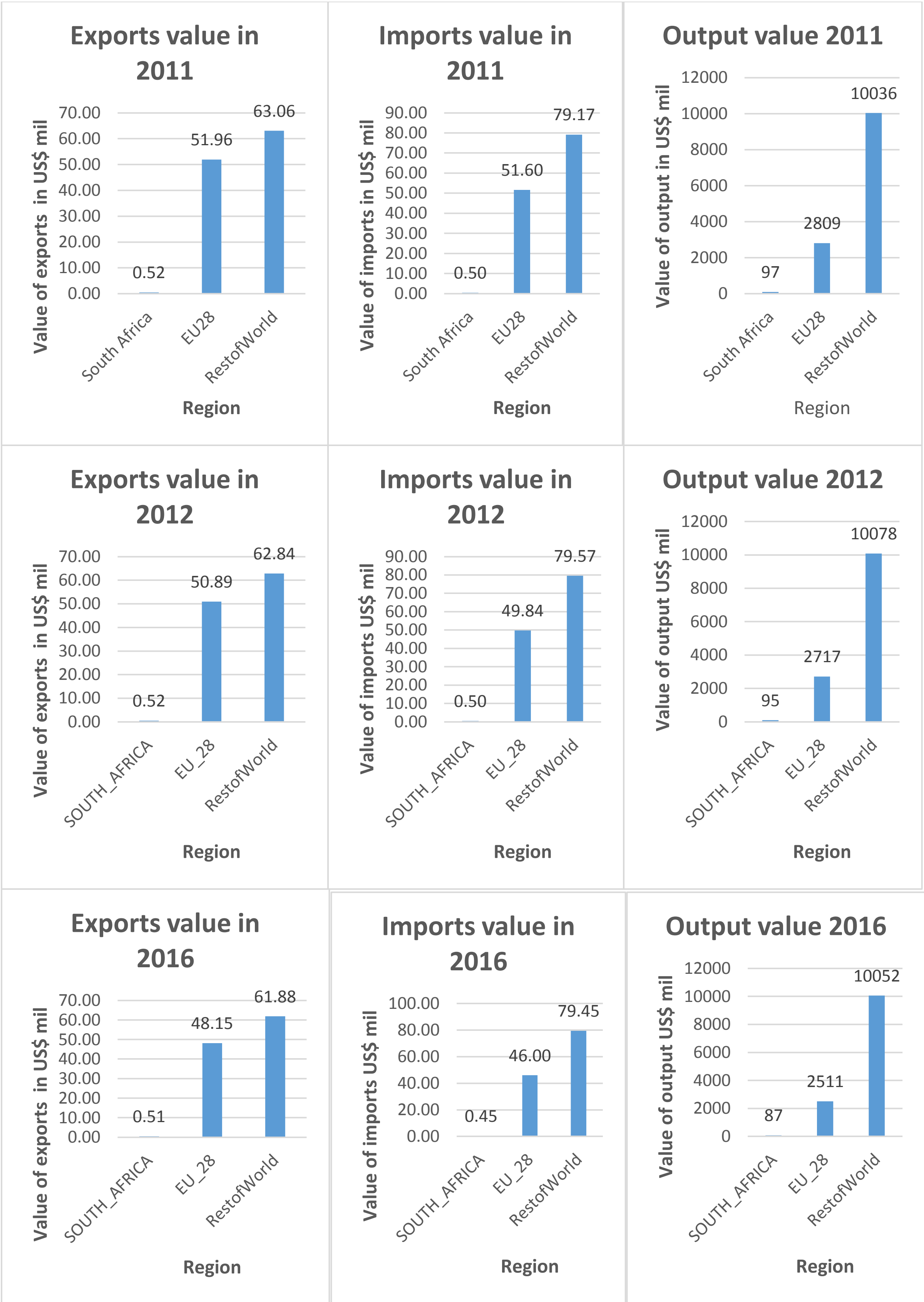


Figure 5.8: Base pattern of frozen orange juice production and trade (US$ Mil)

Source: Author's computation based on GTAP version 9

South Africa has a small value in imports (US$500 000) compared to the EU28's imports of US$51 600 000. The expected result of an EU tariff liberalisation in the South African economy is positive (Section 5.3.3), because trade liberalisation becomes a stimulus for exports.

The aggregated version of the GTAP database used in this study was converted to a Social Accounting Matrix (SAM) database using an automatic operation in the modelling programme. The SAM used in and relevant to this study is for the year 2011. Using data on economic activities from the SAM, specified for the five sectors delineated for this study, the structure of the modelled sectors of the South African economy is presented in Table 5.7. In 2011, the commodity shares in trade (export and import) for the frozen orange juice tariff line are a very negligible share (almost zero), further indicating the extent to which market access for frozen orange juice is limited when considered amongst the other sectors' commodity shares (79.44% for non-agriculture and 12.67% for services) in export trade in the global economy. Unlike frozen orange juice, which is an HS 6-digit tariff line sector in the model, other sectors aggregate various HS 6-digit tariff lines; hence, the greater commodity shares exhibited. The other processed food products sector from which the frozen orange juice tariff line has been extracted, merely has a 1.57% share in global export trade. This should be an indicator to trade negotiators of the tariff lines or sectors that may need improved market access in export markets.

The pattern observed in Table 5.7 is backed by De Sousa *et al.* (2012) who note that the market access for Least Developed Countries hardly gets up to a share of 1% in the global imports. The use of import/export shares provides some measure of market access (De Sousa *et al.,* 2012).

Table 5.7: South Africa structure table for 2011

		Sectors					Total (%)
		Frozen orange juice	Other processed food	Other agriculture	Non-agriculture	Services	
	GDP in US$ mil	28.28	5878.79	21098.78	95194.49	281691.1	n/a
	Share of industry in GDP	0.01	1.46	5.22	23.57	69.74	100
Factor shares in industry factor costs	Land	0	0	7.33	0	0	n/a
	Unskilled labour	31.2	31.2	22.07	25.23	21.64	n/a
	Skilled labour	23.89	23.89	12.95	17.31	31.94	n/a
	Capital	44.91	44.91	55.62	52.36	46.42	n/a
	Natural resources	0	0	2.03	5.1	0	n/a
	Total	100	100	100	100	100	n/a
Industry shares in factor employment	Land	0	0	100	0	0	100
	Unskilled labour	0.01	1.84	4.11	24.72	69.32	100
	Skilled labour	0	1.15	1.96	13.77	83.12	100
	Capital	0.01	1.24	4.92	24.06	69.77	100
	Natural resources	0	0	7.05	92.95	0	100
Commodity shares in domestic demand	Intermediate demand	0.06	13.75	26.44	12.92	46.83	100
	Private household consumption	0.03	5.87	16.62	25.03	52.45	100
	Government consumption	0.00	0.03	0.01	0.08	99.88	100
	Investment Demand	0.00	0.00	0.01	55.01	44.99	100
Commodity shares in trade	Exports	0.00	1.57	6.31	79.44	12.67	100
	Imports	0.00	1.30	4.65	82.56	11.49	100
	Import share of domestic consumption	0.50	7.96	9.76	30.86	2.70	13.58
	Export share of production	0.54	8.91	12.56	28.96	2.82	12.80

Source: Author calculations based on the GTAP 5x5 SAM for South Africa

South Africa's export share of production of the frozen orange juice tariff line is negligible, almost zero (0%) in 2011. The same applies to the import shares of domestic consumption. The export share of production of frozen orange juice is only

0.54%. The export share of production shows that the foreign market is of little prominence in terms of contribution to the frozen orange juice industry in South Africa, with less than 1% of frozen orange juice production destined for exports. The frozen orange juice sector in South Africa will, therefore, not be vulnerable to shocks emanating from the export market or world market. Nicita and Rollo (2015) indicate that, in general, African countries' share in global trade is marginal, which supports this study's findings. The implication of the findings is that negligible economy-wide effects are expected from any shocks in this sector; therefore, trade policymakers should enact export-oriented policy strategies aimed at improving the export share in the production of frozen orange juice.

In the frozen orange juice sector, less than 1% of South Africa's domestic demand emanates from imports, which shows great self-sufficiency in the frozen orange juice commodity. However, private household consumption in the frozen orange juice sector is only 0.03% of all household consumption across the five sectors of the model. This can easily be explained in the model: frozen orange juice is a single tariff line in comparison to other sectors, and it is in the nature of processed food products that there is low household consumption. The self-sufficiency status implies that, for the frozen orange juice sector, policymakers can aim to boost the sector by focusing on innovations to increase output destined for the export market. Given the low household consumption, the implication is that price effects in the trade policy liberalisation scenarios will be negligible. Beckman and Arita (2016) also allude to the fact that when the base trade is small, the resulting impacts from liberalising a TRQ measure are small.

The frozen orange juice sector accounts for a 0.01% of GDP which also implies that a shock in that sector will be small in its impacts in the economy, given the small size of the sector in terms of the industry's share in GDP. The frozen orange juice TRQ could easily be viewed as ceremonial market access to count towards the number of TRQs granted in a bilateral trade agreement. The implication of these findings is that this is a commodity with small impacts on the economy and, unless improved export market access is provided to an extent that improves the frozen orange juice sector's contribution to the share of industrial GDP, the benefits of the TDCA preferences will remain minimal.

The employment of capital and labour in the frozen orange juice sector is a small 0.01% for both factors. The type of labour employment in the frozen orange juice sector is unskilled labour. An examination of the factor shares in industry costs shows that the frozen orange juice sector is slightly more labour (skilled and unskilled together) than capital intensive, with about 45% of the cost shares in capital costs. However, in terms of the labour types, unskilled labour has a greater share. The implication of this finding is that improving market access for the frozen orange juice sector has the potential to create some employment for the abundant unskilled labour in South Africa; however, it must also come with more capital investments. Policymakers are presented with the challenge of enacting support policies to boost exports which must, consequently, create commensurate labour demand. Edwards and Behar (2006) find that within South African manufacturing firms, trade liberalisation affects the skill structure of employment, which supports this study's findings.

Figure 5.9 further illustrates the demand for endowments in the frozen orange juice sector and supports the observation on industry cost shares. As expected, there is no land or natural resources demand in this sector, given that this is the 'processed food products' sector. Capital makes up 48% of the demand for endowments in the frozen orange juice sector, followed by unskilled labour (31%) and skilled labour (21%).

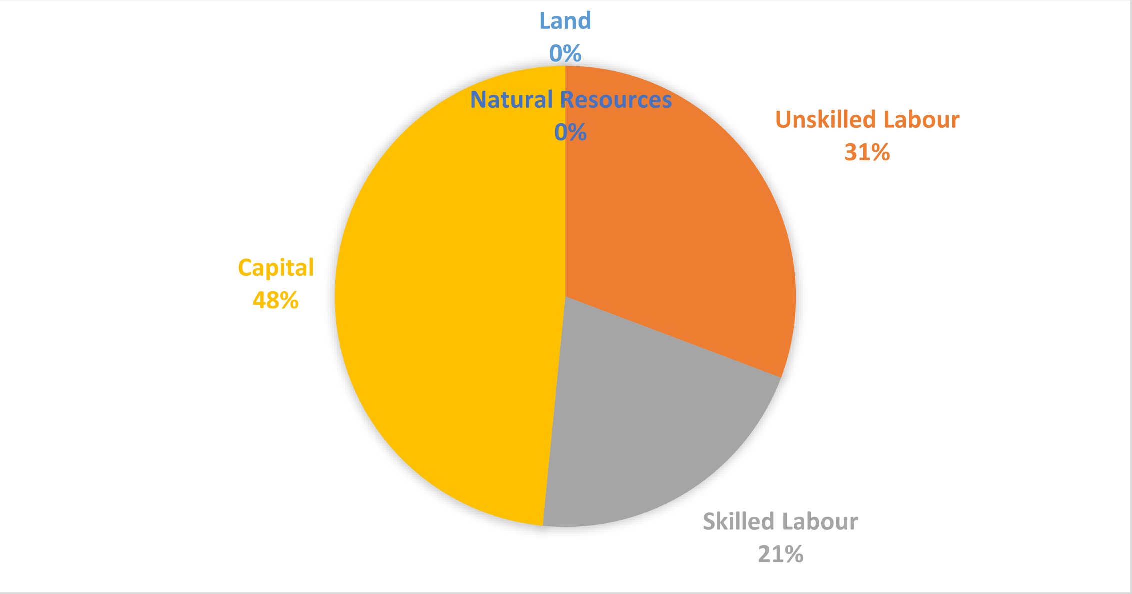


Figure 5.9: Frozen orange juice sector demand for endowments in South Africa (2011)

Source: Author's computation based on GTAP version 9

5.3.3 Frozen orange juice tariff line liberalisation in the GTAP model

The results of the model for the frozen orange juice tariff liberalisation are presented at the tariff line (HS2009.11), so the quantities or volumes in question are, evidently, small in comparison to quantities in the other sectors in the model. The other sectors are analysed at aggregated levels which combine various HS 6-digit tariff lines. Regarding the analysis of how the EU28's liberalisation of the frozen orange juice tariff may affect South Africa, it focuses on the examination of the following variables: output, exports, prices, consumption, factor demand, welfare measured in EV as well as welfare measured in quota rents changes.

Table 5.8 presents the findings of the 2011 frozen orange juice tariff line liberalisation. The findings are discussed and interpreted in Sections 5.3.3.1 to 5.3.3.8.

Table 5.8: Changes due to tariff liberalisation of the frozen orange juice sector in 2011

Sector	South Africa		EU28		ROW	
	Initial (2011)	At 100% liberalisation	Initial (2011)	At 100% liberalisation	Initial (2011)	At 100% liberalisation
	(US$ mil)	*% change*	*(US$ mil)*	*% change*	*(US$ mil)*	*% change*
Output						
Frozen orange juice	96.65	0.038391	2 809.30	-0.001235	10 036.37	-0.000042
Other processed food products	20 099.70	0.000018	639 568.31	0	2 107 543.25	0
Agricultural	57 158.34	0.000007	1 627 961.25	0	7 215 566	0
Non-agricultural	317 756.69	-0.000015	10 680 061	0	36 652 828	0
Services	505 248.97	0	21 625 058	0	60 411 080	0
Exports to EU28						
Frozen orange juice	0.13	29.3723	38.77	-0.043277	9.18	-0.043278
Other processed food products	446.56	-0.00002	118 672.57	0	43 546.48	-0.000001
Agricultural	2 433.37	-0.000029	254 724.16	0	102 567.03	-0.000002
Non-agricultural	19 069.32	-0.000033	2 754 797.25	0	2 001 184.13	0
Services	5 257.16	-0.000023	859 645.19	0	674 955.06	0
Aggregate Imports						
Frozen orange juice	0.50	0.000039	51.60	0.041964	79.17	0
Other processed food products	1 659.23	0.000038	171 929.16	0.000001	263 798.63	0
Agricultural	5 980.45	0.000052	386 584.84	-0.000001	823 715.44	0
Non-agricultural	104 840.44	0.000005	5 055 438.5	0	10 469 043	0
Services	13 899.51	0.000011	1 539 857.38	0	17 96 445.13	0

Source: Author estimates based on GTAP version 9, South Africa 5x3 database aggregation

The 100% tariff liberalisation simulation in the scenario experiment is a recent concession under the SADC-EU-EPA (signed at the end of 2016). The findings give an insight into what would have happened had the concession been given earlier in 2011. The results in 2011 are compared to the database of projections of the representative economy in 2012 and 2016. Other results pertaining to simulations in 2012 and 2016 are presented in Table 5.9. Price changes, consumption changes and factor demand changes are presented in Tables 5.10 and 5.11 and in Figure 5.10, respectively, whilst welfare measurements in EV are presented in Table 5.12.

5.3.3.1 Output changes in the frozen orange juice sector and other sectors of the model

The output of frozen orange juice in South Africa increases by 0.04% (Table 5.8) and decreases in the EU28 and the ROW. Besides the structure of the frozen orange juice being less prone to shocks (Section 5.3.2), the change is small, possibly due to the frozen orange juice industry requiring substantial capital investments as shown by the capital intensity of almost 50% in the base pattern (Figure 5.9). The implication of this finding is that the impact of full tariff liberalisation on output changes of the frozen orange juice TRQ is small, and the base structure in that sector could be important in order to explain the changes. The challenge posed to exporters is to sustain increased output in South Africa in order to take advantage of the available quota. In terms of policy, the full tariff liberalisation of an already low in-quota tariff is less beneficial than a liberalisation policy where the intention is to improve market access. Studies, such as Bureau *et al.* (2014), support the findings of this study on tariff liberalisation bringing marginal trade benefits.

Domestic demand (the difference between initial output and exports value in 2011 for frozen orange juice in Figure 5.8), is large (US$96 130 000) in comparison to exports of US$520 000 to the EU28 (Table 5.8). The policy implication is that the stimulus from the export market is not large enough to change the ratio of domestic demand to exports. The change in South African exports of frozen orange juice to the EU, though relatively large (29%), is for a small quota quantity (+/- 1000 tons). Ultimately, this means there is no penetration in frozen orange juice imports of the EU28. Given, therefore, that there are no substantial changes, the results are consistent with the EU28's aspirations to protect the sensitive products. The removal of the frozen orange juice tariff will not generate any significantly sized impact in the other processed food products sector or the remaining modelled sectors in the South African economy, despite the direction of change in 'non-agricultural' output being a decrease. The policy implication is that without liberalisation in the other sectors, the frozen orange juice tariff liberalisation impacts do not have substantial economy-wide impacts. Other trade liberalisation policies which are beyond the full in-quota tariff liberalisation, such as quota expansion and MFN tariff liberalisation, must be used to maximise the TDCA TRQ benefits. Arita *et al.* (2017) suggests that a combination of trade liberalisation policies brings greater benefits., which supports the findings of this study.

The findings of scenarios PC2*(b)* – full implementation of TDCA in 2012 and PC2*(c)* – inception of SADC-EU-EPA in 2016 (Table 5.9) indicate that the output changes are approximately the same: roughly a 0.04% increase for South Africa, and exports (29%) to the EU28 also mirror each other for 2011, 2012 and 2016. The timing of the liberalisation, therefore, does not seem to matter for these variables within the five (5)-year period analysed.

Table 5.9: Changes from 100% tariff liberalisation of the frozen orange juice sector

SCENARIO PC2*(b)* (2012) and SCENARIO PC2*(c)* (2016)						
	South Africa		**EU28**		**ROW**	
Frozen orange juice sector	2012	2016	2012	2016	2012	2016
	% change	*% change*	*% change*	*% change*	*% change*	*% change*
Output	0.037356	0.037678	-0.00123	-0.00122	-0.000038	-0.000034
Exports to EU28	29.37253	29.37284	-0.04305	-0.04276	-0.04305	-0.04276
Aggregate imports	0.000038	0.000037	0.041745	0.041462	0	0
Market price % change	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Consumer price % change	0.000005	0.000005	-0.000392	-0.000389	0	0
Producer price % change	0.000005	0.000005	0	0	0	0

Source: Author estimates based on GTAP version 9 and South Africa 5x3 database aggregation

The policy implication is that the full tariff liberalisation would have offered the same results in spite of the implementation timing. Therefore, there is a loss of the potential trade benefits that would have accrued. Without the simulated tariff liberalisation in 2011 and 2012, there is no stimulation of output neither is there an increase in exports.

As expected for a small sector such as frozen orange juice, the impacts on prices are small both in 2012 and 2016. In both scenarios PC2*(b)* and PC2*(c)*, the consumer price in the EU28 decreases amongst all other price changes in other regions, which show either an increase or no change. A decrease in consumer price, which is a response to the tariff liberalisation, would be a welcome development for

EU consumers. The implication of these results is that there will be no substantial effects on the world price culminating from the small size of the share of South Africa's frozen orange juice export trade, as the discussion of the base structure in Section 5.3.2 has shown.

5.3.3.2 Export changes in the frozen orange juice sector and other sectors of the model

The South African exports in the frozen orange juice sector increase by 29.4% regardless of whether the 100% EU tariff liberalisation on frozen orange juice was implemented in 2011, 2012 or 2016. Table 5.8 shows the results for 2011, and Table 5.9 for results of 2012 and 2016. At full implementation of the TDCA in 2012, the preferential tariff on frozen orange juice is still 7.9% and a full liberalisation simulation shows that, had this occurred, the exports would increase. Such an increase, however, became possible only in 2016 at the inception of the SADC-EU-EPA. A 100% tariff liberalisation is standard under the SADC-EU-EPA, as of 2016/17 when the new concession was implemented. The frozen orange juice sector, thus, faces an attractive situation emanating from the tariff liberalisation, and such increases in exports would likely lead to further developments in the processed orange juice sector. A 100% liberalisation changes the structure of exports in South Africa; however, the output of frozen orange juice in South Africa increases by only 0.04%, as noted in Section 5.3.3.1. Exports increase by a huge margin in comparison to the output increase, implying a shift from domestic consumption to exports. Due to these substantial export gains it would be expected that South Africa (in 2011 and 2012) would favour the liberalisation, and the EU28 would not be in favour simply because intra-EU exports for frozen orange juice decrease by 0.04%. The findings on export increases due to the in-quota tariff liberalisation is in agreement with the findings of Li and Carter (2009). The policy implications point to the need for support policies to stimulate output in order to ensure adequate export potential so that the pressure is not on shifting from domestic consumption to exports which may, as a result, prejudice consumers with a price increase.

In Table 5.8, negative impacts on exports from South Africa to the EU are observed for the rest of the sectors. Though the percentage changes are small, the decrease in exports observed is more for the 'non-agricultural' sector followed by the 'agricultural' sector. The policy implications concerning these findings bode on the observation that tariff liberalisation in one sector hampers exports in other sectors. This is expected, given that the liberalisation scenario in this section pertains only to the frozen orange juice sector. Mold and Mukwaya (2016) note that decreases occur in other sectors because resources are reallocated to sectors favoured by the implemented trade liberalisation policy. Despite the TDCA having concessions in other sectors, such a result serves to strengthen the argument that coordinated efforts should be made by policymakers to promote export growth in the rest of the sectors of the economy. The negotiation process could also involve seeking concessions of relevant magnitude under the same trade agreement for which tariff liberalisation has been granted in the frozen orange juice sector.

In addition, intra-regional exports decrease for the EU28, and, at the same time, exports decrease from the ROW region to the EU28 by 0.04% in both PC2*(b)* and PC2*(c)* (Table 5.9). This decrease in exports is supported and has been explained in other literature (Gilbert, 2008; Ingco and Winters, 2008) as being a result of the erosion of preferences. Ingco and Winters (2008) note that preferential TRQ allocation to a specific country limits market access by other countries. The other individual countries, included in the ROW region, receiving preferences for frozen orange juice from the EU28 are Morocco, Turkey, Tunisia, Algeria, Israel and Chile. Morocco, like South Africa, receives a preferential tariff quota. The countries (competing with South Africa to receive tariff concessions) are expected, as indicated in various literature (Gilbert, 2008; Ingco and Winters, 2008), to experience a further decrease in their exports to the EU as the demand increases for the exporter (South Africa) enjoying further liberalisation. Not only will the exports decrease for competing countries or regions receiving preferences, but there will be an export reduction for the rest of the countries that had not been benefiting in terms of preferences.

5.3.3.3 Import changes in the frozen orange juice sector and other sectors of the model

The removal of tariff barriers in 2011 has positive impacts on imports for all South African sectors and negligible negative effects for the agricultural sector of the EU28 (Table 5.8). The ROW region does not experience any changes in imports in any of the sectors. Whilst there is no impact on ROW region imports of frozen orange juice, the EU28 imports increase by 0.04%. The possible explanation for an increase in EU28 imports is that after full tariff liberalisation, imports of frozen orange juice from South Africa into the EU28 become relatively cheaper in comparison to frozen orange juice produced in ROW. The same reasoning is advanced in Nicita and Rollo (2015): trade liberalisation, where small export shares are concerned, tends to have no impact on the world trade. This supports the findings concerning the frozen orange sector in South Africa. The policy implications is that, since full tariff liberalisation of the frozen orange juice TRQ promotes increased EU imports by a small amount, policymakers and trade policy negotiators, despite boosting exports, should also give attention to the negotiation for removal of other influential factors (such as NTMs) as a support strategy to further boost the South African exports to the EU. Import price changes and other related price changes are further explained in Section 5.3.3.4.

5.3.3.4 Price changes of the frozen orange juice sector

Market price changes, consumer price and producer price, depicted in Table 5.10, all show a very small positive change, except in the EU28 where the consumer price decreases by roughly 0.0004% for frozen orange juice.

Table 5.10: Changes in prices due to full tariff liberalisation in 2011

Variables and sectors	**South Africa**	**EU28**	**ROW**
Market price % change			
Frozen orange juice	0.000005	0.000005	0.000005
Other processed food products	0.000005	0.000005	0.000005
Agricultural	0.000006	0.000006	0.000006
Non-agricultural	0.000004	0.000004	0.000004
Services	0.000006	0.000006	0.000006
Consumer price % change			
Frozen orange juice	0.000005	-0.000395	0
Other processed food products	0.000005	0	0
Agricultural	0.000005	0	0
Non-agricultural	0.000003	0	0
Services	0.000005	0	0
Producer price % change			
Frozen orange juice	0.000005	0	0
Other processed food products	0.000005	0	0
Agricultural	0.000006	0	0
Non-agricultural	0.000004	0	0
Services	0.000006	0	0
Domestic price % change of commodity supplied from South Africa			
Frozen orange juice	0.000005	-7.353895	0.000005
Other processed food products	0.000005	0.000005	0.000005
Agricultural	0.000006	0.000005	0.000005
Non-agricultural	0.000004	0.000004	0.000004
Services	0.000006	0.000006	0.000006
Import price % change			
Frozen orange juice	0	-0.021311	0
Other processed food products	0	0	0
Agricultural	0	0	0
Non-agricultural	0	0	0
Services	0	0	0

Source: Author estimates based on GTAP version 9, South Africa 5x3 database aggregation

The greatest price change (-7.35%) occurs in the domestic price of imported frozen orange juice by the EU28 from South Africa. The 100% liberalisation concession is of no consequence on the producer price. This finding is supported in Larue, Gervais and Pouliot (2007), denoting TRQs to be a supply-management program used to achieve domestic price targets. The producer price change results are quite significant for the EU28, which is trying to protect its sensitive product. There is also a 0.02% decrease in the import price of frozen orange juice for households in the EU28. Policy implications stem from the findings on the price response to tariff liberalisation, particularly the domestic price of imported frozen orange juice in the EU which decreases by an equal amount as the power of the tariff liberalised. Therefore, the same tariff liberalisation policy should be promoted for other TRQs since price decreases benefit consumers and can be associated with increased EU demand for the South African imports. The influence that these price changes have on welfare are discussed in Sections 5.3.3.7 and 5.3.3.8.

5.3.3.5 Consumption changes and cost structure of consumption of frozen orange juice

Findings presented in Table 5.11 show the household spending on commodities as well as the cost structure of consumption.

Table 5.11: Cost structure of consumption and consumer demand in 2011

	Cost structure of consumption in the base (%)			% change in consumer demand		
Sector	**South Africa**	**EU28**	**ROW**	**South Africa**	**EU28**	**ROW**
Frozen orange juice	0.000284	0.000170	0.000199	0.000001	0.000245	0
Other processed food products	0.058684	0.039379	0.042550	0.000001	0	0
Other agriculture	0.166214	0.089912	0.115285	0.000001	0	0
Non-agricultural	0.250281	0.258973	0.176963	0.000002	0	0
Services	0.524537	0.611566	0.665004	0.000002	0	0
Total	*1.000000*	*1.000000*	*1.000000*	*n/a*	*n/a*	*n/a*

Source: Author estimates based on GTAP version 9, South Africa 5x3 database aggregation

As expected, the frozen orange juice sector (which is a single tariff line), exhibits the smallest budget share in total household consumption in comparison to other sectors in the South African economy. This is the trend for all regions. South Africa, however, has a slightly larger cost share in frozen orange juice consumption in comparison to the frozen orange juice shares exhibited for the EU and ROW. Due to the liberalisation of the tariff in 2011, the results indicate almost no changes in the household demand for all commodities, with only a slight increase for the EU28. This is an expected result: the changes are close to zero since this commodity is not mainly for household consumption but, rather, an input in the production process for other fruit juices. The policy implication is that tariff liberalisation for a commodity with low cost shares in a household's consumption does not lead to substantial changes in consumption. This finding is supported by the findings of De Sousa *et al.* (2012) as well as Nicita and Rollo (2015), who have noted the low shares in world trade for African nations. Therefore, other support policy strategies that promote impacts leading to greater price decreases in the domestic goods market would promote more household consumption.

5.3.3.6 Changes in factor demand in the frozen orange juice sector

Figure 5.10 shows the percentage change in the employment of factors, under different scenarios, used in the frozen orange juice sector in South Africa. Whilst the proportion of changes is small and positive, indications show that, in relative terms, the demand for labour and capital shows a greater increase than the demand for land and natural resources. The changes in labour and capital employment have equal proportions of about a 0.04% increase. The EU28 and ROW region face a decrease in the frozen orange juice sector's demand for all factors of production (not shown in Figure 5.10).

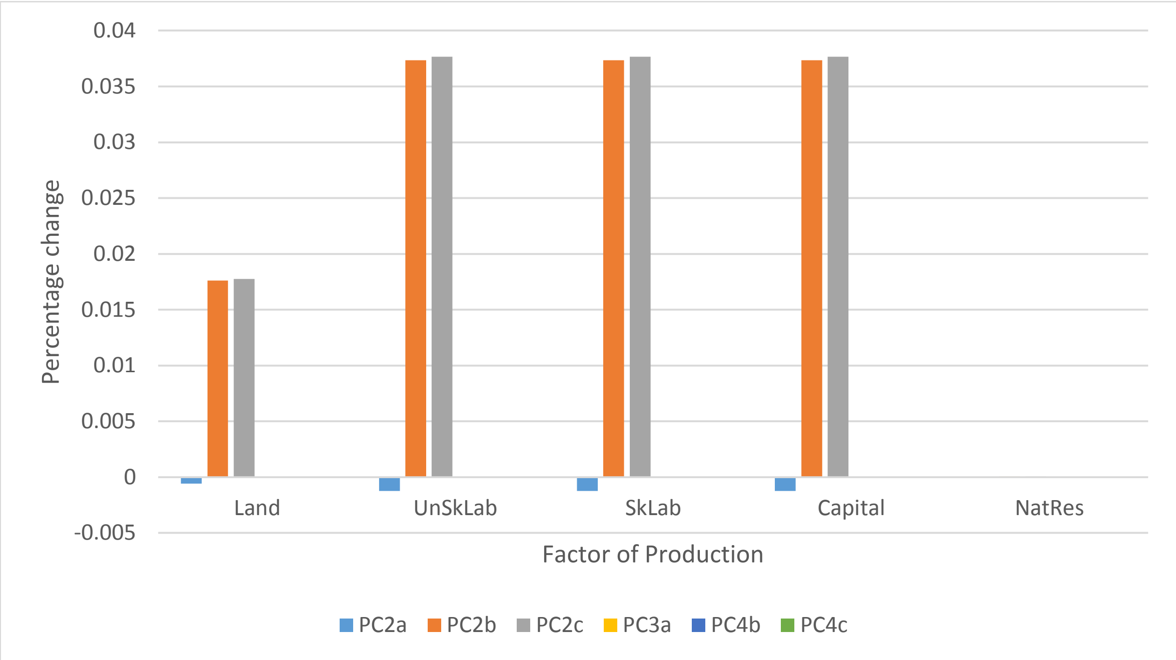


Figure 5.10: Comparison of changes in demand for production factors by the frozen orange juice sector in South Africa in 2012 and 2016

Source: Author's computation based on GTAP 9

This would seem consistent given that, in the ROW region, exports have decreased due to preferential liberalisation of the tariff line. Such decreases in the demand for labour, as an example, may explain the negotiating position of the EU in the TDCA

TRQs for frozen orange juice which, whilst the tariff has been liberalised, has maintained a yearly cap for the quota quantity. Though there are small changes in factor demand, the EU28 is likely to maintain a negotiating position that preserves the employment of labour. McDonald and Walmsley (2003) also note that negative movements in employment of production factors are not a welcome development for governments. The policy implication is that South Africa's trade policy negotiations are thus inclined to favour the tariff liberalisation which improves the employment of production factors.

5.3.3.7 Welfare impacts based on EV

Table 5.12 presents the findings of the change in welfare, under different scenarios, after the EU28 liberalisation of the frozen orange juice tariff on exports from South Africa.

Table 5.12: Welfare impacts of the liberalisation of frozen orange juice

Scenario	Region	**Welfare measured in EV** (US$)			
		Allocative Efficiency	*TOT*	*Investment and savings*	**Total**
PC2*(a)* Unfilled quota 2011; 100% tariff liberalisation in 2011. TDCA	South_Africa	-21	5346	286	5611
	Eu_28	3747	-4677	-160	-1090
	Row	-225	-669	-126	-1021
	Total	**3500**	**0**	**0**	**3500**
PC2*(b)* Unfilled quota 2012; 100% tariff liberalisation at full TDCA implementation.	South_Africa	-30	5131	241	5341
	EU_28	3627	-4498	10	-861
	ROW	-199	-633	-251	-1083
	Total	**3398**	**0**	**0**	**3398**
PC2*(c)* Unfilled quota 2016; 100% tariff liberalisation. SADC-EU-EPA inception.	South_Africa	-77	4732	-138	4517
	EU_28	3348	-4134	318	-468
	ROW	-149	-598	-180	-928
	Total	**3121**	**0**	**0**	**3121**
PC3*(a)* Quota fill 2011; TDCA tariffs	South_Africa	-130	-2425	-153	-2708
	EU_28	474	2527	98	3098
	ROW	-9	-102	55	-55
	Total	**334**	**0**	**0**	**334**
Scenario	**Region**	**Welfare measured in EV** (US$)			
		Allocative Efficiency	*TOT*	*Investment and savings*	**Total**
PC4*(b)* Quota fill 2012; 100% tariff liberalisation at full TDCA implementation.	South_Africa	-103	-1929	-107	-2139
	EU_28	239	2076	-8	2307
	ROW	-7	-147	115	-39
	Total	**129**	**0**	**0**	**129**
PC4*(c)* Quota 2016; 100% tariff liberalisation. SADC-EU-EPA inception.	South_Africa	-81	-1672	58	-1696
	EU_28	190	1811	-161	1841
	ROW	-6	-139	103	-42
	Total	**103**	**0**	**0**	**103**

Source: Author's GTAP model results

In scenario PC2*(a)*, the tariff represented in the model is the TDCA tariff of 2011 which, in the agreement, represents the existing concession of a 50%liberalisation of the MFN tariff. The welfare results of PC2*(a)* are, therefore, compared to scenarios PC2*(b)* PC2*(c)* PC3*(a)* PC4*(b)* and PC4*(c)*, which refer to the unilateral tariff liberalisation by the EU.

The results show a positive net welfare for the globe/world in all scenarios with the highest gains (US$3 500) obtained in PC2*(a)*. Global welfare is the lowest in scenarios PC3*(a)*, PC4*(b)* and PC4*(c)* compared to that obtained in other scenarios. Given that a trade distortion has been removed, as expected for each of the scenarios, the total welfare measured in EV is positive. South Africa, however, experiences negative results for EV in scenarios PC3*(a)*, PC4*(b)* and PC4*(c)* which differs from scenarios PC2*(a)*, PC2*(b)* and PC2*(c)* in that a quota fill experiment has been implemented for scenarios PC3*(a)* PC4*(b)* and PC4*(c)*. The policy implications of these results indicate that the factors influencing TRQ fill increase the trade costs; hence, the reason why quotas are not filled. Such influential factors (which include NTMs) are identified in various literature studies (Nimenya *et al.,* 2012; Disdier *et al.,* 2015; Cadot and Gourdon, 2016) whose findings agree with this study's findings: the influential factors raise import prices and result in negative trade effects. Forcibly filling the TRQs, as this study's quota fill experiment demonstrates, will lead to losses in welfare. This points to a need for interventions aimed at boosting output targeted for the EU export market. However, at the same time, it is critical for both the exporting establishments and policymakers to address influential factors impacting TRQ fill. Some of the strategies bode awareness and compliance training on EU export standards, especially for non-historical exporting establishments that might take advantage of the market access preferences of the EU.

Negative total welfare impacts in the EU28 for PC2*(a)*, PC2*(b)* and PC2*(c)* indicate the sensitivity of the frozen orange juice sector, which has already been classified as sensitive in the trade agreement. This likely justifies the EU's stance of keeping the frozen orange juice sector protected through TRQs. The implications of this result confirm the expectation of welfare losses for the country or region implementing a tariff cut. The findings of Arita *et al.* (2017) agree with these findings and the authors further explain that the welfare decreases are due to the deteriorating TOT. Ramos, Bureau and Salvatici (2010) also indicate welfare losses in the presence of TRQs. South Africa, in comparison to the ROW, already faces low in-quota tariffs for frozen orange juice, but the 100% tariff liberalisation has a positive impact on welfare in South Africa. The gains, though positive, are not very large. However, on the South African side, trade policy negotiations must continue for increased EU market access in the frozen orange juice sector. South Africa’s trade negotiating position should aim for the expansion of the TRQ or quota free access.

The ROW experiences negative welfare for all scenarios. The welfare loss in the ROW can be explained on the basis of possible preference erosion when barriers to exports for South Africa are reduced by the EU28. The policy implication of this finding is that there are always winners and losers due to trade liberalisation. However, the challenge is for the South African trade negotiators to request for further market access concessions that open up the EU market, since the findings clearly show the best use of TDCA preferences is in the frozen orange juice sector. The frozen orange juice industry should also aim for competitiveness strategies to sustain advantages over the ROW’s preference erosion. The results are consistent with Jackson and Shepotylo (2018) who note that countries left out of trade liberalisation experience economic losses due to trade preference erosion, among other factors. Comparisons based on the timing of the liberalisation show that welfare gain is higher in 2011 than in both 2012 and 2016; hence, the implication of this finding is that timely implementation of liberalisation policies is key.

Further decomposition of the total welfare shows that there is a loss of allocative efficiency effects but a gain in the TOT effects for South Africa in scenarios PC2*(a)*, PC2*(b)* and PC2*(c)*. South Africa and the ROW have losses in allocative efficiency for all scenarios, signalling resource movement from efficient sectors to the non-efficient frozen orange juice sector. However, the allocative efficiency losses are quite small, so the inefficiencies in South Africa are not substantial enough to mask the TOT effects (which are positive) in scenario PC2*(a)*, PC2*(b)* and PC2*(c)*. For scenarios PC2*(a)*, PC2*(b)* and PC2*(c)*, there are adverse TOT effects for the EU and the ROW. These adverse TOT effects are also indicated in Arita *et al.* (2017).

The gains in South Africa are sufficient enough to offset the negative effects in the EU28 and the ROW, resulting in a positive total welfare in the globe for these three scenarios. The welfare gains for South Africa, due to an EU28 tariff removal on frozen orange juice in 2011, are positive, in total, emanating mostly from the TOT contribution followed by investment and savings contributions. In relative terms however, the allocative efficiency losses are not that substantial. Negative TOT effects are experienced for the EU28 in scenarios PC2*(a)*, PC2*(b)* and PC2*(c)*. Such negative TOT effects are consistent with the findings of Gilbert (2008) that state that TOTs appear negative in unilateral liberalisation cases. The policy implication is that whilst there are positive welfare gains for South Africa, emphasis should be placed on strategies to make the frozen orange juice sector more efficient, so as to avoid allocation efficiency losses.

The total welfare gain for South Africa is US$5 611 in scenario PC2*(a).* As may be expected, the TOT, investment and savings welfare contributions are negative for the EU28 in the scenario PC2*(a)*. There is positive allocative efficiency in the EU28 in all scenarios. The ROW region experiences reductions in allocative efficiency and TOT effects. South Africa's TOT effects in 2011 are, as expected, supported by the results in Table 5.8 that show a substantial increase in the volume of exports by South Africa compared to the imports. South Africa, however, shows the inefficient use of resources manifesting in the negative allocative efficiency effects for all scenarios. The allocative efficiency results for the EU are positive in all scenarios. As noted above, policy strategies are required to ensure competitiveness and efficiency of the frozen orange juice sector.

Further liberalisation under the SADC-EU-EPA is represented in scenarios PC2*(c)* and PC4*(c)*. A welfare loss is obtained in scenario PC4*(c)*; however, this loss is smaller than that experienced in scenarios PC3*(a)* and PC4*(b)*. In scenario PC2*(c),* the TOT effects are positive but smaller than those in PC2*(a)* and PC2*(b).* The policy implication is that an attempt to fill quotas leads to losses, which clearly indicates the need for support policies targeted at the removal of other non-tariff influences that impact quota filling. In addition, the findings support the assertion of Razzaque and Vickers (2016) that the EPAs have largely not been beneficial, because exports from African nations to the EU have not increased as a result of the EPAs.

5.3.3.8 Welfare impacts based on quota rents

Calculations of the percentages of unfilled quota (*uTRQ*) in Table 5.13, based on Equation (4.15) (Section 4.2.4.2), show that South African frozen orange juice exporters lost a market access advantage by not exporting to fill the available quotas in 2010 to 2012. This was the period leading to the full implementation of the TDCA. The frozen orange juice TRQ is also not filled in 2016 but the unfilled portion is only 0.3%. The policy implication is that where preferential market access has been opened and exporters do not take advantage to fill TRQs losses are experienced. In support of this finding, various studies (Khorana, 2008; Li and Carter, 2009; Lim and Blandford, 2009; Meade *et al.,* 2010) have indicated the prevalence of unfilled TRQs. Hence, support strategies are needed to ensure adequate export production and the smoothing of influential factors preventing TRQ fill. The strategies could involve training in export market access requirements and compliance to EU export standards.

Table 5.13: Unfilled frozen orange juice TRQ in relation to the total EU28 notified TRQ

	Year						
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Notified allowable quota (Kgs)	910 000	931 000	952 000	973 000	994 000	1 015 000	1 036 000
Unfilled quota portion (Kgs)	441 232	420 049	129 541	0	0	0	3602
Percentage unfilled quota *(uTRQ)*	48.5	45.1	13.6	0.0	0.0	0.0	0.3

Source: Author's calculations based on European Commission Statistics (European Commission Statistics, 2016).

The price change results from scenarios PC3*(a)*, PC4*(b)* and PC4*(c)* are presented in Table 5.14 together with quota rent expected with the quota fill simulation and the relevant policy scenario. The quota rent calculation is based on Equation (4.14) after the EU domestic price change. The policy implication is that the size of the quota rent is dependent upon the magnitude of the price change. Other studies (Decreux and Ramos, 2007; Grant *et al.,* 2009) have also calculated quota rent based on price change and the allocation between the exporter and the importer. In this study, the quota rent is fully allocated to the exporter according to the specifications of the TDCA provisions. Another contrasting approach of this study is the manual calculation of the quota rent after the simulation. In the cited studies (Decreux and Ramos, 2007; Grant *et al.,* 2009), the quota rent calculation uses a different framework built into the modelling software. As indicated in the discussion of TRQ export regimes (Section 3.8.3), quota rents are only expected for the experiments in scenarios PC3*(a)*, PC4*(b)* and PC4*(c)* which assume filled TRQs; the results in Table 5.14 present the quota rents for those scenarios. The price change upon which the quota rent analysis is based is a result from the modelled scenarios.

Table 5.14: Liberalisation impacts and expected quota rents, frozen orange juice TRQ

Scenario	Domestic Price in the EU (US$/tonne)	World Price (US$/tonne)	Domestic price change in the EU (%)	Expected quota rent (US$/tonne)
PC3*(a)* Quota fill at 2011 baseline with TDCA tariff	1564	1724	-0.00136	-298
PC4*(b)* Quota fill at TDCA implementation in 2012 with zero tariff	1562	1227	-0.00105	333
Scenario	**Domestic Price in the EU (US$/tonne)**	**World Price (US$/tonne)**	**Domestic price change in the EU (%)**	**Expected quota rent (US$/tonne)**
PC4*(c)* Quota fill at SADC-EU-EPA onset in 2016 with zero tariff	1365	1071	-0.00090	293

Source: Author's calculations based on European Commission Statistics (European Commission Statistics, 2016) and GTAP model results

As expected, the influence on the domestic EU price is very small (less than 1%), and there is also no change in the world price of frozen orange juice after each of the scenarios PC3*(a)*, PC4*(b)* and PC4*(c)*, which typifies the relative small country that South Africa represents in this trade arrangement. Another factor explaining this is that the size of the frozen orange juice sector in the model in terms of world exports is also small. There is some variation in the results of scenarios PC3*(a)*, PC4*(b)* and PC4*(c)* given that in PC3*(a)*, the experiment of filling the TRQ in 2011 without tariff liberalisation induces a quota rent loss. However, such a loss does not materialise, explaining why TRQ remains unfilled in 2011. The policy implication is that without further tariff liberalisation and an improvement in the world price, there would be no incentive to fill the unfilled quota. In view of the findings, policymakers should also come up with strategies to increase exports with the aim of gaining an improved market share, which will lead to quota rent increases through the price impacts. Arita *et al.* (2017) in a study of reducing trade barriers between the EU and US agricultural food trade, finds that, after a tariff liberalisation, an expansion of exports leads to increases of prices of below 1% for all agricultural commodities, which agrees with the findings of this study.

Before the quota fill experiment in 2011 (PC3*(a)*), the world price is higher than the EU domestic price, and, after quota fill, the decreased EU domestic price is still dominated by the world price plus in-quota tariff. The quota fill data in Table 5.13, relating the 2011 baseline, clearly indicates that the TRQ was unfilled by almost 50%. The policy implication of a negative quota rent implies that the frozen orange juice exporters would need a subsidy to encourage exports to fill the quota, and such an intervention becomes counterproductive. This finding differs from other studies (Decreux and Ramos, 2007; Grant *et al.,* 2009) that did not find or calculate negative quota rents.

A per unit quota rent of US$333 obtained with scenario PC4*(b)* (representing full tariff liberalisation with a 100% filled TRQ at the full implementation of the TDCA) is higher than the US$293 per unit quota rent that would be obtained at the onset of the SADC-EU-EPA. The welfare results based on quota rents suggest that, had the TRQ been filled at the full implementation of the TDCA, the per unit quota rent would be higher than the per unit quota rent captured at the onset of the SADC-EU-EPA. This result mirrors that of the welfare measured in EV (Section 5.3.10) which suggests that gains are greater if the trade negotiations of the agreement are concluded sooner rather than later. Given that the quotas are, in reality, not filled, there is a welfare loss measured in per unit quota rent. The welfare loss is greater in scenario PC4*(b)* than in scenario PC4*(c)*. The welfare loss is quantified in forgone quota rents; EV results do not show this loss. The policy implication is that welfare calculations based on EV might be an overestimate as the potential quota rent is not taken into account. The findings of welfare loss indicate that some form of stimulus is thus required in South Africa to encourage the frozen orange juice TRQ to be filled in order to avoid the loss of potential quota rent. None of the reviewed studies have calculated potential quota rent as a welfare loss; hence, this study fills the gap in the literature by using this approach to calculate welfare loss.

5.4 CHAPTER SUMMARY

This chapter has presented the analysis of fill rates and has shown that most of the fruit products TRQs have not been filled throughout the implementation period of the TDCA from 1999 leading to the inception of the SADC-EU-EPA in 2016. The data has shown that when a quota is not filled, there is some missing trade, which is the difference between the notified quota and the actual quota quantity traded. The unfilled quota, therefore, has been characterised as a loss on preferential exports and, thus, a trade cost. This study has compiled a number of influential factors preventing tariff quota fill which are responsible for that trade cost and has surveyed fruit sector export participating establishments and key informants in the fruit products TRQ trade to establish their experiences.

The findings have shown that fruit sector participants' ability to access markets, in other words fill quotas, is influenced by a number of factors categorised under TRQ administration methods, TRQ definition and use conditions, supply and demand of the notified quota, and associated tariff level aspects. The weighted intensity of influence of each factor was calculated to gauge the extent to which a factor contributes to preventing quota fill or TRQ market access for South African fruit products into the EU market. The findings have suggested that when influential factors present low negative effects, then TRQs can move towards 100% fill and quota rents can be generated.

Following the analysis of factors influencing TRQ fill, this chapter has presented the CGE modelling results on the impacts of TRQs on export market access of South African products in the EU market. In order to analyse TRQ impacts, the influential factors (including NTMs) preventing quota fill, obtained from exporter experiences, were incorporated as extra model information in the form of a shock input to the GTAP model to determine the results on market access variables when the influential factors are removed. An application of the GTAP model to the frozen orange juice case was undertaken in further analysis of potential quota rent changes.

The results have shown that South African exports of TRQ fruit products may, as a consequence of TRQ policies in place, not fully benefit in realising the potential trade and welfare gains in the processed fruit products sector. The results have shown that South Africa exports viewed in the base data are small on the global scale as well as small in terms of South Africa's share in the EU. This explains the small size impacts on market access variables as well small EV changes in value terms.

In this chapter new information, in addition to the calculated weighted score of the intensity of factors preventing quota fill, has been provided. Given that, in previous studies on the TDCA welfare evaluation, quota rent changes in the context of unfilled TRQs have not been analysed, this study has been able to add to the knowledge on the impacts of TRQ market access. In addition to welfare analysis measured in EV (which is a measurement of expenditures after a policy change), the welfare measure has been extended (in this chapter's analysis) regarding the manner in which quota rents losses are calculated on the benchmark of market access benefits of filled TRQs. If the exporters were to fill the quotas then this would enable the capturing of quota rents. Full tariff liberalisation and quota expansion scenarios for the frozen orange juice sector have been estimated to illustrate quota rent losses. Whilst market access should improve for the TRQs granted under the TDCA, the inability to fill the quotas leads to some quota rent losses which, in this study, are viewed as a loss in welfare. Such welfare losses due to quota rents that are not captured have been estimated using results in TRQ liberalisation scenarios.

CHAPTER SIX

6. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

Access barriers to the EU fruit and fruit products market have been of concern to South African exporters, policymakers and stakeholders (including representative associations in the fruit sector). South Africa and the EU implemented the TDCA, a bilateral trade agreement, between 1999 and 2016. As part of an effort to address export market access barriers, the TDCA had a trade chapter that, among other provisions, set out the framework of TRQ concessions for fruit/fruit products. A TRQ is a trade policy instrument that allows a low in-quota tariff to be charged for quantities exported within a given quota and a high out-of-quota tariff charged for quantities above the guaranteed quota level. Within this framework, the EU granted fruit products TRQs to South Africa on a preferential basis.

At the end of 2016, the SADC-EU-EPA replaced the TDCA trade chapter. The fruit products TRQ concessions implemented under the TDCA are now being implemented under the SADC-EU-EPA. The SADC-EU-EPA covers the trade relationship between the EU and the SADC-EPA Group (Botswana, Lesotho, Namibia, Mozambique, Swaziland and South Africa). South Africa, however, still enjoys preferential market access to the EU market for fruit products. The same fruit products TRQs that had been obtained under the TDCA are granted to South Africa under the SADC-EU-EPA.

The main objective of the study was to modify the GTAP CGE model sectors and innovate the model to enable an analysis of TDCA fruit/fruit products TRQs market access influential factors. To achieve the first objective of the study, the thesis analysed fruit products export flows and established that quota export regimes for the fruit products were “in quota” except for the frozen orange juice TRQ that traded in “at quota” in 2015. The analysis to determine the TRQ export regimes was supported by an overview discussion of the TRQ implementation and administration framework. The TRQs for fruit/fruit products granted to South Africa by the EU have remained underfilled, as exporters have failed to take advantage of the market access granted throughout the implementation period of the TDCA. The underfill situations have generated interest, and, therefore, this thesis unpacked the drivers of TRQ underfill in order to contribute in the market access debate, which is of importance to researchers, exporters, policymakers and trade negotiators. Exporter experiences, based on a survey, were analysed to establish the stringency of influential factors in affecting exports and subsequent quota fill in the fruit sector.

The thesis provided a comprehensive analysis of agricultural market access for South African fruit and fruit products exports in the EU under TRQs. Using the GTAP CGE model, the thesis strived to examine the TRQ policy instrument as a determinant of market access. The thesis examined influential factors within the context of fruit products TRQ fill and constructed a weighted score of each influential factor preventing TRQ fill. An aggregation of the weights of the various influential factors, falling within the category of NTMs, was undertaken and then used as an input in GTAP CGE model simulations of trade liberalisation scenarios.

In order to analyse fruit products TRQ exports under the TDCA, the thesis relied on the latest GTAP version 9 database which is the year 2011. The database was aggregated into three (3) regions and nine (9) sectors, and, of the nine (9) sectors, five (5) were the fruit products sectors, which formed the focus of TRQ analysis in the thesis. In the scenario applied to analyse the case of the frozen orange juice TRQ, the GTAP database was aggregated into five (5) regions. TDCA fruit products tariff rates data was supplied to the GTAP database as a counterfactual simulation in order to create the base case scenario reflecting TDCA tariff concessions offered for South African fruit products exports to the EU.

The six (6) fruit products of focus in the thesis are the products traded under TRQs of TDCA and administered by the DAFF in South Africa. The fruit products are frozen strawberries (HS0811.10); canned pears, apricots and peaches (HS2008.40/50/70); canned tropical mixtures of fruit (HS2008.97); canned non-tropical mixtures of fruits (HS2008.97); frozen orange juice (HS2009.11); and pineapple juice and apple juice (HS2009.41/49/71/79). The EU defines the fruit products as sensitive and includes them in an EU list of sensitive products, which affords them protection from full trade liberalisation. The EU's reasons for providing fruit products market access through TRQs is explained that, in the context of the TDCA, such fruit products are sensitive products of the EU. Hence, the EU justifies the motivation for the existing quota restriction, coupled with the imposition of an in-quota and out-of-quota tariff rate, as a trade protection measure for a product of strategic importance to the EU.

In the first part of the analysis in Chapter 3, the thesis presented an overview of the TDCA, detailing the implementation and administration framework of fruit products TRQs, in the context of the TDCA trade chapter and the relevant trade protocols. The administration of TRQs mainly centres on the allocation of the yearly available quota to the prospective exporter. The DAFF is the institution within South

Africa tasked with the administration of the fruit products TRQs. Under the administration mechanism, exporters receive permits on an annual basis for fruit TRQ exports to the EU governed through a DAFF-originated and existing trade permit system. Government Gazettes are used as a platform by DAFF to publish the quota availability as well as to publish the relevant TRQ administration mechanism for fruit/fruit products under the TDCA.

Chapter 5 of the thesis presented the results and discussion which included the analysis of exporter experiences with factors affecting the export market access/quota fill of fruit products. The weighted score of intensity of influence of each factor preventing quota fill was determined based on Likert scores obtained from a survey of exporting establishments in the fruit/fruit products sector. The score of the intensity, once determined, enabled the linking of the TRQ market access influential factors as a model input to the GTAP model in the analysis of the impacts of TRQs in the GTAP CGE model. The thesis presented the results and discussion of the GTAP CGE model simulation of TRQ liberalisation impacts on export market access of South African fruit products into the EU market. The results focused on export, output, consumption and price changes as well as welfare changes measured in EV. Furthermore, the results and discussion of the application/implementation of the GTAP model implemented in the frozen orange juice case to further analyse welfare based on quota rent changes were presented.

The policy case scenarios that were simulated in the GTAP CGE static model to analyse the third and fourth study objectives comprised some sub-simulations. There were two (2) sub-simulations on quota export expansion, three (3) sub-simulations on free trade conditions involving the abolition of the in-quota tariff, two (2) sub-simulations on the removal or reduction of influential factors to quota fill, and three (3) sub-simulations on a combined quota fill and 100% tariff removal. Finally, one simulation combined full tariff liberalisation with NTMs removal. GEMPACK software was used to carry out the policy simulations in the GTAP model and to decompose welfare results measured in EV. The power of the tariff (*1 + t*) and quota volumes of exports were the exogenous variables upon which comparative statics results of policy simulations were reported.

A summary of results on factors influencing TRQ fill and the GTAP simulations are presented in Section 6.2.1 to Section 6.2.3 below.

6.2 SUMMARY OF RESULTS

6.2.1 TRQ export regimes and exporter experiences regarding TRQ fill factors

The first objective of the study was addressed through the analysis of quota fill rates for all fruit TRQ products. During the TDCA implementation period, none of the TRQs were filled, except for frozen orange juice in 2015. The average unfilled percentage of the quota, during the period spanning two (2) years pre TDCA full implementation in 2012 and four (4) years post TDCA full implementation, was calculated. The frozen strawberries (HS0811.10) and the tropical mixtures of fruit (HS2008.97) TRQs were completely unfilled. Apart from the TRQ for frozen orange juice (HS2009.11), with an average unfilled quota of 15.5%, the next best performing TRQ was pear, apples and pineapple (HS2008.40/50/70) with 33.8%. The fill rates were used to determine the TRQ export regime that defines the binding element of the TRQ policy. The frozen orange juice TRQ, therefore, was the only TRQ to have been an “at-quota” export regime in 2015 and “very close to quota” in 2016, where the quota level influenced the frozen orange juice exports. The rest of the TRQs were exported at the “in-quota” export regime for the whole period analysed, they did not exceed the quota. In view of these results, only the frozen orange juice TRQ would gain quota rents.

To answer the second study objective, the study used a questionnaire, comprising twenty-six (26) questions on fruit exports, to collect information on exporter experiences with factors influencing tariff quota fill under TRQs. The questions in the structured questionnaire were based on a background review of literature on market access under TRQs, from which four (4) categories representing influential aspects of market access under TRQs were drafted. The predetermined categories of influential factors to TRQ market were: (A) TRQ administration methods, (B) TRQ definition and use conditions (C) TRQ supply and demand conditions of export commodity for the notified TRQ and (D) tariff levels and associated trade arrangements.

The respondents, including Chief Executive Officers, managers in respective relevant portfolios as well as government officials, comprised the sixteen (16) exporting establishments knowledgeable about the TDCA and fruit TRQ exports. The government officials were drawn from the DTI (involved in the implementation of the trade agreement) and the DAFF (involved with the administration of TRQs).

The influential factors preventing tariff quota fill were assessed in terms of individual weights of intensity of influence in preventing quota fill. Seventeen (17) of the analysed factors influencing market access were identified as NTMs. NTMs are among the influential factors to quota fill and are a trade cost. Such a trade cost is, therefore, an addition to the in-quota tariff affecting tariff quota fill. The findings on the various factors influencing quota fill are summarised below.

Influential factors classified under NTMs were indicated to a have combined weight of intensity of influence of 68.75% in preventing quota fill, with the rest accounted for by supply and demand factors as well as tariff related influences. Exporting establishments stated that the amount of quota applied for by all applicants (large amounts consequentially impose smaller individual allocations) – at 7.11% – and the criterion of the total number of applicants for the quota (posing competition for quotas) – at 6.62% – as the two (2) factors exhibiting the greatest intensity in preventing quota fill. These two (2) factors (which are part of the NTMs) fall under the category TRQ definition and use conditions and are under the control of DAFF as the institution administering the TRQs. Not all influential factors preventing quota fill are attributable to the importer. The results in this regard also found commonly occurring influences in trade agreements, such as the stringent safety standards and SPS measures as well as the rules of origin, to be among the factors individually weighted to have a greater influence on preventing quota fill.

6.2.2 TRQ liberalisation impacts on market access of fruit products to the EU market

This summary of results satisfies the third and fourth study objectives. The results relate to three (3) regions distinguished in the model, namely South Africa, the EU28 and the ROW, with emphasis on reporting the impacts in South Africa. The six (6) fruit products TRQs of the TDCA were analysed in the GTAP model under five (5) TRQs specified at the HS 6-digit level code. This was necessitated by the canned tropical mixtures of fruit TRQ and the canned non-tropical mixtures of fruit TRQ belonging to the same HS 6-digit level commodity group in the GTAP model, despite the TDCA granting two (2) separate TRQs. In this regard, five (5) TRQs, comprising a total of ten

(10) HS 6-digit tariff lines, were extracted from the GTAP defined fruit products OFD sector to be presented as five (5) new GTAP sectors. The findings are summarised accordingly for quota expansion, full tariff liberalisation pre full implementation of the TDCA, quota fill and NTMs removal scenarios.

The results of the two (2) scenarios of quota expansion by the TDCA 3% annual growth factor *(*PC1*(a)*) and quota expansion by actual growth rate of exports (PC1*(b)*) highlighted the impacts of quantity changes on domestic prices in South Africa and the EU, production/output in South Africa and consumption in South Africa. The simulated expansion of exports at the TDCA TRQ 3% annual growth factor showed that consumption and prices respond negatively. The exception is for industry output that increased for all TRQs in South Africa. In comparison to scenario (PC1(*b*)) – determining if the TDCA provisions had provided for an expanded TRQ by the actual recorded rate of increases in TRQ exports – household demand for all TRQs would have increased in South Africa. Output in the frozen orange juice sector only would also have increased in this scenario. The decrease in output in all other TRQs has shown that, as expected, there was a shift to the more productive sector of frozen orange juice. The shift is supported by the results showing a 0.04% increase in the demand for labour and capital resources. Observations on the data on TRQ fill has also shown that the frozen orange juice sector was the only sector in which quotas had been filled in a specific year since the full implementation of the TDCA. Output prices for all TRQs did not change in South Africa.

The findings on welfare impacts of the simulated scenarios were measured in EV using US$ values. The changes in welfare were found to be small and this is explained by the fact that the share in industry GDP of the processed fruit products sector was only 2% in the model and that the frozen orange juice sector had a share of 0.01 in the industry GDP of South Africa. The labour share of the other processed food products sector was also approximately 3%. The results show that if South African exporters filled the TRQs, a welfare loss of US$14 040 would have resulted indicating that a boost to TRQ fruit products production draws away resources from more productive non-TRQ sectors in the economy. The welfare loss is, thus, a reason that can explain the unfilled quotas. The expansion of exports by the TDCA 3% annual growth factor resulted in the highest welfare loss (US$23 140) for South Africa among all the scenarios simulated. A full tariff liberalisation scenario, however, showed a gain in welfare of US$31 943. The removal of non-tariff influential factors brought higher positive welfare results (US$189 891) and even a greater gain (US$221 834) when NTMs removal was implemented together with a full tariff liberalisation.

6.2.3 Application of the GTAP CGE analysis in the frozen orange juice case

The thesis also applied the GTAP CGE model to analyse the case of the frozen orange juice TRQ, specifically to establish welfare measured in both EV and quota rent changes. In addition to the 2011 (pre-TDCA) database, growth forecasts were used to establish two additional baselines for 2012 (TDCA) and 2016 (SADC-EU-EPA).

The findings on welfare measured in EV show that if the provisions of the SADC-EU-EPA on the frozen orange juice TRQ were implemented pre full implementation of the TDCA, higher gains in welfare (US$5 611) result when compared to gains resulting at full implementation of the TDCA (US$5 341) and SADC-EU-EPA inception (US$4 517). Further liberalisation of the tariff (which is a SADC-EU-EPA concession of in-quota tariffs of 0%), as well as an assumption of quota fill, brought welfare losses of US$2 139, compared to US$1 696 for the TDCA and SADC-

EU-EPA respectively. At the full implementation of the TDCA, full tariff liberalisation without quota expansion resulted in higher welfare (US$5 341) gains than full tariff liberalisation at 100% quota fill, which resulted in a loss of US$2 139. The loss in welfare, when South Africa filled the quotas, is explained by the negative TOT effects that accompanied the quota fill. In scenarios PC3*(a),* PC4*(b)* and PC4*(c)*, the frozen orange juice quota was filled and the expected quota rents showed that a failure to gain those rents resulted in a loss of US$298 pre full implementation of the TDCA, a gain of US$333 at full implementation of the TDCA and a gain of US$293 at the inception of the SADC-EU-EPA.

6.3 ACHIEVEMENTS AND CONTRIBUTIONS OF THE STUDY

The main study objective – modifying the GTAP database and model to analyse TDCA fruit products TRQs – was achieved through the innovations and extra model information supplied in the GTAP analysis (which includes the addition of fruit products TRQs and TDCA tariffs in the GTAP database). New elements in the analysis of the TDCA to include fruit TRQ products were thus contributed. The main study objective was achieved through the four (4) sub-objectives, which achieved the study outcomes and contributed in the specific study areas stated below.

The study determined TRQ regimes and the extent of factors influencing TRQ fill from the exporting country's perspective; thus, adding to the literature on TRQ fill and highlighting the mismatch between the FTA provisions and the actual trade situation. The strength of each influential aspect, determined from information obtained from the exporter experiences, contributes to the literature on in-depth understanding of the inefficiencies of TRQs as trade policy tools. Whilst NTMs, which are part of the TRQ fill influential factors, have been modelled in the GTAP model using various methods, this study has provided a new way to calculate the strength of the shock input to remove NTMs in the GTAP model. The intensity of influence of NTMs was calculated based on the reported experiences of the fruit products sector participants and was used as an input to the GTAP model to simulate the removal of NTMs preventing quota fill. The study, by achieving this objective, contributed a Likert score-based procedure to calculate the strength of influence of factors affecting TRQ fill. This paved the way to innovate the removal of NTMs in the GTAP model without relying on the most common approach of calculating AVEs of NTMs.

The model innovation to uniquely fill TRQs in the GTAP model (through a technique to expand the trade flows of the targeted fruit TRQ tariff lines to a level of quota fill) was achieved by incorporating a determined TRQ fill factor in a specific GTAP model equation. Using this technique, the study has achieved the objective of determining the loss in quota rents resulting from unfilled TRQs thus contributing to the literature on analysing welfare in trade agreements. In this regard the study has been able to conclude that the welfare analysis involving TRQs and measured only in EV does not capture the potential losses in welfare resulting from uncaptured quota rents. Based on the simulated policy scenarios, the study has also been able to determine the TRQ liberalisation policies that provide the more favourable trade and market access benefits thus contributing to the policy debate on TRQ regimes and the proper targeting and selection of appropriate liberalisation policies. The GTAP model innovation to simulate filled TRQs can also be extrapolated to other GTAP model sectors representing TRQ traded tariff lines. In addition the analysis can also be applied to other countries that are interested in assessing trade and welfare outcomes of TRQ trade in bilateral agreements.

6.4 CONCLUSIONS OF THE STUDY

The study concludes that, despite the development of the TDCA, low TRQ fill levels were achieved, showing continued low levels of access to the EU market. The results of the TRQ fill rates analysis showed that most of the fruit products TRQs were not filled during the implementation period of the TDCA. Except for the frozen orange juice TRQ in 2015, the TRQ export regime for the fruit products was the in-quota export regime. The conclusion of this study is that the unfilled quota, therefore, was a loss of preferential exports. The loss in preferential exports is also a trade cost, but it is difficult to conclude and indicate if indeed the tariff was the limiting factor, given that the in-quota tariff rates on the fruit products were already considered low enough (50% of the MFN tariff in most cases). In some cases, such as the frozen strawberries TRQ, the in-quota tariff was zero, yet no trade for this TRQ occurred during the TDCA implementation period.

Whilst there is a demand to judge the effects of tariffs, the issue of NTMs, which is working in tandem, provokes the debate on the effectiveness of trade agreements. The NTMs, found in this study to have exhibited the highest weighted influences in preventing quota fill, were found to be in the category associated with the TRQ administration framework in South Africa. Such a finding confirms that, within the TRQ administration framework, there were aspects that drove the usage and fill of TRQs. Given the poor performance in quota fill, none of the quotas were overfilled. A situation that results in overfilled quotas generally implies that exporters have more capacity but are bound by the quota quantities set by the importing country.

The fruit products TRQs in this study were granted a mixture of reduced and fully liberalised tariffs under the TDCA, yet the observed TRQ fill data showed the exporter's inability to take full advantage of the market access provided. Any assumption, therefore, on the reasons behind quota fill (based on fill rates) would fail to account for other non-tariff factors influencing quota fill. The export of processed food products faced complexities, especially with regard to African countries' access to developed world markets. By finding that the actual annual growth of TRQ export flows of the fruit products (PC1*(b)*) was not related to the TDCA-assigned annual growth factor of 3% (PC1*(a)*), the study concludes that there were no feedback mechanisms to inform the annual TDCA provision of quota expansion of 3%. This highlights the ineffectiveness of the TRQ as a policy instrument in trade agreements, because there is no way to relate fill rates to the provided quota quantity. In the absence of the TDCA, it can be expected that the South African fruit products export growth may have taken a different path into the EU market.

The study discussed factors influencing TRQ fill in the realm of NTMs associated with export market access of fruits/fruit products. The low fill rates were attributed to various aspects (differing in intensity of influence) in identified categories of influential factors namely: TRQ administration methods, TRQ definition and use conditions, TRQ supply and demand aspects as well TRQ tariff level influences. In contribution to the debate on NTMs, this study (after having assessed the influence of NTMs on the quota fill of fruit/fruit products TRQs) concludes that the greater portion and weight of intensity of influence in preventing TRQ fill was attributable to NTMs.

The study also concludes (from the scenario analysis in the GTAP model) that when non-influential factors (NTMs such as the rules of origin, conditions and administration of quota applications, packaging and labelling requirements) presented low negative effects, the TRQ gravitated towards 100% fill. Through the removal of

NTMs influences on TRQ fill, introduced as extra model information in the GTAP analysis, the study concludes on the question of the trade costs that are captured in unfilled TRQs. The reduction of NTMs via a shock to the technology parameter *ams* intended for modelling changes to trade costs in the GTAP model has enabled this conclusion. The conclusion that when NTMs presents low negative effects, the TRQ moves towards 100% fill or more contributes to the literature by showing that the removal of NTMs in trade may reduce costs, ultimately expanding trade.

A modified GTAP model capable of analysing TDCA fruit TRQs was used to innovate new elements in the analysis of the TDCA at the TRQ tariff line level. Thus, the main objective of this study was achieved. Whilst the GTAP model version 9 has been used in other studies on the TDCA, the applications did not include the HS 6-digit tariff line analysis of fruit products. Regarding the frozen orange juice case (which was also the first application of the frozen orange juice tariff line in the GTAP model for the trade between South Africa and the EU28 under the TDCA), the study concludes that market access for the frozen orange juice tariff line was limited in much the same way as global trade for South African processed food products is limited.

The policy impact of tariff liberalisation was positive for the frozen orange juice sector in South Africa, indicating some market access benefits, justifying, therefore, the provisions set out for the frozen orange juice tariff line in the agreement. The underlying structure in the frozen orange juice sector (for which the shares of the frozen orange juice sector were small in relation to other sectors in the model) leads to the conclusion that the EU easily conceded the 100% tariff liberalisation (which is the status quo for the SADC-EU-EPA) because the economy-wide effects emanating from the liberalisation simulations were also small.

The removal/reduction of NTMs worked to fill the quotas and improve market access, but the welfare gain to South Africa was higher after combining the removal of NTMs with a complete tariff liberalisation. The study concludes that piecemeal trade liberalisation, such as quota expansion, tariff elimination and NTMs removal, separately implemented did not bring substantial magnitude in welfare gains due to the existence of other structural sub-sector issues, such as demand and supply fluctuations.

The largest benefits in welfare occurred if the complete removal of tariffs had taken place in 2011, prior to the full implementation of the TDCA in 2012 as well as the SADC-EU-EPA in 2016. If the EU had been willing to improve or further open market access in a timely manner to South Africa for the frozen orange juice TRQ by availing concessions given under the SADC-EU-EPA, South Africa would have been better off in 2011. The delay in negotiations outcomes, therefore, did not benefit South Africa. As epitomised by many of the EPAs between the EU and African countries, the process of negotiations of these agreements have been slow, including the process of negotiating the SADC-EU-EPA. The findings from this study contribute to the EPA debate given that, besides the SADC-EU-EPA, most of the EPAs have not been implemented yet, and, therefore, such agreements have not been beneficial regarding potential increased exports of African nations to the EU.

The results of the SADC-EU-EPA, which is deemed superior to the TDCA in terms of market access, did not show that superiority with regard to the frozen orange juice TRQ. Such an assertion is supported by the results presented on the impacts on output, consumption, exports and prices. The expectations are consistent with model results in that there was less vulnerability to shocks, given that the frozen orange juice was a small sector in the model with little prominence in the world export market. This manifested in the small percentage changes in prices as well as welfare measured in EV.

The provisions of the SADC-EU-EPA, when implemented on the TDCA frozen orange juice TRQ, translated to higher gains in welfare, suggesting that timely implementation of the conclusion of negotiations is key. The frozen orange juice sector had already been partially liberalised and further liberalisation under the SADC-EU-EPA, as determined from the results of scenarios PC2*(c)* and PC4*(c)*, would not bring massive improvements. The extent of the loss from unfilled TRQs, for which South African exporters did not take advantage of the market access granted, was quantified in a quota rent change calculation, which indicated potential quota rent losses. The unavailability of full welfare results, to the extent of negotiators not determining the losses in quota rent, could lead to uninformed trade negotiations and policy choices. Welfare results are a vital component of the information required by trade negotiators.

An additional conclusion on the small changes, resulting from the experiments of tariff liberalisation under TDCA and SADC-EU-EPA scenarios, is that the tariffs for the fruit products were scheduled in the trade agreement as opposed to tariff reductions that were announced. Market access benefits were expected with the EU's removal of the tariff on South African fruit products TRQ exports, and the findings in this study have indicated the extent of the benefits. Even though all fruit products of the TDCA received concessions specific to each TRQ, not all the fruit sectors gained to the same extent. The study finally concludes that quota expansion should be combined with both tariff removal and the reduction of NTMs in order to maximise market access opportunities.

In the following section, the study makes recommendations on market access agreements and the liberalisation of TRQs.

6.5 POLICY IMPLICATIONS AND RECOMMENDATIONS

The outcomes from this study will benefit trade negotiators and policy makers with evidence on the impacts of TRQ policies in the fruit products sectors, including impacts on other sectors of the economy. The following policy implications and recommendations are forwarded based on the findings and conclusions of the study.

The TRQ administration aspects, such as the implementation mechanisms that fail to guarantee quota access, have implications in preventing quota fill not only for the TDCA but for the SADC-EU-EPA, which is administered under the same TRQ administration framework. A few established firms dominate in accessing quota permits with the implication that when the dominant firms shift focus from the EU to alternative markets, a void in fruit TRQ exports emerges, leading to more occurrences of unfilled quotas. The recommendation is for DAFF to improve the TRQ administration system. This is particularly relevant to the trade permit system that already exists as a facet to promote new entrants, including the BBBEE firms.

Given the market access preferences, an opportunity presents itself to ramp up the deliberate action to capacitate historically disadvantaged exporters and new entrants to target the unfilled portions of the quota. Such action could include trade expansion and facilitation support. The EU market access desk, from the South African policymaker’s point of view, should engage in actively boosting export market strategies targeted at non-established firms; thereby developing strategies that link directly with processed TRQ fruit products destined for the EU market, specifically frozen strawberries. The strategies could also include more research efforts to understand the NTMs that prevent quota fill, such as the SPS and safety requirements, and to improve monitoring systems to aim for more compliance by the non-established exporters in order to prevent a rejection of consignments in the EU market. The DAFF Directorate, tasked with implementing the trade agreement (now the SADC-EU-EPA), should coordinate the continuous training on compliance with the EU market requirements and standards. The training component should also from part of the negotiated agreement to the extent of having an integral financing component ring-fenced for training.

A recommendation for the agricultural trade policymaking process in the South African context is that efforts should be increased to link research with trade policy negotiations in order to enable informed negotiating positions to be taken. This recommendation is targeted at improving the TDCA negotiated provisions, for which the assumption was made that quota level is the restriction to EU market access for South African fruit products. Such an assumption misdirected the policy intervention by availing a blanket 3% annual expansion for all fruit products TRQs. The policy did not guarantee market access improvement. This is clearly not a beneficial trade policy for improving market access across all the fruit products TRQ. The implication of this policy provision is that it does not guarantee quota fill. The market access provision of a 3% quota responds to a quota TRQ regime in which quotas are filled, yet the provision was applied to an in-quota TRQ regime exhibited by the TDCA fruit products TRQs (where the quotas were unfilled). The quota expansion trade policy did not respond to the actual fruit TRQ products situation in South Africa where the quotas were largely unfilled, even before the quota expansion provision.

Based on research, a policy provision in the trade agreement or a support policy in South Africa should aim to stimulate adequate industry output, to the level of generating fruit products exports that might fill the provided annual quota. Expanding the quota as a provision alone is not an efficient policy; therefore, a different and more beneficial liberalisation policy is recommended. This could be a basket of policies. It is, therefore, recommended that in the next round of the provision revisions (now set out under the SADC-EU-EPA), quota expansion with full tariff liberalisation should be coupled with the removal of the NTMs acting as a barrier to fill quotas. The policymakers need to also put in place mechanisms and initiatives to support the provisions of the agreement in ensuring that at least a 3% increased capacity can be generated annually – this may also relate to improving labour demands and, thus, improving employment in South Africa. The trade protocols on SPS and TBT measures forming part of the trade agreement should be revised. To ensure the implementation of the commitments to remove barriers, the trade desk in the implementing Directorate should be strengthened.

Given the insignificant impacts in flows of trade, output, prices and welfare, the policy implication in the case of the frozen orange juice TRQ is that a 100% liberalisation of an already low in-quota tariff presents only marginal gains. In addition, negotiators need be aware of the impacts of concessions resulting from tariff lines with small shares in the economy. The recommendation to trade negotiators is to focus on sectors with larger shares in the economy when seeking substantial positive economy-wide impacts emanating from the trade agreement. However, it is also recommended to seek concessions in sectors with prohibitive tariffs. On the other hand, perhaps it is timely to focus on negotiating for further market access in this sector, because there is need to improve the frozen orange juice sector's contribution in terms of industrial GDP.

A general recommendation to policymakers, exporters and producers is to improve the competitiveness of South African processed fruits in the export sector. This could include the promotion of export growth strategies to sustain increased output, and this could involve addressing the constraints through coordinated and strengthened producer/exporter associations that target the preferential market access in the EU. Improved coordination of the sector, trade facilitation and collaborative efforts in the processed fruit sector (involving market intelligence and dissemination through export campaigns) will enable access to knowledge of the fruit products TRQ preferences.

Finally, there should, therefore, be a motivation for South Africa policymakers to continue negotiating for bilateral trade provisions, as was provided under the TDCA. However, the recommendation is to include negotiations on the removal of NTMs, in addition to complete tariff removal under the SADC-EU-EPA. The findings of higher positive welfare results with filled quotas at full tariff liberalisation strengthen the recommendation that other support policies are needed and the policies should simultaneously be implemented together with NTMs removal.

6.6 STUDY LIMITATIONS AND AREAS OF FURTHER RESEARCH

Similar to other modelling studies in a GTAP CGE model, this study also has limitations which should be pointed out. It was possible, in this study, to simulate the removal of NTMs in the GTAP model through the analysis of Likert scores that were converted to weighted scores of intensity of influence for each factor preventing quota fill. However, the results were interpreted with the knowledge that not all the unfilled quotas might have resulted from the presence of NTMs only, given that there could be capacity constraints arising from time to time.

In the context of the limitations that are common with GTAP database and model use, several assumptions had to be made concerning elasticities and splitting weights used to introduce new GTAP sectors. The trade elasticities in the GTAP model were adopted and used as given, seeing as the elasticities were not the focus of the liberalisation experiments in this study. The splitting weights, used to extract the fruit products of focus in this study from the GTAP OFD sector, were sourced from the publicly available source TASTE that enables the calculation of actual trade weights. The procedure followed in SPLITCOM (a GTAP utility programme), of adding the new fruit products sectors to the GTAP database, automatically balanced the matrices in the model using the externally supplied actual trade weights. However, actual output shares and consumption shares could be sourced additionally to avoid the automatic balancing of the matrices in the model as a way to account for the output and consumption shares.

Whilst the modelling lacked sufficient detail on the splitting weights for the output and consumption shares and made assumptions to adopt the splitting weight of the GTAP processed food products sector, further studies could collect the corresponding data on consumption and production shares in order to calculate the specific weights. With these assumptions, however, this study provided a preliminary and practical analysis of TDCA fruit products represented as sectors in the GTAP model.

The substitution elasticities presented in the GTAP database for the processed food products OFD sector were adopted for all the new fruit products sectors introduced to the model. With the assumption made in this study that the existing elasticities relevant to the GTAP OFD sector are representative for all the fruit products sectors extracted, there is scope, therefore, for further studies to econometrically estimate the substitution elasticities and replace the GTAP OFD sector elasticities relating to the identified fruit products. Behavioural parameters, such as elasticities, could be econometrically estimated, specifically for the fruit product sectors, in further studies.

The database was projected to allow for further analysis in the study's benchmarked periods (full implementation of the TDCA and the inception of the SADC-EU-EPA), for which the criticism can be levelled that a dynamic GTAP model would have been more appropriate than the static model that was used. However, the static model is valuable in a study that intends to analyse specific periods in time and not trace the variability of changes over time.

The unavailability of actual TRQ trade data in the GTAP data and the assumption that the GTAP-based data represented the trade flows for fruit products exported within quota was limiting. However, the study was able to innovate and assume the trade flow levels to be the actual reported percentages according to publicly available TARIC data. Fill rates were calculated and quota fill could be simulated given that only percentage changes were in operation. In future studies, fruit products TRQ data can be sourced to replace all the data in the GTAP database; however, some aggregation issues avoided in this study could arise in such future operations.

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APPENDICES

APPENDIX 1: GROWTH FORECASTS – World Economic Outlook

The best guess of the economies in the model are produced for 2012 and 2016 using the GDP growth forecasts in Table A1 to shock the 2011 GTAP database.

Table A1: Growth forecasts for GDP (%)

Region	**GDP**						
	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*Cumulative Average 2011 to 2016*
South Africa	3.3	2.2	2.5	1.7	1.3	0.3	8.24
EU28	1.8	-0.4	0..3	1.8	2.3	2.0	6.18
ROW	4.3	3.5	3.5	3.6	3.4	3.2	18.42

Source: IMF (2017) and author calculations based on IMF (2017).

APPENDIX 2: QUESTIONNAIRE

Table A2: Questionnaire

©Copyright 2016 PhD Project - FRUIT SECTOR PERSPECTIVES OF FACTORS AFFECTING EXPORT MARKET ACCESS FOR FRUIT/FRUIT PRODUCTS

<table>
<tr><td colspan="4">Questionnaire ID</td></tr>
<tr><td colspan="2">INTERVIEWER:</td><td colspan="2">CHIEDZA L. MUCHOPA</td></tr>
<tr><td colspan="4">NAME OF COMPANY INTERVIEWED:</td></tr>
<tr><td colspan="4">Fruit Sector Classification:</td></tr>
<tr><td>Destination country/countries of exports</td><td colspan="2">EU</td><td>NON-EU</td></tr>
<tr><td colspan="2">Are you aware of the EU-SA-TDCA and/or EU-SADC-EPA</td><td colspan="2">Yes /No</td></tr>
<tr><td colspan="4">I am a student of the University of the Free State enrolled for a doctorate degree in Agricultural Economics. This survey is to gather information on influential factors to fruit products market access faced by South African fruit/fruit products exporters to the EU market and other relevant markets thus providing context to available export statistics. For fruit/fruit products under tariff rate quotas (TRQs), three broad categories of influential factors have been isolated: (1) TRQ export administration methods (2) TRQ definition and conditions (3) Supply and demand conditions of notified TRQs. The interview will take about 30-45 minutes to complete. This is an expert opinion exercise examining about your experience in international exports of fruit products indicating the extent to which you regard the aspects (in the three categories identified) to have an influence on filling of quotas/market access. Other questions relate to export market access aspects in other relevant markets. The information will only be utilised for research purposes and the dataset generated is intended to generate an index of market access and will thus not trace back to any particular individual or company.</td></tr>
<tr><td colspan="4">If exporter/trader/agent/association answer questions on pages 1 to 4</td></tr>
<tr><td colspan="4">If exporter/association under TDCA/SADC-EU-EPA answer questions on pages 5 to 9</td></tr>
<tr><td colspan="4">If service provider/association answer questions on pages 10 to 12</td></tr>
<tr><td colspan="4">Your participation is greatly appreciated.</td></tr>
<tr><td colspan="4">DATE:</td></tr>
<tr><td colspan="4"></td></tr>
</table>

Agents/Exporters/Processors/Trader/Producer/Logistics support/Other

Questions mainly apply to exporters in the fruit/fruit products sector. Non-exporters ask direct questions 3,5 & 11; for questions 1,2,4 & 6 ask about clients represented

Respondent's selected answer	Name of representative	1. Which markets do you or exporters you represent export to?	2. Do you export fresh or processed?	3. Which markets are difficult to export to?	4. What is the biggest market of the fruit/fruit products exports?	5. Which of three factor categories mainly affect fruit/fruit products exports?		6. Which agreement have you/exporters you represent exported under in the past 5 years?		7. How long has your company exported or assisted exportation to the EU market?	8. In past 5 yrs have you/exporters experienced any restrictions on receiving TDCA preference?	9. Do you or exporters you represent export any of the following fruit products? Tick where pplicable. If ...								10. If fresh exports which fruits?	11. In which category would you say export restrictions & barriers are greatest?
		1 = EU 2 = USA 3 = Africa 4 = Asia 5 = UK 6 = Other	1 = fresh 2 = processed	1 = EU 2 = USA 3 = Africa 4 = Asia 5 = UK 6 = Other	1 = EU 2 = USA 3 = Africa 4 = Asia 5 = UK 6 = Other	1 = Export admin methods 2 = Export definition & conditions 3 = Supply & Demand conditions of export	Insert X if all apply	1 = TDCA/SADC EPA 2 = AGOA 3 = SACU 4 = SADC 5 = EFTA 6 = Other	insert X if all apply	Number of years	1 = No 2 = Yes 3 = Not Applicable	Frozen strawberries (HS0811.10)	Canned Pears (HS2008.40)	Canned Apricots (HS2008.50)	Canned Peaches (HS2008.70)	Fruit juice mixtures (HS2008.97)	Frozen orange juice (HS2009.11)	Pineapple juice (HS2009.41/.49/.71)	Apple juice (HS2009.79)	1 = strawberries 2 = pears 3 = apricots 4 = peaches 5 = oranges 6 = apples 7 = pineapples 8 = other (specify)	1 = fresh 2 = processed
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State any other factors affecting fruit products exports

General Export Questions - Non-EU (1)

Questions apply to non-EU markets.

Respondent's selected answer	1. Would you export if there were no preferential arrangements in place in destination market?	2. Are there instances where you have deviated to other markets due to too high tariffs?	3. In which markets are transaction costs greatest in negatively affecting volume of exports?	4. To what extent have these challenges affected exports over the last five years?		5. Do procedures of export permit application hinder export market access?	6. To what extent do exporters encounter customs clearance procedures that hinder export of fruit/fruit products?	7. To what extent do exporters experience costly and cumbersome export administration procedures?	8. Have you ever abandoned exporting because of export permit requirements?	9. Do export license allocation procedures hamper access to available export markets?	10. Do you consider export license allocation procedures as ..		
				export admin methods that are distorting exports?	*customs clearance procedures that hinder exports?*						consistent	transparent	complicated
	1 = Yes 2 = No	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = EU 2 = USA 3 = Africa 4 = Asia 5 = UK 6 = Other	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so
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State other export administration methods distorting exports.

General Export Questions - Non-EU (2)

Questions apply to Non-EU markets

If exporters, ask direct experience of questions 1, 2, 4 & 5

Respondent's selected answer	1. How often do exporters experience unattractive market conditions in the export market for fruit/fruit products?	2. How often does inadequte domestic supply impact the ability to fulfil exports?	3. To what extent are the following conditions a deterrent to market access in terms of volume of exports?		4. How often do exporters experience stringent safety standards as well as stringent sanitary and phytosanitary measures?	5. To what extent do exporters abandon exporting due to high tariffs?	6. Do you think the following method to allocate export license is effective in promoting increased exports?			
			stringent safety standards	packaging and labelling requirements			movement certification	tax clearance	export permit fee	validity period of permit
	1 = Not at all *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Never* *2 = Rarely* *3 = Occasionally* *4 = Often* *5 = Very often*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Never* *2 = Rarely* *3 = Occasionally* *4 = Often* *5 = Very often*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*
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Any other comments

General Export Questions - Non EU (3)

Questions apply to Non-EU markets

Respondent's selected answer	1. For these transaction costs, to what extent do you view their effect on increased exports?						2. To what extent do the following factors hinder ability to increase exports?							
	costs of getting informed	requirements to qualify for export market	costs of paperwork	time necessary for application process	costs of speeding up exportation	costs of finding business partners in export country	rules of origin	distance between SA & export market	freight charges	transport costs	communica-tions costs	discrimination among exporters by importers	low demand for imports	importer requirements on how products should be processed
	1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*
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Any other comments

TDCA/SADC-EU-EPA Tariff Rate Quotas (TRQs)

Questions apply fruit/fruit products. Skip if not exported under the TDCA/SADC-EU-EPA.

Respondent's selected answer	1. Would you normally export to the EU if the TDCA/SADC-EU-EPA tariff rate quota (TRQ) was not available?	2. Did you apply for export permit under TDCA/SADC-EU-EPA in the last..		3. Do you sometimes export outside the TDCA/SADC-EU-EPA tariff rate quotas (TRQs)?	4. Are there instances where you have deviated to other markets because..		5. Is there a difference in transaction costs faced at the in-quota tariff exports vs at the MFN tariff?
					the in-quota tariff is too high	it is convenient to pay the high MFN tariff	
	1 = Never *2 = Rarely* *3 = Occasionally* *4 = Often* *5 = Very often*	*1 = year* *2 = 2 years* *3 = 3 years* *4 = 4 years* *5 = 5 years*	*Insert X if all apply*	*1 = Never* *2 = Rarely* *3 = Occasionally* *4 = Often* *5 = Very often*	*1 = Never* *2 = Rarely* *3 = Occasionally* *4 = Often* *5 = Very often*	*1 = Never* *2 = Rarely* *3 = Occasionally* *4 = Often* *5 = Very often*	*1 = Not at all* *2 = Not very much* *3 = Moderately* *4 = Quite a bit* *5 = Very much so*
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In what ways do TRQs create obstacles in accessing the EU market?

What are the extra barriers to trade imposed by the way in which TRQs are administered?

What are some of the reasons why quotas are underfilled?

In what ways should TDCA TRQ administration methods be modified to improve quota fill?

TRQ administration methods

Questions apply to TDCA/SADC-EU-EPA fruit/fruit products. If exporter, ask direct experience questions 2, 4, 5 not opinion.

Respondent's selected answer	1. Are you aware of any...		2. To what extent have these challenges affected exports over the last five years?		3. Does the available time to submit export permit application hinder quota fill?	4. To what extent do exporters encounter customs clearance procedures that hinder export of fruit/fruit products?	5. To what extent do exporters experience costly and cumbersome export administration procedures?	6. Have you ever abandoned exporting to the EU under TRQs because of export permit requirements?	7. How often do you take part in assisting DAFF in quota administration?	8. Do export license allocation procedures hamper access to the full available quota?	9. Do you consider the allocation of quotas as ..		
	TRQ admin methods that are distorting exports?	*customs clearance procedures that hinder exports?*	*TRQ admin methods that are distorting exports*	*customs clearance procedures that hinder exports*							consistent	transparent	complicated
	1 = Yes 2 = No	1 = Yes 2 = No	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so
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State other TRQ administration methods distorting exports.													

TRQ administration methods cont'd..

Questions apply to TDCA/SADC-EU-EPA fruit/fruit products

BEE= Black Economic Empowerment; QSE= Qualifying Small Enterprises; EME= Exempted Micro-Enterprises

Respondent's selected answer	9. Do you think the method to allocate quotas is effective in promoting quota fill?											
	DAFF as quota administrator	***BEE criteria & compliance requirements***	***Enterprise classification into large, QSE, EME***	***Historical Export Quantity to determine share***	**EUR.1 movement certification**	**Exporter registraion with DTI/SARS**	**First come first serve allocations**	**Tax clearance certificate**	**Export permit fee**	**Provisional allocation of quotas**	**Unknown market shares allocation formula**	**Twelve months validity of permits**
	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much*
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Any other comments

TRQ definition and conditions

Questions apply to TDCA/SADC-EU-EPA fruit/fruit products

If exporters, ask direct experience of questions 3 & 5.

Respondent's selected answer	1. Does the size of import quota notified for any specific tariff line discourage potential applicants for export permits?	2. To what extent are the following conditions a deterrent to EU market access/quota fill under TRQs?			3. How often do exporters experience stringent safety standards as well as stringent sanitary and phytosanitary measures?	4. To what extent does the following definition of a TRQ affect quota under-fill?		5. Are you aware of exporters abandoning exporting to the EU due to		6. Do you think the following conditions considered in allocating quotas are efficient in promoting quota fill?		
		time validity of quota allocated (i.e. 12 mnths)	stringent safety standards	packaging and labelling requirements		definition of TRQ at a broad HS level	narrow CN product definition	high MFN tariffs	high in-quota tariffs	amount of quota applied for by all applicants	total number of applicants	quota available
	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*
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Any other comments

TRQ supply and demand conditions

Questions apply to TDCA/SADC-EU-EPA fruit/fruit products

If exporters, ask direct experience questions of 1, 5 & 6.

Respondent's selected answer	1. To what extent do competing TRQs with the TDCA affect access to the EU market?	2. To what extent does indirect trade from developing countries through EU affect EU market access?	3. How often does inadequte domestic supply impact the ability to fill a quota?	4. To what extent do customs clearance procedures hinder export of fruit/fruit products?	5. How often do exporters experience unattractive market conditions in the EU market for fruit/fruit products in the last 5 years?	6. How often do exporters abandon exporting to the EU to pursue other trade arrangements offering better tariffs than TDCA in-quota tariff?	7. To what extent do the following factors hinder ability to fill quotas?							
							rules of origin	distance between SA & EU countries	freight charges	transport costs	communica-tions costs	discrimination among exporters by importers	low demand for imports	importer requirements on how products should be processed
	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*
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SAFVCA and other service providers to the fruit sector including DAFF & PPECB
Questions apply to TDCA/SADC-EU-EPA

Respondent's selected answer	1. To what extent do you participate in quota allocation decision-making?	2. How often do exporters experience a reduction of their total requested quota?	3. How important is DAFF as a source of information on the TDCA TRQs?	4. How often are exporters willing to supply a larger quantity than what their allocated permit allows?	5. To what extent do exporters of fruit/fruit products export to the EU outside the TDCA in-quota tariffs?	6. For these quota administration transaction costs, to what extent do you view their effect on quota fill?					
						costs of getting informed	requirements to qualify for quota access	costs of paperwork	time necessary for application process	costs of speeding up exportation to fall within end of quota period	costs of finding business partners in export country
	1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*	*1 = None 2 = Not very much 3 = Moderate 4 = Quite a bit 5 = Very much*
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Any other comments:

DAFF and other fruit sector providers including SAVFCA & PPECB

Questions apply to TDCA/SADC-EU-EPA

If not DAFF skip 5, 7 & 10

What is the available time period for submitting applications for annual export permits?

Are exporters aware of the quota allocation formula used?

Respondent's selected answer	1. How often do exporters reduce their requested quota?	2. How often are quotas allocated or reallocated after the export permit has been issued?	3.Are high quota fill rates a priority to (i) DAFF (ii) Exporters?	4. How important is DAFF as a source of information on TDCA TRQs?	5. How do you classify the quota administration procedure under the TDCA?	6. How often do quota applicants overstate quota requests exceeding their export capacity?	7. How often have you modified TRQ administration methods to promote filling of quotas?	8. How often do you experince exporters disengaging from submitting an application for permit to export under the TDCA?	9. How often do some of the applicants fail to get access to quota due to the volume of demand for quotas?	10. To what extent is the volume of applications impacted by		11.Do you agree that the quota allocation methods are restrictive and non-transparent?
										available period of time for applying for licenses?	period of time available for delivering fruit/fruit products to exporters?	
	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	*1 = Daily 2 = Monthly 3 = Quarterly 4 = Half yearly 5 = Yearly*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = License on demand 2 = First come first serve 3 = Historical importers 4 = Auctioning 5 = State trading 6= Other*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*
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What mechanisms should you have you employed or should you employ to modify current TRQ administration methods for quotas that are underfilled?

Is there a part of quota reserved for new entrants?

SARS

Questions apply to TDCA/SADC-EU-EPA

Do you utilise the HS or CN classification for purposes of levying tariffs?

Respondent's selected answer	1. How often do exporters not meet requirements for issuance of EUR.1 movement certificate?	2. How often is origin verification of products undertaken?	3. How often are tariff quotas not granted due to ..		4. To what extent would you say SARS officials guarantee importers the..		5. How often do inspections or other checks for fulfilment of originating status lead to preferences not being granted?	6. How often are EUR.1 movement certifcates issued retrospectively?	7. To what extent does the 4 months validity of proof of origin hinder exports?	8. How often have you encountered the importing country suspending or refusing granting of preferential treatment due to origin status verification?
			the acceptance date of the customs declaration falling outside the quota validity period	failure to provide proof of originating status	authenticity in issuing of certificates of origin	consistency in administration of preferential rules of origin				
	1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Never 2 = Rarely 3 = Occasionally 4 = Often 5 = Very often*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*	*1 = Not at all 2 = Not very much 3 = Moderately 4 = Quite a bit 5 = Very much so*
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What are some of the technical reasons for which the EUR.1 movement certificate is not acceptable at importation?

APPENDIX 3: ABBREVIATIONS OF ENDOGENOUS AND EXOGENOUS VARIABLES IN THE GTAP MODEL CLOSURE

The following variables, used this study's GTAP model, are available on the GTAP website: https://www.gtap.agecon.purdue.edu/models/setsVariables.asp.

Table A3: Variables in the GTAP model

Quantity Variables
QO_{ir} quantity of non-saving commodity i output or supplied in region r
i = NSAV_COMM   r = REG
$QOES_{ijr}$ quantity of sluggish endowment i supplied to sector j firm of region r
i = ENDWS_COMM; j = PROD_COMM; r = REG
QDS_{ir} quantity of domestic sales of tradable commodity i in region r
i = TRAD_COMM; r = REG
QXS_{irs} quantity of exports of tradable commodity i from source r to destination s
i = TRAD_COMM; r = s = REG
QST_{ir} quantity of sales of marginal commodity i to the international transport sector in region r
i = MARG_COMM; r = REG
QFE_{ijr} quantity of endowment i demanded by sector j firm in region r
i = ENDW_COMM; j = PROD_COMM; r = REG
QVA_{jr} quantity index of land-labor-capital composite (value-added) in sector j firm in region r
j = PROD_COMM; r = REG
QF_{ijr} quantity of composite tradable commodity i demanded by sector j firm in region r
i = TRAD_COMM; j = PROD_COMM; r = REG
QFD_{ijr} quantity of domestic tradable i demanded by sector j firm in region r
i = TRAD_COMM; j = PROD_COMM; r = REG
QFM_{ijr} quantity of imported tradable i demanded by sector j firm in region r
i = TRAD_COMM; j = PROD_COMM; r = REG
QP_{ir} quantity of composite tradable i demanded by private household in region r
i = TRAD_COMM; r = REG
QPD_{ir} quantity of domestic tradable i demanded by private household in region r
i = TRAD_COMM; r = REG
QPM_{ir} quantity of imported tradable i demanded by private household in region r
i = TRAD_COMM; r = REG
QG_{ir} quantity of composite tradable commodity i demanded by government household in region r

i = TRAD_COMM; r = REG

QGD_{ir} quantity of domestic tradable commodity i demanded by government household in region r

i = TRAD_COMM; r = REG

QGM_{ir} quantity of imported tradable commodity i demanded by government household in region r

i = TRAD_COMM; r = REG

QIM_{ir} quantity of aggregate imports of tradable commodity i demanded by region r using market prices as weights

i = TRAD_COMM; r = REG

QIW_{ir} quantity of aggregate imports of tradable commodity i demanded by region r using cif prices as weights

i = TRAD_COMM; r = REG

QXW_{ir} quantity of aggregate exports of tradable commodity i supplied from region r using fob prices as weights

i = TRAD_COMM; r = REG

$QIWREG_{r}$ volume of merchandise imports demanded by region r

r = REG

$QXWREG_{r}$ volume of merchandise exports supplied by region r

r = REG

$QIWCOM_{i}$ volume of global merchandise imports of tradable commodity i

i = TRAD_COMM; r = REG

$QXWCOM_{i}$ volume of global merchandise exports of tradable commodity i

i = TRAD_COMM; r = REG

QXWWLD volume of world trade

QOW_{i} quantity index for world supply of tradable commodity i

i = TRAD_COMM

$EXPAND_{ir}$ change in investment levels relative to endowment stock

i = ENDWC_COMM; r = REG

$QOWU_{ir}$ quantity index for world supply of goods i at user prices *i = TRAD_COMM; r = REG*

$QTMFSD_{mirs}$ international usage margin m on i from r to s *m = MARG_COMM; i = TRAD_COMM; r = s = REG*

QTM_{m} global margin usage *m = MARG_COMM*

$QCGDS_{r}$ quantity of capital goods sector supplied in region r *r = REG*

$QSAVE_{r}$ quantity of savings demanded in region r *r = REG*

GLOBALCGDS quantity of global supply of capital for net investment

$KSVCES_{r}$ quantity of capital services in region r *r = REG*

KB_{r} quantity of beginning-of-period capital stock in region r *r = REG*

KE_r quantity of end-of-period capital stock in region r *r = REG*

$QGDP_r$ quantity index for GDP in region r *r = REG*

WALRAS_DEM quantity demanded in the omitted market - equals global demand for savings

WALRAS_SUP quantity supplied in the omitted market - equals global supply of new capital goods composite

POP_r population in region r *r = REG*

$COMPVALAD_{ir}$ composition of value added for goods i and region r *i = TRAD_COMM; r = REG*

Price Variables

PM_{ir} market price of non-saving commodity i in region r

i = NSAV_COMM; r = REG

$PMES_{ijr}$ market price for sluggish endowment i supplied to firm j in region r

i = ENDWS_COMM; j = PROD_COMM; r = REG

PS_{ir} supply price of non-saving commodity i in region r

i = NSAV_COMM; r = REG

PFE_{ijr} demand price for endowment i by firms in sector j of region r

i = ENDW_COMM; j = PROD_COMM; r = REG

PVA_{jr} price of value-added in sector j

j = PROD_COMM; r = REG

PF_{ijr} demand price for composite tradable i by firms in sector j of region r

i = TRAD_COMM; j = PROD_COMM; r = REG

PFD_{ijr} demand price for domestic tradable i by firms in sector j of region r

i = TRAD_COMM; j = PROD_COMM; r = REG

PFM_{ijr} demand price for imported tradable i by firms in sector j of region r

i = TRAD_COMM; j = PROD_COMM; r = REG

PP_{ir} private household's demand price for composite tradable i in region r

i = TRAD_COMM; r = REG

PPD_{ir} private household's demand price for domestic tradable i in region r

i = TRAD_COMM; r = REG

PPM_{ir} private household's demand price for imported tradable i in region r

i = TRAD_COMM; r = REG

PG_{ir} government household's demand price for composite tradable i in region r

i = TRAD_COMM; r = REG

PGD$_{ir}$ government household's demand price for domestic tradable i in region r

i = TRAD_COMM; r = REG

PGM$_{ir}$ government household's demand price for imported tradable i in region r

i = TRAD_COMM; r = REG

PSAVE$_{r}$ price of savings in region r

r = REG

PCGDS$_{r}$ price of investment goods in region r - equals PS(cgds,r)

r = REG

PGDP$_{r}$ price index for GDP in region r

r = REG

PPRIV$_{r}$ price index for private household expenditure in region r

r = REG

PGOV$_{r}$ price index for government household expenditure in region r

r = REG

PFOB$_{irs}$ world fob price of tradable commodity i exported from source r to destination s (prior to including transport margins)

i = TRAD_COMM; r = s = REG

PCIF$_{irs}$ world cif price of tradable commodity i imported from source r to destination s (after having included transport margins)

i = TRAD_COMM; r = s = REG

PMS$_{irs}$ market price by source of tradable commodity i imported from source r to destination s

i = TRAD_COMM; r = s = REG

PIM$_{ir}$ market price of aggregate imports of tradable commodity i in region r

i = TRAD_COMM; r = REG

PIW$_{ir}$ world price of aggregate imports of tradable commodity i in region r

i = TRAD_COMM; r = REG

PXW$_{ir}$ price index for aggregate exports of tradable commodity i from region r

i = TRAD_COMM; r = REG

PIWREG$_{r}$ price index of merchandise imports in region r

r = REG

$PXWREG_r$ price index of merchandise exports from region r

r = REG

$PIWCOM_i$ price index of global merchandise imports of tradable commodity i

i = TRAD_COMM

$PXWCOM_i$ price index of global merchandise exports of tradable commodity i

i = TRAD_COMM

PXWWLD price index of world trade

PR_{ir} ratio of domestic market price to market price of imports for tradable commodity i in region r

i = TRAD_COMM; r = REG

PW_i world price index for total supply of tradable commodity i in region r

i = TRAD_COMM

PSW_r price index received for tradable commodities produced in region r including sales of net investment to the global bank

r = REG

PDW_r price index paid for tradable commodities used in region r including purchases of savings from the global bank

r = REG

TOT_r terms of trade for region r

r = REG

PT_m price of margin services supplied

m = MARG_COMM

PCGDSWLD world average price of capital goods (net investment weights)

PWU_i world price index for total goods i supplies at user prices

i = TRAD_COMM

$PTRANS_{irs}$ cost index for international transport of i from r to s

i = TRAD_COMM; r = s = REG

$RENTAL_r$ rental rate on capital stock in region r - equals PS(CGDS,r)

r = REG

$RORC_r$ current net rate of return on capital stock in region r

r = REG

$RORE_r$ expected net rate of return on capital stock in region r

r = *REG*

RORG global net rate of return on capital stock

P_r price index for disposition of income by regional household

$PFACTREAL_{ir}$ ratio of return to primary factor i to cpi in r

i = ENDOW_COMM; r = REG

$PFACTOR_r$ market price index of primary factors, by region

PFACTWLD world price index of primary factors

Technical Change Variables

AO_{ir} output augmenting technical change in sector j of region r

j = PROD_COMM; r = REG

AFE_{ijr} primary factor i augmenting technical change in sector j of region r

i = ENDW_COMM; j = PROD_COMM; r = REG

AF_{ijr} intermediate input i augmenting technical change in sector j of region r

i = TRAD_COMM; j = PROD_COMM; r = REG

AVA_{jr} value-added augmenting technical change in sector j of region r

j = PROD_COMM; r = REG

AMS_{irs} import i from region r augmenting tech change in region s

i = TRAD_COMM, r = s = REG

$AOSEC_j$ output tech change of sector j, worldwide

j = PROD_COMM

$AOREG_r$ output tech change in region r

r = REG

$AOALL_{jr}$ output augmenting technical change in sector j of r

j = PROD_COMM; r = REG

$ESUBT_j$ elasticity of substitution among composite intermediate inputs in production

j = PROD_COMM

$AFCOM_i$ intermediate tech change of input i, worldwide

i = TRAD_COMM

$AFSEC_j$ intermediate tech change of sector j, worldwide

j = PROD_COMM

AFREG$_r$ intermediate tech change in region r

r = REG

AFALL$_{ijr}$ intermediate input i augmenting tech change by j in r

i = TRAD_COMM,j = PROD_COMM; r = REG

AFECOM$_i$ factor input tech change of input i, worldwide

i = ENDW_COMM

AFESEC$_j$ factor input tech change of sector j, worldwide

j = PROD_COMM

AFEREG$_r$ factor input tech change in region r

r = REG

AFEALL$_{ijr}$ primary factor i augmenting tech change sector j in r

i = ENDW_COMM; j = PROD_COMM; r = REG

AMS$_{irs}$ reduction in effective price associated with delivery of i from r to s

i = TRAD_COMM; r = REG; s = REG

ATMFSD$_{mirs}$ tech change in m's shipping of i from region r to s

m = MARG_COMM; i = TRAD_COMM; r = s = REG

ATM$_m$ tech change in mode m, worldwide

m = TRAD_COMM

ATF$_i$ tech change shipping of i, worldwide

i = TRAD_COMM

ATS$_r$ tech change shipping from region r

r = REG

ATD$_s$ tech change shipping to s

s = REG

ATALL$_{mirs}$ tech change in m's shipping of i from region r to s

m = MARG_COMM; i = TRAD_COMM; r = REG; s = REG

AU$_r$ input-neutral shift in utility function

r = REG

Policy Variables

TO_{ir} power of the tax on output (or income) of non-savings commodity i in region r

i = NSAV_COMM; r = REG

TF_{ijr} power of the tax on endowment commodity i demanded by sector j of region r

i = ENDW_COMM; j = PROD_COMM; r = REG

TFD_{ijr} power of the tax on domestic tradable commodity i demanded by sector j of region r

i = TRAD_COMM; j = PROD_COMM; r = REG

TFM_{ijr} power of the tax on imported tradable commodity i demanded by sector j of region r

i = TRAD_COMM; j = PROD_COMM; r = REG

TPD_{ir} power of the tax on domestic tradable commodity i purchased by private household in region r

i = TRAD_COMM; r = REG

TPM_{ir} power of the tax on imported tradable commodity i purchased by private household in region r

i = TRAD_COMM; r = REG

TGD_{ir} power of the tax on domestic tradable commodity i purchased by government household in region r

i = TRAD_COMM; r = REG

TGM_{ir} power of the tax on imported tradable commodity i purchased by government household in region r

i = TRAD_COMM; r = REG

TXS_{irs} power of the tax on exports of tradable commodity i from source r to destination s (levied in region r)

i = TRAD_COMM; r = s = REG

TMS_{irs} power of the tax on imports of tradable commodity i from source r to destination s (levied in region s)

i = TRAD_COMM; r = s = REG

TX_{ir} power of the variable export tax on exports of tradable commodity from region r - destination generic

i = TRAD_COMM; r = REG

TM_{ir} power of the variable import tax (levy) on imports of tradable commodity i in region s - source generic

i = TRAD_COMM; r = REG

TP_{r} region-wide shock to tax on purchases by private household in region r

r = REG

ATPM$_{ir}$ actual tax on imported traded commodity i purchased by private households in region r

i = TRAD_COMM; r = REG

ATPD$_{ir}$ actual tax on domestic traded commodity i purchased by private households in region r

i = TRAD_COMM; r = REG

DGTAX$_{ir}$ tax on government consumption of domestic goods i in region r

r = REG

IGTAX$_{ir}$ tax on government consumption of imported goods i in region r

r = REG

TGC$_{r}$ government consumption tax payments in r
TGC$_{r}$ = S$_{i}$DGTAX$_{ir}$ + IGTAX$_{ir}$ *i = TRAD_COMM; r = REG*

DPTAX$_{ir}$ tax on private consumption of domestic goods i in region r
DPTAX$_{ir}$ = VDPA$_{ir}$ - VDPM$_{ir}$ *i = TRAD_COMM; r = REG*

IPTAX$_{ir}$ tax on private consumption of imported goods i in region r
IPTAX$_{ir}$ = VIPA$_{ir}$ - VIPM$_{ir}$ *i = TRAD_COMM; r = REG*

TPCr private consumption tax payments in r
TPC$_{r}$ = S$_{i}$DPTAX$_{ir}$ + IPTAX$_{ir}$ *i = TRAD_COMM; r = REG*

DFTAX$_{ijr}$ tax on use of domestic intermediate goods i by j in r
DFTAX$_{ijr}$ = VDFA$_{ijr}$ - VDFM$_{ijr}$ *i = TRAD_COMM; j = PROD_COMM; r = REG*

IFTAX$_{ijr}$ tax on use of imported intermediate goods i by j in r
IFTAX$_{ijr}$ = VIFA$_{ijr}$ - VIFM$_{ijr}$ *i = TRAD_COMM; j = PROD_COMM; r = REG*

TIU$_{r}$ firms' tax payments on intermediate goods usage in r
TIU$_{r}$ = S$_{j}$S$_{i}$(DFTAX$_{ijr}$ + IFTAX$_{ijr}$) *i = TRAD_COMM; j = PROD_COMM; r = REG*

ETAX$_{ijr}$ tax on use of endowment goods i by industry j in region r
ETAX$_{ijr}$ = VFA$_{ijr}$ - VFM$_{ijr}$ *i = ENDW_COMM; j = PROD_COMM; r = REG*

TFU$_{r}$ firms' tax payments on primary factor usage in r
TFU$_{r}$ = S$_{i}$S$_{j}$ETAX$_{ijr}$ *i = ENDW_COMM; j = PROD_COMM; r = REG*

PTAX$_{ir}$ output tax on goods i in region r
PTAX$_{ir}$ = VOM$_{ir}$ - VOA$_{ir}$ *i = NSAV_COMM; r = REG*

TOUT$_{r}$ production tax payments in r
TOUT$_{r}$ = S$_{i}$PTAX$_{ir}$ *i = PROD_COMM; r = REG*

XTAXD$_{irs}$ tax on exports of goods i from source r to destination s
XTAXD$_{irs}$ = VXWD$_{irs}$ - VXMD$_{irs}$ *i = TRAD_COMM; r = s = REG*

TEX_r export tax payments in r
$TEXr = S_iS_sXTAXD_{irs}$ *i = TRAD_COMM; $r = s$ = REG*

$MTAX_{irs}$ tax on imports of goods i from source r in destination s
$MTAX_{irs} = VIMS_{irs} - VIWS_{irs}$ *i = TRAD_COMM; $r = s$ = REG*

TIM_r import tax payments in r
$TIM_r = S_iS_sMTAX_{isr}$ *i = TRAD_COMM; $r = s$ = REG*

$TOTTAX_r$ total tax receipts in r
$TOTTAX_r = TPC_r + TGC_r + TIU_r + TFU_r + TOUT_r + TEX_r + TIM_r + TINC_r$ *r = REG*

$TGCR_r$ change in ratio of government consumption tax to INCOME in region r *r = REG*

$TPCR_r$ change in ratio of private consumption tax to INCOME in region r *r = REG*

$TIUR_r$ change in ratio of tax on intermediate usage to INCOME in region r *r = REG*

$TFUR_r$ change in ratio of tax on primary factor usage to INCOME in region r *r = REG*

$TOUTR_r$ change in ratio of output tax to INCOME in region r nbsp; *r = REG*

$TEXPR_r$ change in ratio of export tax to INCOME in region r *r = REG*

$TIMPR_r$ change in ratio of import tax to INCOME in region r *r = REG*

$TINC_r$ income tax payments in r
$TINC_r = S_iPTAX_{ir}$ *i = ENDOW_COMM; r = REG*

$TINCR_r$ change in ratio of income tax to INCOME in region r *r = REG*

$DTAXR_r$ change in ratio of taxes to INCOME in r *r = REG*

Regional Household Preference Parameters and Shifters

$DPARPRIV_r$ private consumption distribution parameter
$DPARPRIV_r = UELASPRIV_r*XSHRPRIV_r/UTILELAS_r$ *r = REG*

$DPARGOV_r$ government consumption distribution parameter
$DPARGOV_r = XSHRGOV_r/UTILELAS_r$ *r = REG*

$DPARSAVE_r$ saving distribution parameter
$DPARSAVE_r = XSHRSAVE_r/UTILELAS_r$ *r = REG*

$DPARSUM_r$ sum of distribution parameters *r = REG*

$dpav_r$ change in average distribution parameter *r = REG*

$dpsum_r$ change in sum of the distribution parameters *r = REG*

$dppriv_r$ change in private consumption distribution parameter *r = REG*

$dpgov_r$ change in government consumption distribution parameter *r = REG*

$dpsave_r$ change in saving distribution parameter *r = REG*

Slack Variables

profitslack$_{jc}$ slack variable in the ZEROPROFITS equation (this is exogenous as long as output level, QO(j), is determined endogenously)

j = PROD_COMM; r = REG

cgdslack$_r$ slack variable in the CAPGOODS equation (this is exogenous as long as output level of new capital goods, QO("cgds"), is determined endogenously)

r = REG

endwslack$_{ir}$ slack variable in the MKTCLENDWM and ENDW_SUPPLY equations (this is exogenous as long as primary factor rental rates, PMi and PMESij are determined endogenously)

i = ENDWS_COMM; r = REG

tradslack$_{ir}$ slack variable in the MKTCLTRD equation (this is exogenous as long as market price of tradable, PMi, is determined endogenously)

i = TRAD_COMM; r = REG

incomeslack$_r$ slack variable in the INCOME equation (this is exogenous as long as income, Y, is determined endogenously)

r = REG

psaveslack$_r$ slack variable in the SAVINGS equation (this is exogenous as long as level of savings, QSAVE, is determined endogenously)

r = REG

walraslack slack variable in the WALRAS equation (this is endogenous as long as price of savings, PSAVE, is determined exogenously which is the case in a standard GE closure. When any one of the GE links is broken, this is swapped with PSAVE, the numeraire price, thereby forcing global savings to equal global investment).

incomeslack$_r$ slack variable in the expression for regional income *r = REG*

Value and Income Variables

vxwfob$_{ir}$ percentage change in value of exports of tradable commodity i from source region r using fob weights (is identical to the linearized form of VXW$_{ir}$)

i = TRAD_COMM; r = REG

vxwreg$_r$ percentage change in value of merchandise exports from region r using fob weights (is identical to the linearized form of VXWREGION$_r$)

r = REG

vxwcom$_i$ percentage change in value of global merchandise exports of tradable commodity i using fob weights (is identical to the linearized form of VXWCOMMOD$_i$)

i = TRAD_COMM

viwcif$_{ir}$ percentage change in value of imports of tradable commodity i into region r using fob weights (is identical to the linearized form of VIW$_{ir}$)

i = TRAD_COMM; r = REG

$viwreg_r$ percentage change in value of merchandise imports into region r using cif weights (is identical to the linearized form of $VIWREGION_{ir}$)

r = REG

$viwcom_i$ percentage change in value of global merchandise imports of tradable commodity i using fob weights (is identical to the linearized form of $VIWCOMMOD_i$)

i = TRAD_COMM

vxwwld percentage change in value of worldwide commodity exports using fob weights (is identical to the linearized form of VXWLD)

$valuew_i$ percentage change in value of global supply of tradable commodity i using fob weights (is identical to the linearized form of $VWOW_i$)

i = TRAD_COMM

$valuewu_i$ value of world supply of goods i at user prices

i = TRAD_COMM

$vgdp_r$ percentage change in value of GDP in region r (is identical to the linearized form of GDP_r)

r = REG

y_r percentage change in regional household income (is identical to the linearized form of INCOME)

r = REG

yp_r percentage change in private household expenditure (is identical to the linearized form of PRIVEXP).

r = REG

FY_r primary factor income in r net of depreciation
$FY_r = S_i VOM_{ir} - VDEP_r$ *i = ENDW_COMM; r = REG*

$fincome_r$ pc change in factor income variable in r net of depreciation *r = REG*

Utility Variables

U_r per capita utility from aggregate household expenditure in region r *r = REG*

UP_r per capita utility from private household expenditure in region r *r = REG*

UG_r aggregate utility from government household expenditure in region r *r = REG*

$UTILELAS_r$ elasticity of cost of utility wrt utility
$UTILELAS_r = (UELASPRIV_r*XSHRPRIV_r + XSHRGOV_r + XSHRSAVE_r)/DPARSUM_r$
r = REG

$uelas_r$ pc change in elasticity of cost of utility wrt utility *r = REG*

$uepriv_r$ pc change in utility elasticity of private cons expenditure *r = REG*

uelasev $_r$ pc change in elasticity of cost of utility wrt utility, for EV calculation *r = REG*

ueprivev $_r$ pc change in utility elasticity of private cons expenditure, for EV calculation
r = REG

Welfare Variables
EV $_r$ equivalent variation, in US$ million (positive figure indicates welfare improvement) *r = REG*
WEV equivalent variation, in US$ million, for the world (positive figure indicates welfare improvement)
ugev $_r$ per capita utility from government expenditure, for EV calculation *r = REG*
upev $_r$ per capita utility from private expenditure, for EV calculation *r = REG*
qsaveev $_r$ total quantity of savings demanded, for EV calculation *r = REG*
ypev $_r$ private consumption expenditure, in region r, for EV calculation *r = REG*
ygev $_r$ government consumption expenditure, in region r, for EV calculation *r = REG*
qpev $_{ir}$ private household demand for commodity i in region r, for EV calculation *i = TRAD_COMM, r = REG*
yev $_r$ regional household income, in region r, for EV calculation
ysaveev $_r$ NET savings expenditure, for EV calculation
dpavev $_r$ average distribution parameter shift, for EV calculation *r = REG*

Trade Balance Variables
DTBAL $_r$ change in trade balance of region r , in US$ million (positive figure indicates increases in exports exceeds increases in imports) *r = REG*
DTBALi $_{ir}$ change in trade balance for tradable commodity i in region r , in US$ million (positive figure indicates increases in exports exceeds increases in imports) *i = TRAD_COMM; r = REG*

Source: GTAP database and model

https://www.gtap.agecon.purdue.edu/models/setsVariables.asp