THE IMPACT OF NON-TARIFF MEASURES ON SADC AGRICULTURAL TRADE

by

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Submitted in partial fulfilment of the
requirements for the degree

Philosophiae Doctor

in the

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

July 2014

DECLARATION

I, Mmatlou William Kalaba, hereby declare that this thesis, which I submit for the degree PhD in Agricultural Economics at the University of Pretoria, is my own work and has not been submitted by me for a degree at this or any other tertiary institution.

Signature: _____

Date: _____

ACKNOWLEDGEMENT

When time started exerting pressure to complete this study, I was required to put everything aside and focus on the job in hand. That time coincided with an interesting stage of "Outliers", the book I was reading then (Gladwell, 2008). In the words of Malcolm Gladwell, *"success follows a predictable path. It is not the brightest who succeed. Nor is it simply the sum of decisions and efforts made. It is not exceptional or mysterious. It is rather a gift, … grounded in a web of advantages and inheritances, some deserved, some not, some earned, 3and some just pure luck. Those who have been given opportunities and had strength and presence of mind to seize them, eventually succeed*" (p. 267).

So, I would like to thank everyone who has played a role and has been a part of the network that provided this opportunity and contributed towards the completion of this thesis. I will start with my supervisor and *chief enforcer*, Prof Johann Kirsten, who provided numerous opportunities to get started, to keep going and to see the end. His persistence is admirable, and at times, he showed more energy, enthusiasm and passion than the owner of the project did. Thank you very much, and I still have no idea how you do that.

I would also like to thank Dr Babatunde Abidoye who joined midway through the process and provided the technical, quantitative and econometric expertise. Until you showed up on the scene, the light that was visible through the PhD tunnel was never clear – whether it was from an on-coming train or the exit. Then Prof Alex McCalla came in from the University of California, Davies, and he simplified the process, identifying key points and just making the difficult concepts, which he called "*highly cryptic*". Yet he showed that they are within reach. He provided what Prof Kirsten calls, *"the straw that broke the camel's back*", the back of the blockage, and with his contribution, I found a way out of the tunnel. I am very grateful for your contributions.

Appreciation also goes to the web of support and contributions which were provided in many different ways, including Mss Zuna Botha, Dr Ramos Mabugu, Frans de Foglio, Thabo Sacolo, Tinashe Kapuya, Dr Madime Mokoena, Dr Moraka Makhura, Tshegofatso Nkosi, Ben Moholwa, Dr Myriam Velia, the BFAP family and Ximena Gonzalez-Nunes.

Some of the advantages and the support that made this work achievable were provided by several institutions. I am highly indebted to government departments, ministries and state agencies in the Southern African region for the role they played in providing information. The NEPAD Business Forum (The NBF) and Trade and Industrial Policy Strategies (TIPS) helped to unlock some of the information doors by arranging personal interviews with some of the senior government officials in the region. The University of Pretoria has provided me with an opportunity to study in one of the prestigious universities on the continent, and one of the best in the world.

The support and encouragement provided by my mother, siblings and other family members is insurmountable. Finally, thanks go to my wife, Lebogang, who was available in providing support, love and courage throughout this period. My children, Tshepo and Lesedi, did not ask difficult questions, but they kept reminding me that I needed to push harder. A lot was sacrificed, and for that, I am very grateful.

ABSTRACT

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Fifteen countries which are members of the Southern African Development Community (SADC) have embarked on a regional integration initiative. In 1996, a trade protocol that aimed to increase trade among members by removing trade barriers was signed. In the year 2000, this protocol was implemented, leading to a Free Trade Area (FTA) in 2008. More than 85 % of SADC trade was free of customs duties from 2008 onwards. However, while custom tariffs were reduced, the share of SADC trade did not show any improvement over the ten-year period after implementing the trade protocol. Accordingly, the objective of this study is to examine the factors which contributed to lack of improvement in SADC trade, particularly the role of Non-Tariff Measures (NTMs).

One of the main challenges in analysing NTMs in SADC is the unavailability of relevant information. An SADC NTM database was built as a repository of official NTMs. In order to quantify NTMs, a database was classified, similarly to the international database. Agricultural products at HS 4-digit level for ten SADC countries were included in this repository, and groupedinto six main categories; namely animal products, cereals, horticultural products, oilseeds, industrial and processed products.

The trade data challenges within SADC countries inadvertently prescribed the econometric methods to apply for the set objectives of the study. The two main challenges of SADC trade data are missing data for some years and high percentage of zero trade flows. A latent threshold gravity model was employed with hierarchical specification to control for country effects. The hierarchical model captures individual country effects, such as the impact of NTMs on trade volumes, and thus intra-SADC trade.

Such impact was then assessed when an additional NTM is introduced or increases trade volumes. The two effect models were examining the attributes of changes in regional trade, as well as those attributes of change in NTMs. The effects NTMs were incorporated into the model by weighting the number of NTMs by share of trade in the region, as well as ranks of country NTMs within product groups. Types of NTMs which were estimated are Sanitary and Phyto-Sanitary measures (SPS), Technical Barriers to Trade (TBT) and an aggregation of all other NTMs which do not belong to the two groups.

Results show that there is evidence NTMs were increasing at the same period when tariffs were being reduced. Using the inventory methods of evaluating presence and prevalence of NTMs, it was also evident that NTMs are used across most agricultural products. The percentage of products affected by NTMs in 2010 was much higher than in 2000.
The econometric model results show that all gravity model variables, GDP, border and language were consistent with the theoretical expectations.Distance does nothave significant influence on SADC trade. The reason for this has to do with the trading pattern of SADC countries, which is very high between contiguous members, compared to non-contiguous members.
The estimation of zero observed trade, using a threshold model, provided additional understanding of the role and reasons for such trade. The estimated effects of the observed zero trade showed that if this threshold is high, implying that trade costs (NTMs) are restricting trade, then zero trade was observed. When high percentage of zero trade is observed, then intra-SADC trade remains small or declines. However, if the threshold is low, intra-SADC trade increases, as was observed in the case of *industrial* products.

The overall results confirm that NTMs do have an impact on intra-SADC trade. Industrial and cereal products are more responsive to NTMs than the other five product groups. A unit change in NTMs by regional trade members has more effects on intra- regional trade than a

unit change in trade value. That is the case because the SADC is already exchanging a large share of its total trade with non-SADC members. Therefore, attention should be given to addressing the way NTMs are introduced.

One of the important findings from the study is that the intra-SADC trade is affected more by the effect of an additional NTM, than an additional unit of trade in value. The effect of addressing NTMs is one and half more than those of additional trade value. So, in order to improve intra-SADC trade performance, focus must on addressing the NTMs and growing trade. In addressing NTMs, it does not necessarily require removing or even reducing them. It is about making it easy to comply with them. SADC trade can be improved substantially by aiming to harmonise NTMs and overall policies.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Regional integration has gained momentum since the creation of the World Trade Organisation (WTO) in 1995. It is usually pursued with the objective of economic growth or development through trade (Penson, Capps, Rosson & Woodward, 2010). Therefore, countries that participate in regional integration do so with the objective of increasing trade between themselves. The countries in southern Africa are also subscribing to the idea of regional integration as they are changing the objectives of the predecessors to various regional bodies to be more focused on regional integration goals. The Southern African Development Community (SADC) and the Eastern African Community (EAC) are examples of organisations which were established for reasons other than trade, but have now redirected their objectives in pursuit of increasing trade between member states.

The Southern African Development Co-ordination Conference (SADCC), the forerunner to SADC, was established in 1980. It was formed as a loose alliance of nine States in southern Africa with the aim to coordinate development projects in order to lessen economic dependence on the then apartheid South Africa by mobilising resources and securing international support (SADC Secretariat (SADC), 2003). The nine founding member states were Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe. Namibia joined after independence in 1990, followed by South Africa in 1994, after the idea of isolating South Africa was removed from the agenda (Alleyne, 2005). Mauritius and Democratic Republic of Congo (DRC) joined in 1995 and 1997, respectively (SADC, 2003). Madagascar acceded to the SADC in 2005, while Seychelles was re-admitted in 2007.

The initial approach of coordinating development projects did not have anything to do with market integration (Leysens, 2000). The projects were based in individual member states and were largely dependent on foreign funding. Member states submitted projects which were nationally based but which needed to contribute to regional objectives. At the same time, members were allocated sectors to coordinate in which they were perceived to have particular

national interest. For instance, Angola was responsible for energy, Mozambique was in charge transport, while Swaziland handled human resources (Schoeman, 2004). This gave member states an incentive to coordinate policies, strategies and priorities in those areas which they were given responsibility for and were deemed to have capacity and expertise.

The changing global trends that also emphasised trade competitiveness made SADC member states realise the need to mobilise resources, potential and capacity (Schoeman, 2004; Leysens, 2000). Additional momentum came from the Abuja Treaty which was signed in 1991 by the Organisation of African Unity (OAU) heads of states. The treaty envisioned the establishment of the African Economic Community (Alleyne, 2005). The first phase in forming the African Economic Community was the creation of regional economic integration which would evolve into free trade areas and customs unions. SADC was selected as one of the building blocks for this continental integration initiative, hence the move to regional integration. The final transformation from SADCC to SADC was effectively concluded when heads of states and governments signed a Declaration and Treaty in 1992, which was given the theme *Towards Economic Integration* (SADC, 2003).

Prior to 1992, the organisation operated without any written code of conduct for member states (SADC, 2003). The signing of the declaration and treaty gave the organisation a legal character, since the SADC Treaty is a legally binding framework by which countries in the region coordinate, harmonise and rationalise their policies and strategies for sustainable development. SADC has since then developed a programme of action, covering several broad economic and social sectors, such as energy, tourism, environment and land management, water, mining, employment and labour, culture, information, sport, transport, and communications (SADC Secretariat (SADC), 2004).

The transformation of SADC as an organisation took place concomitantly with the restructuring of its institutions to make them more effective. Prior to 1992, there was no synergy between objectives and strategies (Schoeman, 2004). The institutional framework was also absent and therefore member states were unable to execute their mandate as provided by the Treaty. The subsequent SADC restructuring resulted in the formation of several institutions, including the Secretariat.

The Secretariat is responsible for sectoral programmes, which have policy objectives, strategies and projects designed to realise the overall goals and objectives of SADC. Under the sectoral programmes, a total of 23 protocols were developed and signed by October 2004 (SADC Secretariat (SADC), 2008). Most of these protocols have been ratified and are at various stages of implementation. The protocol on trade is the most relevant as it sets up a number of objectives and it guides the SADC integration process. The trade protocol is critical for SADC's integration process and entered into force in 2000, following its ratification by the required number of member States (SADC, 2003). The five objectives of the trade protocol include:

i. the promotion of intra-SADC trade liberalisation,

ii. the enhancement of efficient production within the region,

iii. the creation of an investor-friendly climate,

iv. the contribution to economic development, diversification and industrialisation, and

v. the establishment of the free trade area (FTA) within eight years of the launch.

In order for SADC to achieve what is listed as the first objective, it requires that the last objective be attained first. The proper implementation of the protocol steps were undertaken between the years 2000 and 2008, with eleven of the fifteen members fully or partially complying with the requirements. Angola and the DRC have not ratified the trade protocol, while Madagascar and Seychelles acceded when other members were already implementing it. Eventually, an FTA was established, with 85% of all intra-SADC trade-declared merchandise goods being duty-free (SADC Secretariat (SADC), 2009). Trade in services was not liberalised.

Trade in services, as well as the enhancement of cross-border-investments, was considered for cooperation among SADC members, despite initially being included in the protocol on trade (Southern African Development Community (SADC), 2006). However, at the launch of an FTA in 2008, these two were not part of the implementation. The other three objectives indicate that development directions in the SADC region are more focused on market efficiency. The ultimate objective is to enable SADC to effectively address the developmental

challenges of the region. Up to this point in time, the problems related to non-tariff measures were not addressed or discussed.

The tariff reduction process to reach an FTA stage of 85% of duty-free access in the region was completed through a tariff phase-down process. All SADC members, with the exception of Angola, DRC and Madagascar, have submitted schedules indicating how they will implement the protocol over the allocated period. Angola and DRC have signed the protocol, but did not ratify it and therefore have not reduced their tariff schedules accordingly (Khandelwal, 2004). Madagascar experienced problems with implementation of the trade protocol owing to its late accession to SADC (SADC Secretariat, 2007). The tariff phase-down schedules were differentiated sectorally and by country of imports origin (SADC, 2004).

Sectoral differentiation involved classifying imports into three lists, A, B and C. The A list contained goods which had very low tariff rates. These were reduced to zero upon the implementation of the trade protocol (Nhara, 2006). Goods in the C list comprised sensitive sectors and their liberalisation was to proceed slowly between years eight and twelve'. Mozambique was granted an exemption, and liberalisation of its sensitive products will be completed over a 15-year period (Southern African Global Competitiveness Hub, 2007). The import share of products considered to be sensitive was limited to a maximum of 15% of the 1996 total imports to make sure that when an FTA was established, at least 85% of SADC trade would be duty-free (SADC, 2004). The year 1996 was selected as the base period as it was also the year in which the protocol on trade was signed. The B list contained all goods that are not in A or C lists, and they were to be liberalised over an eight-year period.

SADC followed the principle of asymmetry when implementing the trade protocol by allowing countries at different economic and development levels to reduce tariffs at varying paces (Nhara, 2006). Southern African Customs Union (SACU) countries comprising South Africa, Botswana, Lesotho, Namibia and Swaziland were classified as developed countries. These members reduced tariffs at a faster rate than other members did. The next set of countries to reduce tariffs at a medium pace were Mauritius and Zimbabwe, which were classified as middle-income countries in the context of the SADC region. Finally, the least developed countries implemented a tariff reduction at the slowest rate. This last group of countries comprised Malawi, Mozambique, Tanzania and Zambia. Angola and the DRC were

not participating in the tariff reduction process, while Madagascar and Seychelles acceded midway in the tariff reduction process.

Similarly to the sectoral differentiation, the region was divided into three categories based on the level of development. This was applied in order to account for inequalities arising from different levels of development by member states. This approach was adopted to allow least-developed members more transitional time to adjust than the relatively developed SADC members.

The rationale behind this asymmetry principle was to allow vulnerable countries, as well as those that depended on tariff revenue, more time to adjust and find other sources of revenue. So, the SACU, as a developed group, was required to front-load its tariff phase down, i.e. phasing down tariffs earlier than the rest of the members by reaching the 85% duty-free benchmark by 2006 (SADC, 2003). The second category was expected to mid-load its schedule, while the third group of countries back-loaded. Non-SACU members submitted two tariff phase-down schedules, one for imports originating from South Africa, and the other for the rest of SADC members.

Table 1.1: SADC tariff phase down offers showing per cent of tariff lines that are scheduled to be at zero level in 2001, 2005 and 2008

Country	Number of tariff lines	2001		2005		2008	
		SADC*	SA	SADC *	SA	SADC*	SA
Malawi	5,443	33.40%	33.40%	33.40%	33.40%	85.30%	84.90%
Mauritius	5,479	69.70%	69.40%	90.50%	69.70%	90.50%	90.50%
Mozambique	5,246	30.10%	28.10%	30.10%	28.10%	94%	92.60%
SACU	7,802	63.90%	N/A**	94.60%	N/A**	99.30%	N/A**
Tanzania	6,215	17.50%	15.70%	24.40%	15.70%	86.30%	84.60%
Zambia	6,066	54.20%	32.10%	54.20%	32.10%	95.90%	95.90%
Zimbabwe	7,167	30.70%	32.10%	30.70%	44%	89.80%	71.60%

Source: *Southern African Global Competitiveness Hub, 2007* (Southern African Global Competitiveness Hub, 2007)

** This refers to the offer by SADC member to other member states excluding South Africa.*

*** N/A implies not available, as SACU was required to submit only one offer*

The tariff offers by SADC member states are illustrated in Table 1.1. The loading principle is clearly observable as one can see that the least-developing countries would have only liberalised a third or less of their tariff lines, if the schedules were applied according to

commitments. In contrast, by 2005, SACU had exceeded its requirement of 85% and by 2008, it had liberalised approximately 97% of its lines. In general, the reduction of tariffs by member states illustrates intent and commitment towards trade liberalisation, and thus integration. However, that process was never intended to be the end result but rather to serve as means to encourage intra-SADC trade flows. High volumes of intra-trade flows are associated with improved welfare and living standards. Then trade integration is linked to development challenges if it helps to address welfare and living standards.

1.2 RESEARCH PROBLEM AND MOTIVATION

As shown earlier, several studies in the SADC region on integration have focused on the gains and losses from the process of tariff reduction. Except for a few, most of them have showed that the gains from the integration process and the introduction of free trade outweigh the losses. However, none of these studies looked at protection beyond just tariffs. There is sufficient evidence showing that tariffs have been substantially reduced, as 85% of SADC trade has zero-tariff rate applied to them (SADC, 2009). According to trade theory (Appleyard & Field, 1998), when tariffs are reduced, the response should be an improvement in trade flows for the members of the integration bloc, relative to the rest of trade. Thus, intra-SADC trade share is expected to have been higher or improving as from the year 2000, going forward**.**

When one assesses the value of intra-SADC agriculture imports over the period 2000-2010 and compares this with agriculture imports from non-SADC members, as is shown Figure 1.1, it appears that over this period the gap between SADC imports and non-SADC imports widened, or grew in favour of non-SADC imports. Therefore, SADC countries are still importing relatively more from non-SADC members, despite the incentives of low tariffs within the region.

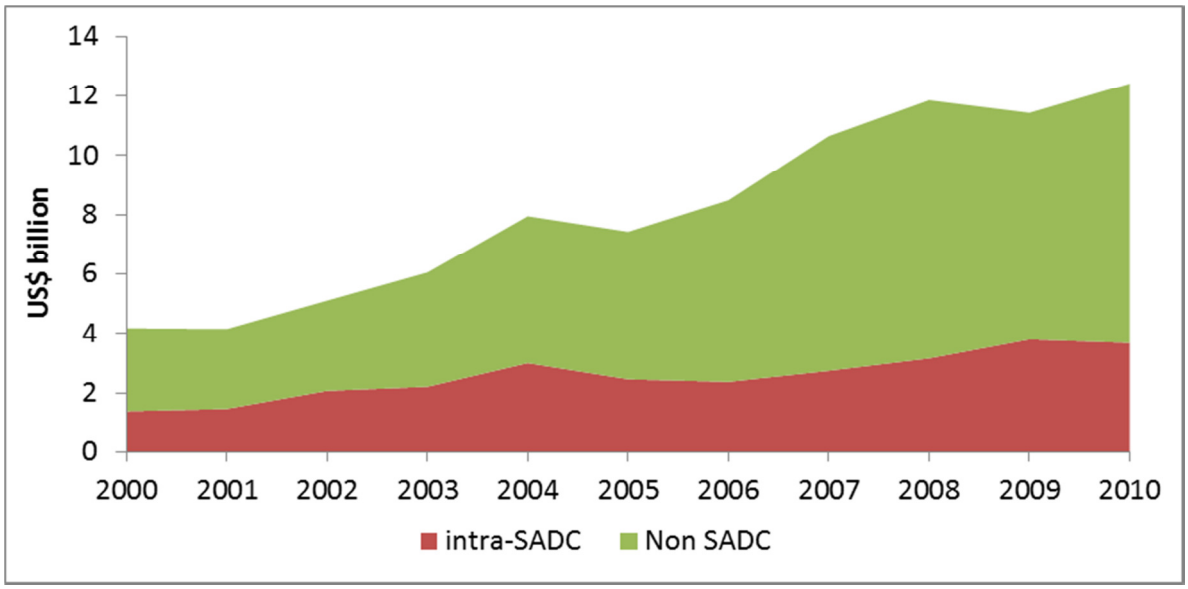

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Figure 1.1: Intra-SADC trade compared to non-SADC imports of agricultural products

Source: Calculated from UNCOMTRADE Database (2012)

Some of the impacts of agricultural trade liberalisation are shown in Figure 1.2. There is clear evidence that agricultural tariffs have declined over the period, from about 15% in 2000 to 4% in 2010. The agricultural tariffs used are simple unweighted averages during this period. The decline in tariffs was due to the implementation of the SADC trade protocol between 2000 and 2008. Despite this reduction in agricultural tariffs between member states, the share of intra-SADC agricultural trade in 2010 was almost at the same level in 2000. It is evident that intra-SADC trade in agricultural products had not improved over this decade, yet tariffs declined substantially. This again suggests that tariffs are not the main barriers prohibiting intra-regional trade of agricultural products.

Regional integration using the current approach of using tariff reduction as the main incentive to stimulate trade has not resulted in substantial growth in intra-regional trade. The current format of regional integration uses reduction in tariffs, harmonisation of policies, and creation of FTAs as means towards fostering growth in intra-regional trade. This approach suggests that trade protection between member states is the main barrier to intra-SADC trade. However, over the period of implementing this regional integration model through tariff reduction, intra-regional trade has not improved. The share of intra-SADC trade in agricultural products remained around one-third of total trade, while about two-thirds of the trade is with other partners. This suggests that there are other barriers to intra-SADC trade which were not addressed in the implementation of the trade protocol.

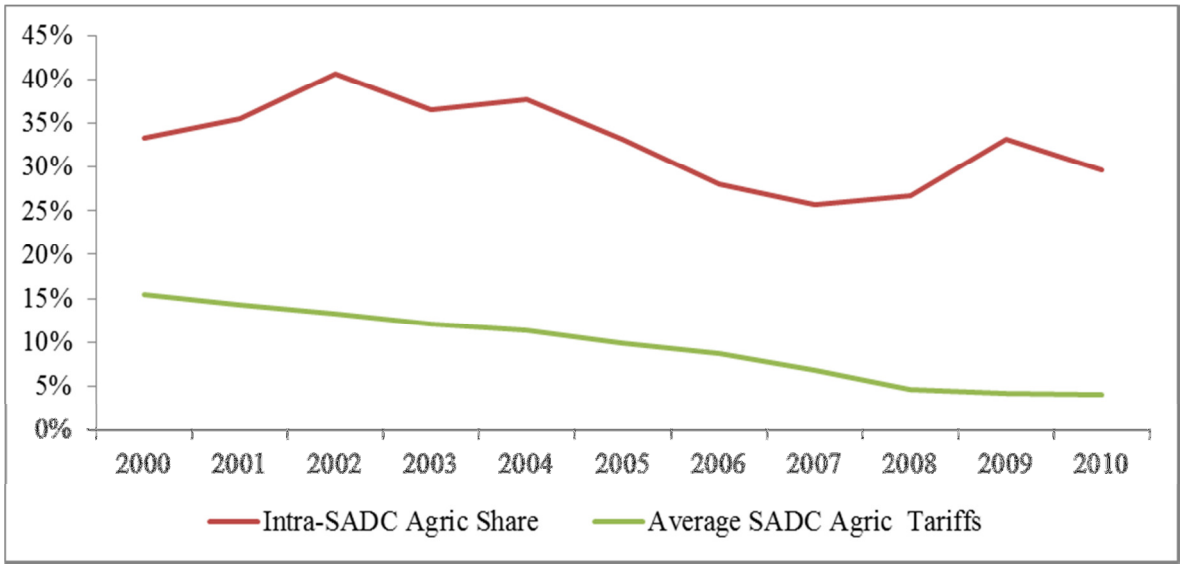


Figure 1.2: Tariffs on intra-SADC trade in agricultural products and intra-regional share of total agriculture exports.

Source: Calculated from SADC Secretariat (2009) *and UNComtrade (2011)*

Another gap in the component of trade barriers is the absence of information on NTMs. There is no single source of these barriers within SADC countries or in the regional secretariats. Therefore, because of this gap, it is very difficult to estimate their impacts or to design appropriate policy actions to deal with their potential protectionist impact.

Research questions

This study addresses the following research questions:

- Are NTMs responsible for the declining intra-SADC trade in agricultural products?
- What are the trade effects of NTMs on agricultural trade in SADC?
- Are trading rules and arrangements responsible for the uses of NTMs?
- Can the removal of NTMs unlock further trade of agricultural products in SADC?

1.3 HYPOTHESES

NTMs have not been a target for reduction in the same way as tariffs by SADC. This may have to do with their attributes, i:e. they are not directly quantifiable; some information is hard to gather; they encompass a wide set of policies; they involve complex legal texts; they

are highly diverse; they are not always applied transparently; and their effects are under-studied. The fact that there is no single repository of NTMs in one country, let alone in the region, makes it difficult to have a view of the SADC-wide application of such measures. Therefore, tariffs have become a soft target for pursuing regional integration, while NTMs were not reduced. It is difficult for SADC to manage the NTMs since they cannot measure them.

While tariffs on SADC agricultural products have declined considerably, intra-SADC trade has not improved substantially. At the same time, little consideration has been given to NTM-related policies for further trade liberalisation (Southern African Trade Hub (SATH), 2012). This is despite Article VI of the SADC trade protocol stating the need to eliminate NTB and not to impose new measures (Southern African Global Competitiveness Hub, 2009). So, these measures are likely to have more impact on trade than tariffs.

SADC's approach to regional integration and to promote regional trade has been mainly through internal mechanisms of tariff reduction, thus paying less attention to NTMs. Considering that NTMs are diverse, some non-transparent, while others are necessary, it is easy to use them for trade protection purposes. This complexity makes them useful trade protection instruments, but their use may negate the progress being made in tariff reduction, or even reverse it. It is, therefore, conceivable that NTMs explain a large proportion of poor performance of intra-regional trade in agriculture. Furthermore, if these measures are addressed, high trade volumes and improvements in consumption, production and welfare can be expected.

Accordingly, the hypothesis of this study comprises four aspects,:

- The focus on tariff reduction by SADC has taken attention away from NTMs, resulting in escalation of NTM over time;
- making NTM information available will make it possible to assess their effects;
- trade effects of NTM use vary across the type of NTMs, product and individual countries; and
- addressing these NTMs would result in improvements in intra-SADC trade flows and thus facilitate the attainment of regional integration goals.

1.4 OBJECTIVES

The main research objective of this study is to evaluate the effects of different types of NTMs on intra-regional trade of agricultural products. However, in order to assess such impact, the first task will be to make NTMs quantifiable by establishing a repository of SADC NTMs, and then evaluate their effects on intra-SADC trade. The study is limited to trade in agricultural goods. The specific objectives are as follows:

- To develop a single repository database of consistent, cross-country SADC NTMs for agricultural products.
- To examine the effects of NTMs on various agricultural products.
- To determine the role played by WTO in the use of NTMs by member states.
- To estimate the effect of NTMs on intra-SADC trade flows.

In brief, this study sets out to establish SADC, NTM database. This database will be used to evaluate various effects of NTMs on agricultural trade. First, the study seeks to determine whether NTMs have increased, decreased or remained the same during and beyond the implementation of the trade protocol. Secondly, to evaluate how these NTMs have affected trade of different product groups. Thirdly, determine whether different NTM categories affect trade in the same or different way. And finally, to assess whether WTO- sanctioned NTMs have more influence on trade than others.

1.5 CONTRIBUTIONS

The main contributions of this study to the discipline and the field include:

- Developing an SADC Database of NTMs for ten countries, within the existing international classification of NTMs.
- Evaluating NTMs using both simple inventory methods and complex econometric approaches; and

- Controlling for censoring due to zero-trade and country-specific effects in a single framework.

There will be a single repository database of NTMs of agricultural products in SADC that follows the recognised international nomenclatures on NTMs. This will provide transparency on the NTMs within SADC, and enhance further analysis in this area. It will also improve policy making for the respective government and regional Secretariats. NTMs will be be compared across countries and products.

The overall results of the study will contribute towards the understanding of the integration process beyond just tariff removal. The study identifies and ranks the NTMs by SADC member states and by agricultural products, from the most prohibitive to the least. Other contributions include permitting a possible consideration of NTMs in a trade negotiation schedule. The study will contribute further insight into the progression of SADC trade and economic integration.

NTMs as elements of trade protection are essential for trade negotiations. This is an area where both political and institutional capacities play important roles. This study will contribute further to the understanding of institutional and regulatory determinants of trade protection. First, a database on NTMs which are regulatory will be established, and then their role on trade will be evaluated. Considering that NTMs are inevitable parts of trade policy, this study will contribute towards trade reforms of individual member states and regional institutions which would desire to make an effort to address the constraints of regional trade. Lastly, the results will contribute towards policy coordination between national and regional priorities as NTMs cut across national, regional and international trade boundaries.

1.6 DATA AND METHODOLOGY

1.6.1 Data and data sources

The trade data used in this study is taken from the SADC trade database. Agricultural products were defined at the HS 4-digit level, as defined in annex 1 of the Agreement on Agriculture by the WTO, in the Harmonised System (HS) Nomenclature. The products

included range from HS1 to HS24, excluding fisheries (HS3), HS40–HS43 and HS50 – HS52. The product information is recorded at the HS 4-digit level. For econometric analysis, these products are grouped into six main agricultural categories, i.e. animal and animal products; cereals, horticulture; industrial products; oilseeds and processed products.

Ten of the fifteen SADC countries are included in this study. They are Botswana, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Angola and DRC were excluded because they are not participating in the FTA and are not reporting their trade data to the Comtrade database (World Bank, 2013). Three other countries, Lesotho, Madagascar and Seychelles, were excluded owing to data unavailability and inconsistencies.

Tariff data used for SADC countries comes from the SADC Secretariat. The data was provided by member states to the Secretariat as part of the monitoring of the SADC trade protocol and the SADC FTA. Data on general tariffs was obtained from the WTO's integrated database on tariffs (World Trade Organisation (WTO), 2013).

Data on NTMs was compiled by gathering such data from various sources, classifying types of NTMs and later matching NTMs trade data at the HS 4 digit-level.The sources of information were identified from various government agencies, research and surveys, private institutions and international institutions. In many countries, information is published on line. Some countries publish information on the official government website, others on the parliament websites. Some of the documents were gathered from the regional Secretariats, i.e. SACU Secretariat in the case of SACU countries, SADC Secretariat, COMESA, EAC, and Indian Ocean Community (IOC). The WTO SPS management system was helpful in getting those regulations which were already notified. The end product was a single NTM database across the ten countries for 250 HS digit agricultural products.

1.6.2 Methodology

In section 1.2, it was observed that intra-SADC trade has not improved, despite substantial declines in tariffs over a decade. One of the possible explanations for this observation is that NTMs may have contributed to the lack of growth of intra-SADC trade during this period. At

the same time, NTMs are not easy to measure as they are applied in many different forms and are not always transparent. Nevertheless, to test the hypothesis that NTMs are responsible for low intra-SADC trade, information relating to NTMs must be prepared in such a way that it can be used to confirm or dispute such an assertion.

The process of preparing this NTM information started with the collection of data that is publicly available for the ten SADC countries in the sample over the period 2000 to 2010. This data was then classified according to the latest international taxonomy of NTMs. Once classified, NTM data was matched with the trade flow data. Then, the trade flows of products and countries that have high NTM incidences can be compared with those with low NTMs.

On trade flow data, it is widely acknowledged that it is always plagued with gaps and other challenges (International Trade Centre (ITC), 2013). The two main challenges for the SADC trade data are:

i) missing data for some years, and

ii) high percentage of zero-trade flows among trading partners.

If these problems are not addressed properly, then the outcomes may be influenced by such data challenges. This may lead to functional misspecification, as well as biased parameter estimates. Such results may end up with incorrect statistical and economic inferences. The most relevant aspect of zero trade in this study is the possibility that high percentage of zero data may be as result of highly restrictive trade regime or NTMs, and therefore if it not addressed, a very useful piece of information may be excluded.

The missing data was addressed using the mirror data method, which implies that trade flow of a reporting member was inverted to estimate the non-reporting country's missing data. So, imports of a reporting country will be used as estimates of exports for a non-reporting country. In the cases were at least two consecutive years of data were missing and it was not possible to use the mirror data method, then the trend was estimated by running an ordinary least squares regression on the available data. Then the coefficients of the regressions where used to estimate the missing data. These approaches are only useful in addressing missing data, but not necessarily in addressing high percentages of zero-trade flow.

To address high percentage of zeros in trade, it was necessary to estimate the level of preferred trade, what is referred to as “a threshold”. This threshold is then used as the trade that could have taken place, had there been no impediments such as NTMs. Theoretically, a threshold represents the amount of trade which is lost in transit. In value terms, it refers to the value of trade that may be eroded owing to trade costs. Therefore, any trade below the threshold does not make economic sense, and therefore that observation will remain as zero trade. The estimated values above the threshold will then replace the recorded zero-trade values.

In practice the latent variable is not observable, although it is observed whether countries trade or not. To estimate this latent variable and capture country effects, a hierarchical model is included in a Tobit gravity model in a Bayesian framework.

The estimation is done using the gravity model. The gravity model is the most preferred trade approach in this case because of the time series data that is available and its predictive power from the previous econometric work on trade (Anderson & van Wincoop, 2003; Helpman, Melitz & Rubinstein, 2008; Ranjan & Tobias, 2007; Stevens & Jabara, 1988). There are other options, such as the general equilibrium models, i.e. Global Trade Analysis Project (GTAP) which uses a reference year as a benchmark. However, the latest GTAP database, GTAP 8, uses 2004 and 2007 as reference years (Badri, Aguiar & McDougall, 2012). In addition, countries and products tend to be aggregated in such a way that individual attributes cannot be separated. For example, agricultural products are aggregated into twelve groups, and therefore it is difficult to estimate the impact of NTMs affecting a product at the disaggregated level of HS 4-digit.

Furthermore, the aggregation of countries on the GTAP database will affect Swaziland as it is aggregated together with Lesotho, and both are aggregated into a single group called “rest of SACU”. Accordingly, in that case, the impact of NTMs on one individual country will be difficult to separate from another. The gravity model makes it possible to observe both estimates for the country and product. So, the gravity model was preferred owing to this ability to separate country and product effects of NTMs. The results are expected to show high probability of the influence of NTMs on agricultural trade. Then, this coefficient of the NTM variable serves as an indicator of that influence on intra-SADC trade.

1.7 ORGANISATION

The rest of the thesis is organised as follows. The next chapter provides the main macro- and socio-economic trends in SADC. Chapter 3 extends the discussion on NTMs from WTO history, as well as on classifications and the prevalence of NTMs. In Chapter 4, various methods and measures of evaluating NTM effects are discussed, as well as the methods which are preferred for this study. An inventory approach analysis of some NTMs in SADC is also undertaken to examine the NTM use in SADC at basic level. Chapter 5 introduces the conceptual framework and derivation of an empirical model that is used to assess NTMs. In Chapter 6, the econometric results are discussed and explained in detail. Chapter 7 concludes with a summary, conclusions and some recommendations.

CHAPTER TWO

A DESCRIPTIVE OVERVIEW OF SADC MEMBER COUNTRIES

2.1 INTRODUCTION

SADC evolved out of the South African Development Coordination Conference (Oosthuizen, 2006). The latter was formed in 1980, with the objective of reducing dependence on South Africa. It was formed by the leaders of seven independent countries: Angola, Botswana, Lesotho, Mozambique, Swaziland, Tanzania and Zambia. The motivation for its formation was coordination on socio-economic grounds. SADC was officially established as an international organisation in 1992 by ten countries when the treaty was signed in Namibia (Chauvin & Gaulier, 2002). The implication of the treaty is that SADC shifted focus away from coordination of national programmes to cooperation and integration through an international organisation. By 2012, eight other members had acceded to SADC. They are Democratic Republic of Congo (DRC), Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa and Zimbabwe.

The objectives of SADC were broadened in 1992 to include two overarching goals of promotion of economic growth and socio-economic development. Specifically, SADC aims to eradicate poverty, and promote and maintain peace, security and democracy through regional cooperation and integration (Oosthuizen, 2006). The facilitation of regional integration has been the main part of SADC's activities on the economic front. The SADC protocol on trade was signed in 1996; in 2000, the protocol was implemented, and in 2008 SADC became a free trade area (FTA) with 85 % of trade taking place free of customs duties.

Despite southern Africa trying to pursue common goals, the constituent countries are different in many ways. The diversity may be a good thing as it may imply that there are opportunities to complement one another. These may present a good case, particularly when it comes to trade, but also with regard to climatic conditions, population and economic trends. However, these aspects must still be coordinated in a way that facilitates regional integration.

This chapter describes the main characteristics of SADC countries. The important element about this chapter is that it discusses country characteristics, which are central in determining bilateral trade. The next section discusses the structural features, colonisation language and macro-indicators of SADC countries. It is followed by a section that explains the socio-economic aspects of SADC, ranging across population, the macro-economy, poverty, hunger and, food security. The role and contribution of agriculture are discussed in the context of the differences between countries. In the last section, SADC trade is discussed in terms of trends in intra-regional trade, as well as total trade in both agricultural and all products.

2.2 A PROFILE OF SADC MEMBER COUNTRIES

There are many differences between countries in SADC, just as there are similarities in other respects. Three countries are islands in the Indian Ocean. These are Madagascar, Mauritius and the Seychelles. Five countries, Botswana, Lesotho, Swaziland, Zambia and Zimbabwe, are land-locked. Five countries have a common external tariff and belong to SACU. These are Botswana, Lesotho, Namibia, Swaziland and South Africa. Two countries use Portuguese as their official language (Angola and Mozambique), four use French (DRC, Madagascar, Mauritius and Seychelles), while in the rest of the countries English is the official language. Some of the differences in SADC countries are reflected in the economic development, socio-economic status and infrastructural development. Some of these topics will be discussed in detail in the subsequent sections.

These characteristics play an important role in determining trade patterns, as will be tested later. For examples, the island countries have a similar transportation mode in accessing foreign markets or goods. This will mainly be through water transportation (especially bulky products) and seldom by air transportation, in the case of lighter goods. This will be different from landlocked countries which will rely mostly on road or rail transportation. Similarly, countries speaking the same language, or which had the same coloniser, are likely to have similar characteristics which affect the way trade and consumption patterns develop.

The combined population of SADC countries was estimated to be 273 million in 2010 (World Bank, 2013). The three most populated countries are the DRC with 66 million, South Africa with 50 million, and Tanzania with 45 million. The least populated country was the island of Seychelles with less than 90 000 people. SADC is also a region with many poor people. It is

estimated that about 45% of the population live on less than $US1 a day (United Nations, 2010).

Another disparity between SADC member countries is in their economic classifications. Based on the World Bank classification which uses A Gross National Income (GNI) indicator, eight countries are classified as middle-income countries (World Bank, 2010). These are Angola, Botswana, Lesotho, Mauritius, Namibia, Seychelles, South Africa and Swaziland. The rest were classified as low-income countries.

2.3 SOCIO ECONOMIC STATUS

Rural poverty in SADC is reported to be very high. This is associated with low agricultural productivity, vulnerability to natural disasters, such as droughts and floods, as well as poor infrastructure (International Fund for Agriculture Development (IFAD), 2007). SADC countries have prioritised poverty reduction through several initiatives, nationally, regionally and internationally. Most countries have poverty reduction strategies in their national plans and policies. At the regional level, SADC is focusing on attaining the set goals under the Regional Indicative Strategic Development Plan (RISDP) (SADC, 2006). All countries have pledged to work towards attaining the Millennium Development Goals (MDGs), one of which is halving the poverty levels of 1990 by the year 2015.

The annual poverty rates, based on national poverty headcount ratio, are presented in Table 2.1. The table has data for countries with such information. National poverty headcount ratio is defined as the percentage of the population living below the set national poverty line (International Food Policy Research Institute (IFPRI), 2012a). It is calculated on the basis of the population-weighted subgroup estimates from household surveys. This poverty measure is different from the international one in that the latter refers to a percentage of the population living on less than $US1.25 a day, based on 2005 prices. Some countries, such as Lesotho, Malawi, South Africa and Zambia, set national poverty lines above the international one (Chilonda & Musaba, 2010).

Table 2.1: SADC National Poverty Headcount for selected years (%)

Country/Year	1990	2000	2005	2009
Lesotho	46.98	65.15	58.08	61.04
Madagascar	77.33	70.87	68.70	66.40
Malawi	54.00	53.00	52.40	38.35
Mauritius	6.98	7.58	7.88	8.12
Mozambique	81.96	61.60	49.81	41.24
South Africa	55.72	50.80	40.68	20.13
Tanzania	38.84	35.70	35.22	34.25
Zambia	70.00	71.00	66.00	62.88
Zimbabwe	23.98	42.18	51.28	58.56

Source: (Chilonda & Musaba, 2010)

The MDG1 goal is to reduce the 1990 poverty rates by half, by the year 2015. It can be seen from Table 2.1 that most countries are reducing their poverty rates. Exceptions are Mauritius, Lesotho and Zimbabwe. Mauritius is the country with the lowest poverty rates, even though it was marginally increasing over the two decades. Lesotho's 2009 poverty rate is higher than it was nearly two decades ago, while Zimbabwe's poverty rates have more than doubled over the same period.

The International Food Policy Research Institute (IFPRI) calculates a comprehensive indicator, the global hunger index (GHI), that tracks global hunger by country and region. The indicator reflects the multidimensional nature of hunger, as it is generated from three indicators: the percentage of people who are undernourished, the percentage of undernourished children under the age of five, and the mortality rate for children under the age of five (International Food Policy Research Institute (IFPRI), 2012b). The GHI ranges from 0 (no hunger) to 100 (the worst case). Since none of these extremes is reached in practice, values less than 5.0 imply low hunger; values between 5.0 and 9.9 reflect moderate hunger; values 10.0 between 19.9 indicate serious levels of hunger, while values between 20 and 29.9 indicate alarming hunger rates (IFPRI, 2012b). Values greater than 30 indicate extremely alarming hunger rates.

Table 2.2: Global Hunger Index Scores for SADC Countries and Selected years

Country	1990	1996	2001	2010
Angola	41.9	39.9	33.0	24.1
Botswana	13.4	15.4	15.7	13.7
Lesotho	12.6	13.6	13.9	11.9
Madagascar	24.1	23.8	24.9	22.5
Malawi	29.9	27.5	22.5	16.7
Mauritius	8.0	7.4	6.0	5.4
Mozambique	35.5	30.7	28.8	23.3
Namibia	20.3	19.1	16.3	13.2
South Africa	6.9	6.5	7.4	5.8
Swaziland	9.3	12.6	12.9	10.9
Tanzania	23.2	28.0	25.9	19.3
Zambia	24.8	25.0	27.2	23.3
Zimbabwe	18.6	22.3	21.3	17.3

Source: International Food Policy Research Institute (IFPRI, 2012b)

Table 2.2 shows the hunger situation of SADC countries for the years 1990, 1996, 2001 and 2010. The scores for each year are actually calculated on an average of five years, two on each side of the year in the table. For example, the GHI for 1990 is the average of the years 1988 to 1992. The only exception is the GHI for 2010, which is the average for the period 2005 to 2010. There was no data for Seychelles and the DRC.

There is evidence from Table 2.2 that the hunger situation has improved for all countries relative to the 1990s and even a decade ago. The best performing countries in 2010 were Mauritius and South Africa, as they have moderate hunger situations. Their GHI scores were between 5 and 9.9. Four countries have hunger situations which are considered to be alarming. These are Angola, Madagascar, Mozambique and Zambia.

SADC countries are also affected by high and uneven income distributions, measured using the Gini coefficient measure. The Gini-coefficient measures the degree of inequality in the income distribution within a country. The measure ranges from zero to 100, indicating the extent to which a country's income distribution deviates from perfect distribution. The lower coefficient indicates that the income distribution is more equal. The Gini-coefficients of Namibia, Angola, South Africa and Botswana have been measured as being above sixty, indicating unequal income distribution (Chilonda & Musaba, 2010). Four other countries had a Gini coefficient of more than fifty. These were Lesotho, Swaziland, Zambia and Zimbabwe.

The countries with low coefficients were Tanzania and Malawi, with a Gini coefficient of less than forty (Chilonda & Musaba, 2010). The average for the region was reported to be 51.

Food security is defined as a situation when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Ecker & Breisinger, 2012). In southern Africa food security is one of the major concerns as it is related to hunger and agriculture, and many people are not considered to be food secure. Within the SADC Secretariat, there are various ways of monitoring food security, such as the food insecurity early warning system and the vulnerability index. The early warning system mechanism which observes production of main cereals crops in the region is preferred for monitoring SADC food security (SADC, 2013). From the crop production and consumptions statistics, the SADC Secretariat estimates the number of people who may be at a risk of being food insecure.

Figure 2.1 shows the numbers and percentages of people who were at risk of food insecurity between the period 2003/04 and 2012/13 in SADC (SADC, 2013). The most number of people who were at a risk of not having sufficient food at all times were recorded in the periods 2003/03, 2005/06 and 2008/09. During these three periods, more than 20 million people were at a risk of being food insecure. More than 7 % of the SADC population were at risk. The highest was in 2003/04, when one tenth of the population faced food insecurity.

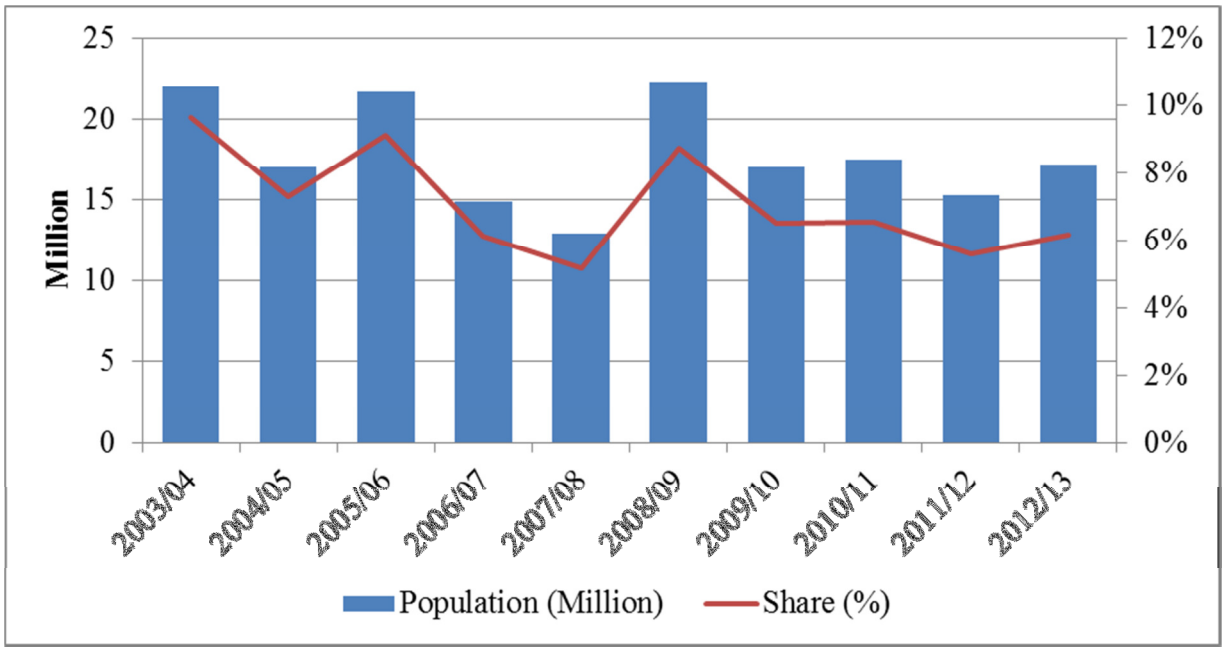


Figure 2.1: Food insecure population in SADC

Source: *Calculated from (SADC, 2013) and* (World Bank, 2013)

The countries that had the most people classified as food insecure in 2012/13 were South Africa with 6.5 million, the DRC with 6.4 million, and Zimbabwe with 2.2 million (SADC, 2013). Tanzania and Malawi also had more than one million people who were at risk. Their numbers were 1.6 and 1.5 million, respectively. The SADC Secretariat argues that changes in certain policies and increases in irrigated hectares would improve the food security situation (Southern African Development Community (SADC), 2012).

2.4 MACROECONOMIC PERFORMANCE

South Africa is by far the leading economy in the region. In the period between 1992 and 1995, South Africa accounted for nearly three quarters of the SADC GDP – $184 billion. Figure 2.2 shows contributions to the SADC GDP during this period. The DRC and Zimbabwe contributed about 4% to total SADC GDP. The countries with smallest contributions were Seychelles and Lesotho, both with contributions of less than 1%.

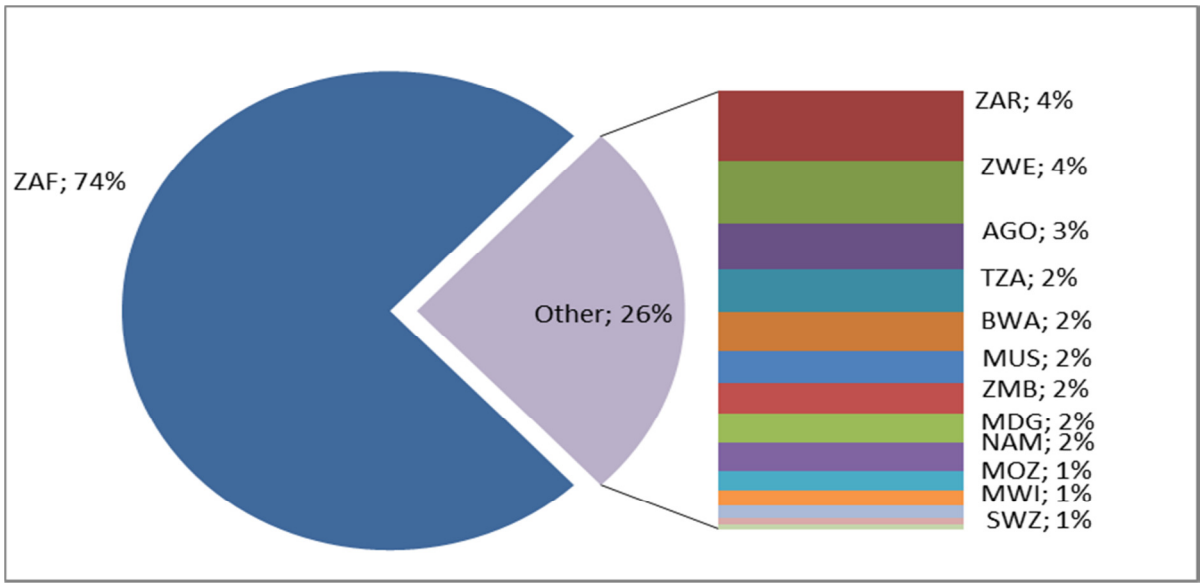


Figure 2.2: Average share of SADC GDP for the period 1992 - 1995

Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

The picture of SADC GDP by contribution of member states has changed in several ways from the early 1990s to the period 2006 to 2010. Firstly, South Africa's share declined from nearly three-quarters to less than two-thirds. Secondly, Figure 2.3 shows that Angola has increased its share from 3% to 14%. Thirdly, Zimbabwe's contribution declined to a mere 1%, compared to 4% in the early 1990s. Fourthly, Tanzania has doubled its share of SADC GDP.

Seychelles and Lesotho (not included in the figure) are the smallest economies in the region. Their combined contribution was less than 1%. Overall, SADC GDP in the latter period was two and half times what it was in the early 1990s, up from $184 billion to $ 466 bn. All these figures are in nominal or current US $.

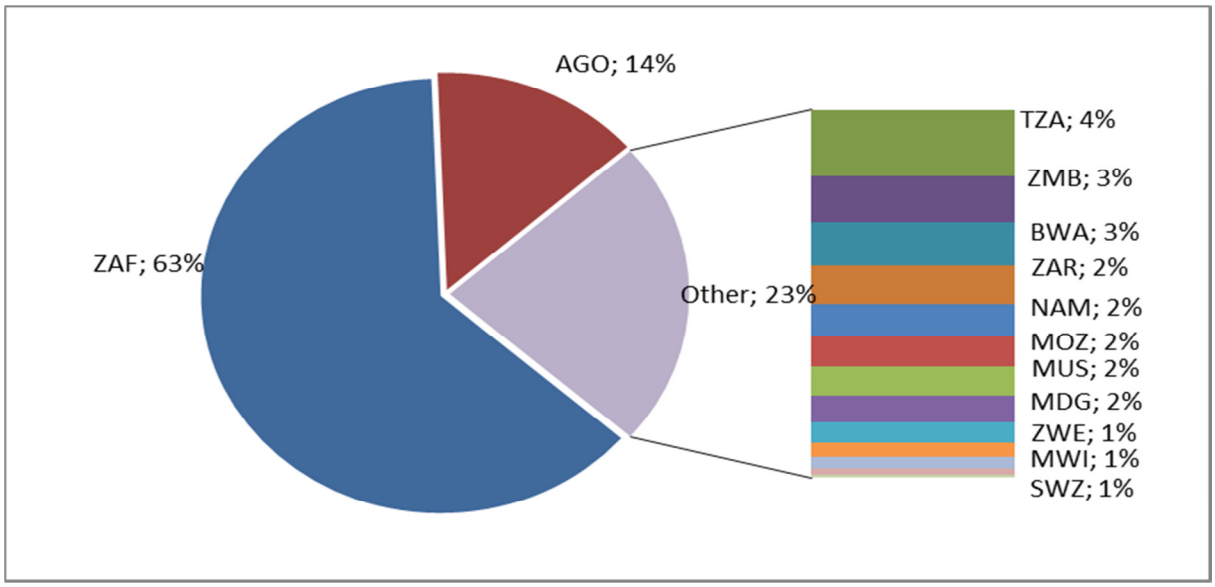


Figure 2.3: Average share of SADC GDP for the period 2006 - 2010

Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

Economic growth rates since SADC was formed are shown in Table 2.3. The GDP growth, on average, has been gradually increasing since the early 1990s. In the first half of the 1990s, the region grew at an average of less than 2%, but between 2006 and 2010 its growth was just less than 5%. The latter period includes years of global recession when many countries around the world were performing poorly.

Table 2.3: SADC average economic growth rates since its formation (%)

Country	1992-95	1996 -2000	2001-05	2006-10
Angola	-4.42	6.43	10.08	12.59
Botswana	3.22	7.45	5.29	3.01
DRC	-6.79	-3.89	4.32	5.60
Lesotho	4.48	3.32	2.89	4.75
Madagascar	1.23	3.84	2.60	3.08
Malawi	2.21	3.92	1.98	7.09
Mauritius	5.00	5.80	3.07	4.50
Mozambique	3.25	7.53	8.84	6.71
Namibia	4.15	3.51	5.00	4.26
Seychelles	2.98	6.24	-0.15	4.62
South Africa	1.36	2.80	3.84	3.22
Swaziland	3.39	2.85	2.11	2.46
Tanzania	1.73	4.31	7.05	6.88
Zambia	-1.60	2.83	4.82	6.42
Zimbabwe	0.36	2.41	-7.19	-1.84
Average	**1.37**	**3.96**	**3.64**	**4.89**

Source: Authors calculations based World Bank Development Indicators (World Bank, 2013)

Angola has shown consistently high growth rates in the last decade. It is also the only country that has growth rates above 10%. In the first half of 1990s, Angola's economy was declining owing to political instability. Recent high growth rates for Angola are associated with the oil sector. Another country with impressive growth rates is Mozambique, with rates higher than 5% in 15 years. Zimbabwe is the country that has regressed significantly over the last decade. It is the only country to record two successive negative growth rates in the last decade. Overall, all countries are experiencing an upward momentum of growth, despite the period being affected by recession.

There are also vast differences in terms of per capita GDP among SADC countries. Table 2.4 shows the average per capita GDP over the periods since SADC was formed in 1992. Overall, SADC GDP per capita has doubled in nearly two decades, from less than $1500 in the early 1990s, to more than $3000 in the period 2006 to 2010.

Table 2.4: SADC average GDP per capita since its formation ($)

Country	1992-95	1996 -2000	2001-05	2006-10
Angola	438.02	289.41	923.14	3 652.66
Botswana	2 852.44	3 147.12	4 412.36	6 493.84
DRC	1 83.31	114.80	108.89	174.84
Lesotho	437.13	429.03	484.98	801.59
Madagascar	250.06	261.92	282.62	403.05
Malawi	165.30	193.48	199.82	304.13
Mauritius	3 185.97	3 730.32	4 507.89	6 696.54
Mozambique	138.84	233.21	254.32	392.30
Namibia	1 963.01	1 980.76	2 542.97	4 133.02
Seychelles	6 446.05	7 371.69	9 141.65	11 249.96
South Africa	3 611.63	3 311.48	3 731.04	6 004.26
Swaziland	1 536.43	1 587.72	1 858.06	3 106.12
Tanzania	162.73	266.83	323.90	452.15
Zambia	38 6.43	348.06	441.18	1 061.94
Zimbabwe	601.64	606.94	482.95	459.21
Average	**1490.60**	**1591.52**	**1979.72**	**3025.71**

Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

Seychelles has the highest annual per capita GDP, compared to all countries over the period. That is mainly because the country is the least populated, with only 80000 inhabitants. The country with the lowest per capita GDP is the DRC, with less than $200 per annum, and it is followed by Mozambique with less than $400 per year. In terms of growth in per capita incomes, most countries have doubled their per capita GDP. However, Zambia has tripled its

per capita GDP from the 1990s, while Angola's GDP per capita is 12 times more than what it was in the late 1990s.

2.5 THE AGRICULTURAL INDUSTRY IN SADC MEMBER COUNTRIES

Agricultural GDP of SADC has shown similar features to the overall GDP over the period since 1992 in terms of growth trends. The average agricultural GDP for the period 1992 to 1995 was about $16 billion. It has increased to about $34 billion in the period between 2006 and 2010. This is a similar trend to the total GDP that has also more than doubled over the same periods.

However, a comparison of country contribution to agricultural GDP is different from that to overall GDP. The first difference is observed in Figure 2.4 in terms of diversity of the countries' shares. In the first period (1992 – 1995), there are three countries with a share of more than 10%. South Africa is still the leading contributor, with a contribution of about one-third of agricultural GDP, followed by the DRC with a quarter, and Tanzania with 12%.

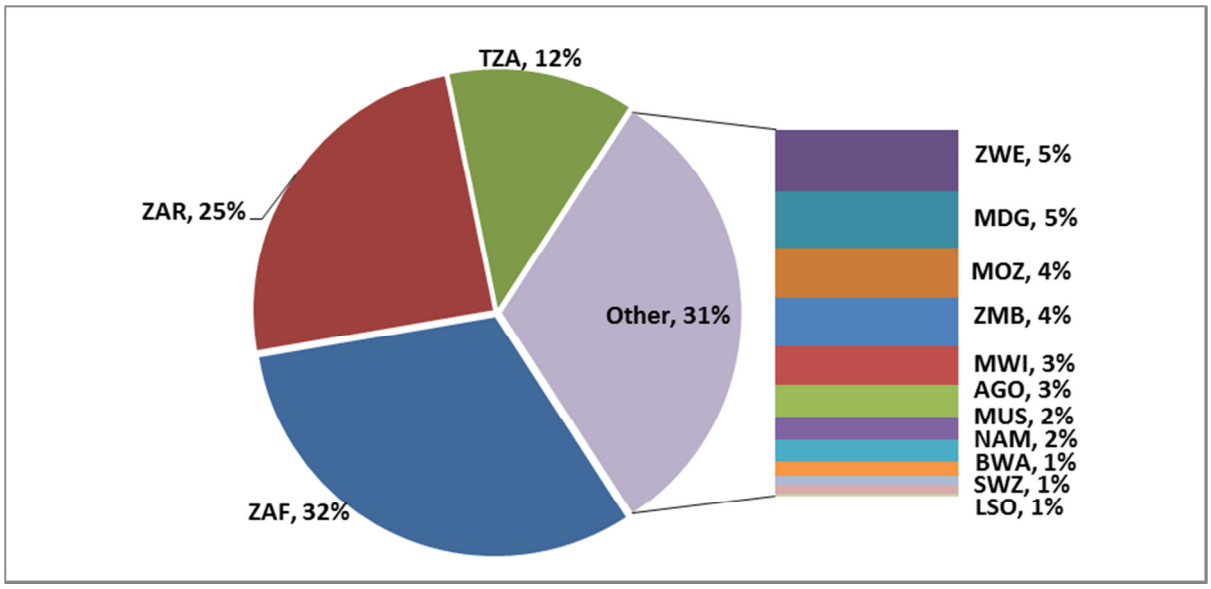


Figure 2.4: Average share of SADC Agriculture GDP for the period 1992 - 1995

Source: Author's calculations based on World Bank Development Indicators (World Bank, 2013)

The rest of SADC countries contribute just one-third of the total agriculture GDP. Zimbabwe and Madagascar contributed 5% each. The country that contributed the least in the first period was the Seychelles. Its contribution is less than one per cent, and is not included in the figure.

There are more differences between the overall GDP and agriculture GDP in the last period (2006 – 2010). Figure 2.5 shows that in that period there were more countries with a share of more than 10%. Angola joins the three others from first period with a share of 16% of the agriculture GDP. That is equivalent to more than five times the share it had in the first period. Tanzania increased its share from 12% in the first period to 15%, while South African and DRC shares declined.

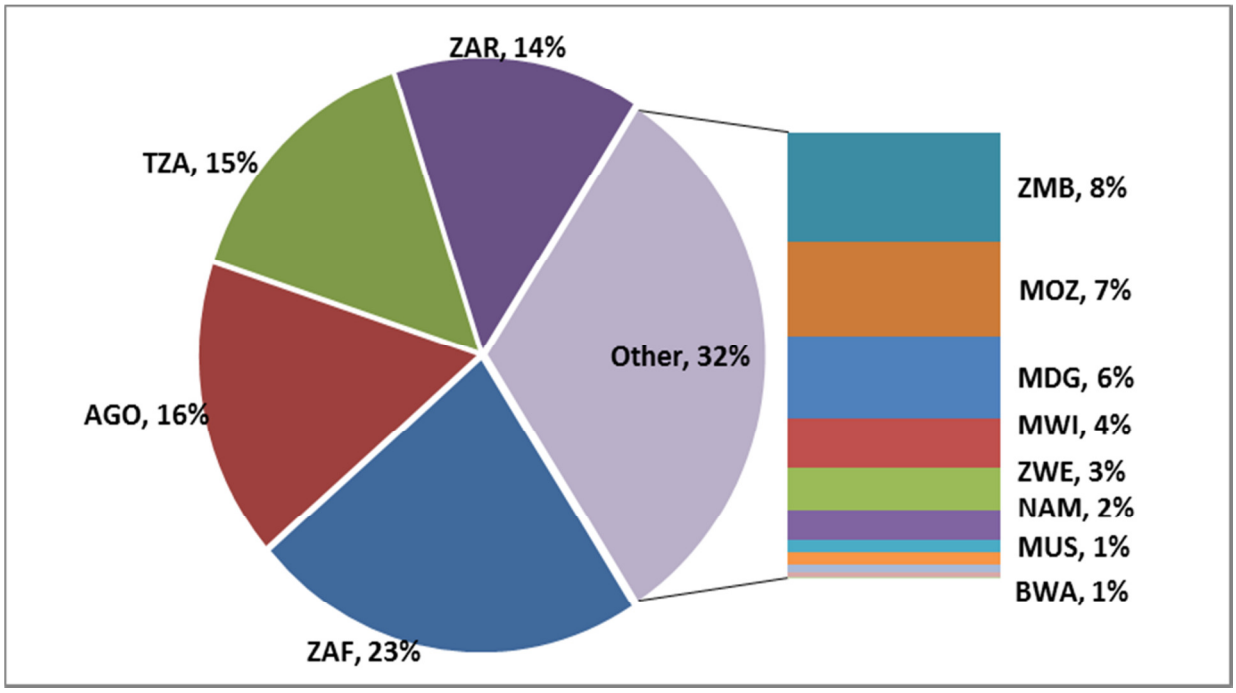


Figure 2.5: Average share of SADC Agriculture GDP for the period 2006 - 2010

Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

The four countries identified in Figure 2.5 contributed in the last period about the same share as the three countries mentioned in the first period, i.e. approximately 70%. The rest of the countries contributed just less than one-third. In that group, Zambia, Mozambique and Madagascar have shares of more than 5%. Zambia managed to double its contribution, while Zimbabwe's share fell from 5% to 3%. The contributions of Lesotho, Seychelles and Swaziland were less than one per cent each, hence they are not included in the pie chart.

The contribution of agriculture to GDP in national economies is depicted in Figure 2.6. The figure provides comparisons of the average share of agriculture GDP between 1992-1995 and 2006 – 2010. The contribution of the agricultural sector in the overall SADC GDP declined

from 19% in the first period to 15% in the latter. That is also something that was consistent among all countries, except for Madagascar, Zambia and Zimbabwe.

The share of agriculture for Madagascar and Zambia remained the same in the two periods, implying that growth rates for agriculture and non-agricultural sectors were the same. As for Zimbabwe, its share actually increased from 13% in the first period to 18% in the latter. This implies that Zimbabwe has increased its reliance on agriculture, relative to the non-agricultural sector. In Figure 2.3, it was shown that, on average, the Zimbabwean economy had been declining over the period 2000 to 2010. So the improvement in the agriculture shown in Figure 2.6 indicates that non-agricultural sector declined faster than agriculture.

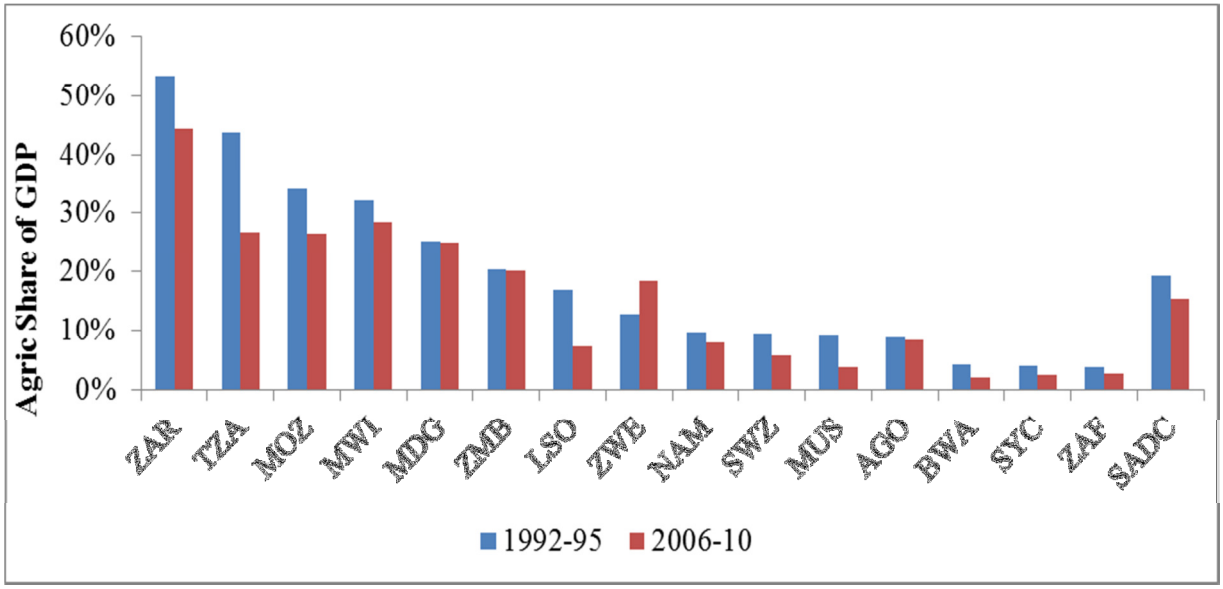


Figure 2.6: Contribution of agriculture GDP in national economies

Source: Author's calculations based on World Bank Development Indicators (World Bank, 2013)

The country that had the highest share of agriculture in both periods is the DRC, with 53% and 44%, respectively. Six countries had agricultural share of at least 20% in both periods. These are the DRC, Tanzania, Mozambique, Malawi, Madagascar and Zambia. The rest had agriculture GDP contributing less than one-fifth of their respective national incomes. Lesotho is the country that has the highest decline in the contribution of agriculture. Agriculture contribution declined from 17% in the first period to 7% in the latter. This is attributed mainly to the growth in the clothing and textiles subsector.

The fact that agricultural contribution was declining over the period is largely consistent with the development theory that, as a country develops economically, the relative importance of agriculture declines (Stevens & Jabara, 1988). In Table 2.3 it is clear that economic performance for SADC was improving over the two-decade period. Furthermore, the only country that had a declining economic growth, Zimbabwe, also increased its reliance on agriculture.

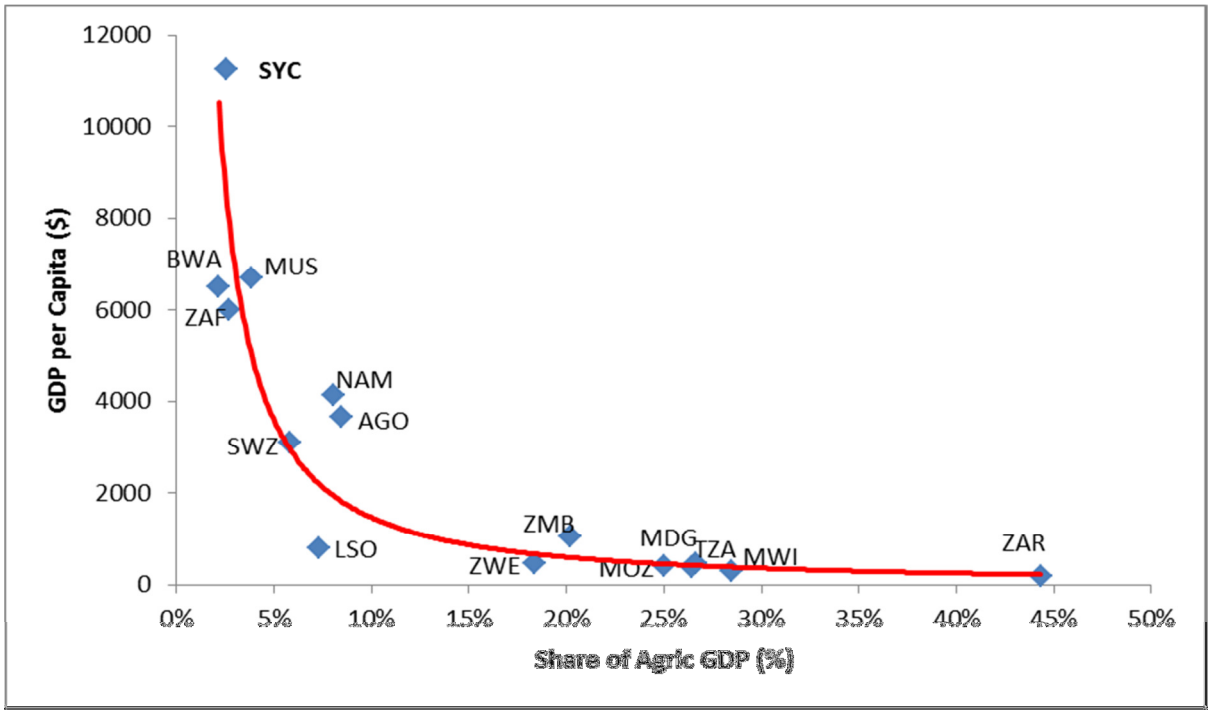


Figure 2.7: SADC country agriculture share of GDP -GDP per Capita nexus, 2006 – 2010

Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

Figure 2.7 presents another way to illustrate the relationship between GDP per capita (in current $) and the share of agriculture in the economy. The figure is convex to the origin, implying that countries with relatively high GDP per capita have low shares of agriculture in their overall nation GDP. And, vice versa, countries with a high share of agriculture have low GDP per capita. The Seychelles represents an outlier with high GDP per capita, and just 3% of agriculture contribution. At the opposite end is the DRC, with a high share of agriculture and the lowest GDP per capita in SADC. This picture is consistent throughout the period. Figures for various periods between 1992 and 2010 can be viewed in the appendix.

2.6 TRADE IN SADC[1]

SADC total trade increased greatly in the period between 2000 and 2010. The total value of SADC imports was less than $40 billion in the year 2000. This increased six-fold in nominal terms to $120 billion. Exports were almost on par with imports in 2000, but increased slower than imports. This implies that throughout this period there was a trade deficit, which is depicted by Figure 2.8. The trade deficit continued to worsen from $1.4 billion in 2000, reaching a peak of $28.4 billion in 2008. It has since declined, but remained high at around $21.3 billion by 2010.

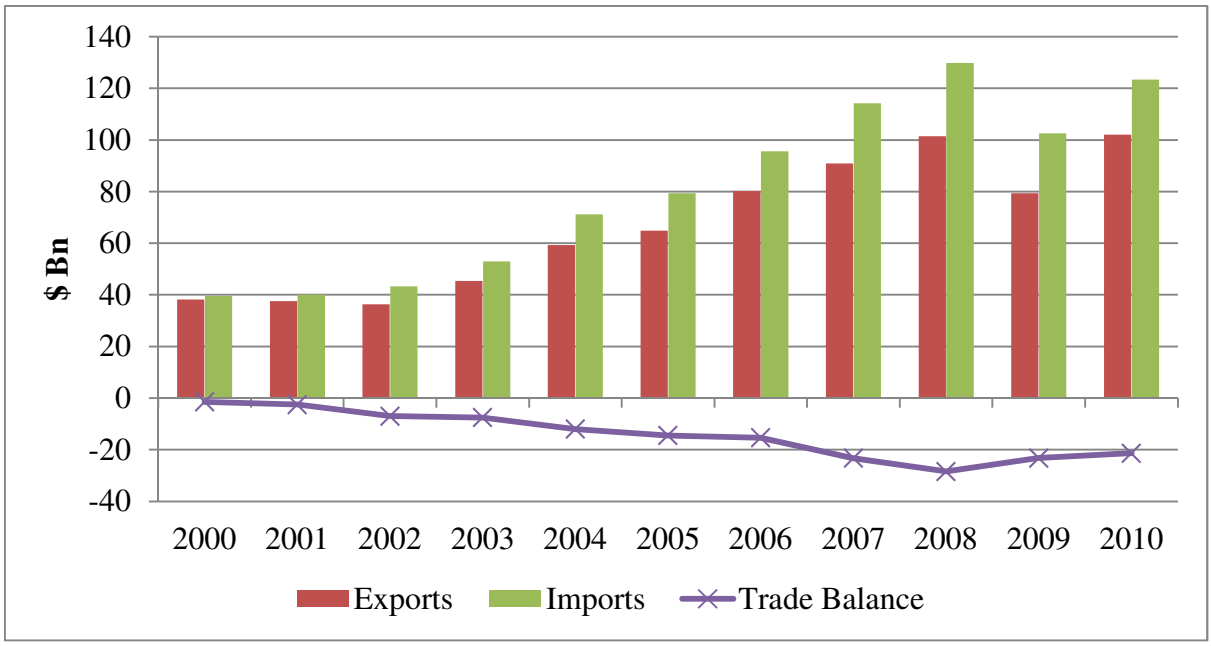


Figure 2.8: SADC Total imports, exports and trade balance, 2000 – 2010

Source: Calculated from Comtrade Database, (2013)

In the case of agricultural trade, exports exceeded imports throughout the period 2000 to 2010. The growth in exports has almost doubled, from $6.8 billion to $13.4 billion in 2010. Imports have, however, increased at a rate faster than that of exports. Agricultural trade reflects a trade surplus, which has been declining over the period as a result of a high growth in importsFigure 2.9 shows that the agricultural trade surplus in 2010 was less than half of

[1] The trade data used in this section comes from the Comtrade Database. These are statistics which are provided by the countries. Several SADC countries have data gaps, and some of them are excluded in this analysis. Angola and the DRC do not report. Lesotho has gaps for the years 2005 to 2009. Swaziland has not reported since 2007, while data for Zimbabwe is missing for 2000 and 2003.

what it was in 2000. The lowest surplus over the period was recorded in the year 2008 at $0.45 billion, while the highest was in 2006, at $2.91 billion.

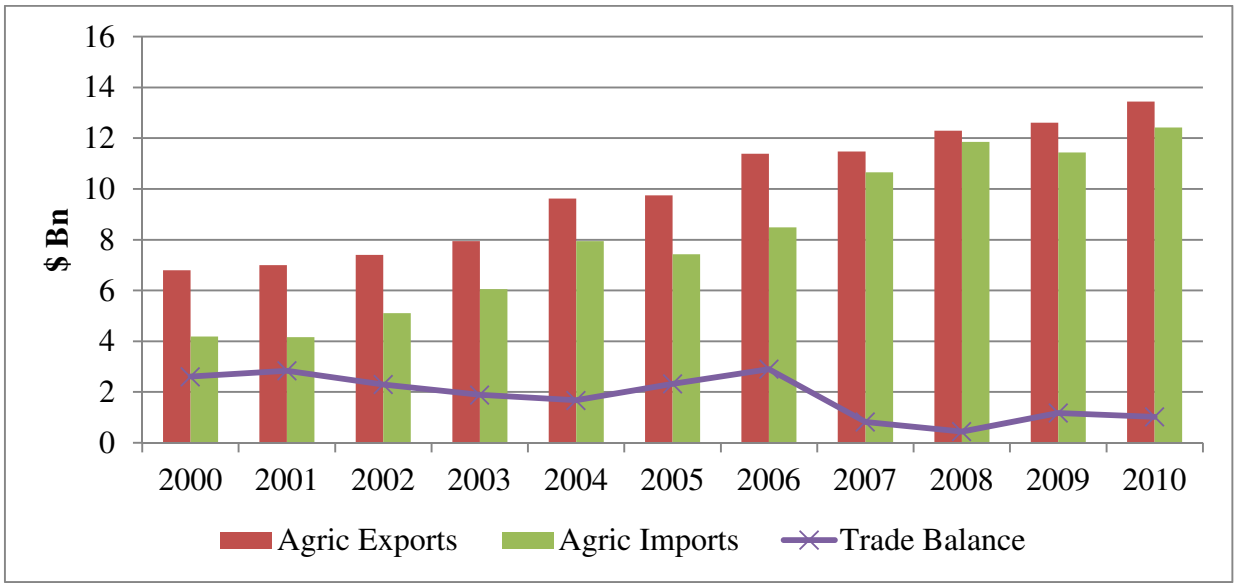


Figure 2.9: SADC Agricultural imports, exports and trade balance, 2000 – 2010

Source: Calculated from Comtrade Database, (2013)

The single most important point about total SADC trade is captured Figure 2.10. The trend line, showing share of SADC trade, is evidently sloping down between 2002 and 2006. The reciprocal of this trend is that a large portion of trade is exchanged with non-SADC members. Furthermore, the trend line shows that at its peak, intra-SADC trade was 22 % (less than one-quarter of total SADC trade), and this was achieved in the year 2002. Over the entire period, the share fluctuated between 15 % and 22 %. Figure 2.8 also shows that in the first two years of the decade, the share was on the rise, reaching the peak of 22 % in 2002, before starting to decline. The decline continued for another three years up to 2006 when it reached the trough of 15 %. Then it started to rise again, and remained on the high during the recession.

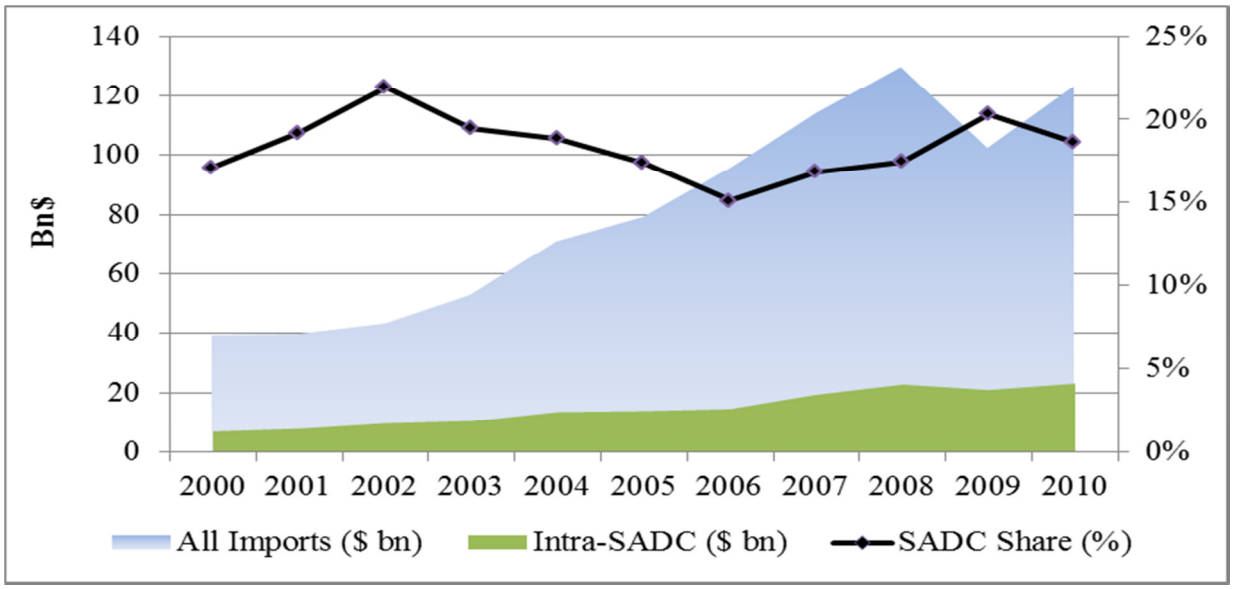


Figure 2.10: Intra-SADC imports of all products as a share of total imports, 2000 - 2010

Source: Calculated from Comtrade Database, (2013)

The trends of share for SADC trade in agricultural products is similar to the total share, calculated using imports. The main difference is that agricultural products show high levels of intra-regional trade relative to all products. Figure 2.11 shows that intra-SADC share in agricultural products fluctuated between 25 % and 41 %. The share reached the peak in 2002, similarly to the total trade and its trough was in 2007, one year later than that of total trade.

Figure 2.11 shows intra-SADC shares and growth rates of shares by country over the period 2000 to 2010. In the year 2000, most countries had higher intra-SADC shares for agricultural products, relative to all products. Only Mauritius and Zimbabwe had lower agricultural product shares compared to all products. The same pattern of higher agricultural shares is observed in 2010. Tanzania and South Africa's shares of all products and agricultural products are equal. Overall, SADC had intra-trade share for all products of 17 % in 2000, and 33 % for agricultural products. In 2010, all products had increased to 19 %, while agriculture share declined to 30 %.

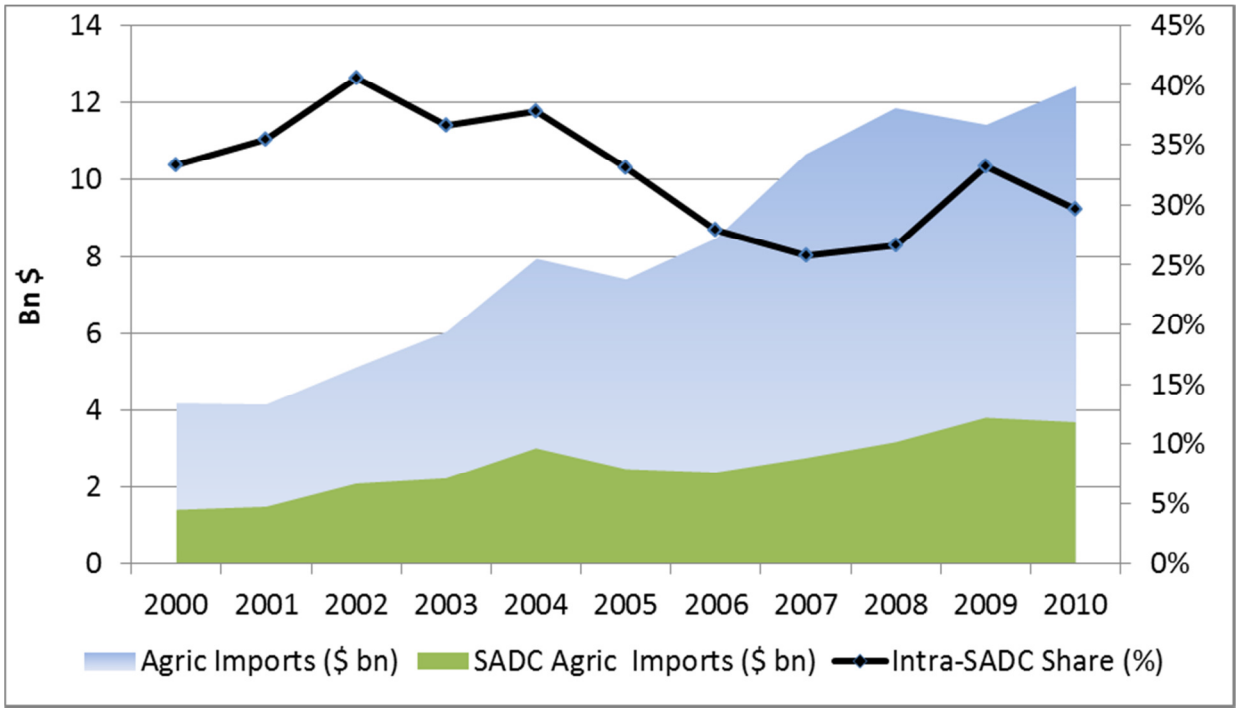


Figure 2.11: Intra-SADC imports of agricultural products as a share of total agricultural imports, 2000 - 2010

Source: Calculated from Comtrade Database, (2013)

In terms of country comparisons, South Africa has the lowest intra-SADC shares for both total and agricultural products, accounting for 1% and 7%, respectively, in 2000. It is the only country that has less than 10% of intra-regional shares for either group of products. Other countries with low intra-SADC shares are Tanzania and Mauritius. These are the only three that imported less than one-fifth of their total imports from SADC, for both 2000 and 2010. The countries that rely mostly on SADC for their imports are the other SACU countries. Imports from SADC for all and agriculture contributed between 75% and 99% of all imports in Botswana, Namibia and Swaziland.

Table 2.5: Intra-SADC share and growth shares by country for agricultural and all products, 2000 and 2010

Country	2000 Share		2010 Share		Growth 2000-05		Growth 2006-10	
	All	Agri	All	Agric	All	Agric	All	Agric
Botswana	78%	95%	75%	98%	12%	2%	-15%	0%
Mozambique	41%	48%	38%	43%	8%	-28%	5%	12%
Mauritius	17%	15%	10%	13%	-39%	-8%	5%	-18%
Malawi	54%	65%	43%	49%	16%	19%	-29%	-35%
Namibia	87%	86%	75%	87%	-3%	6%	-10%	-3%
Swaziland	94%	99%	85%	90%	-8%	-8%	2%	8%
Tanzania	12%	15%	11%	11%	19%	13%	-20%	-6%
South Africa	1%	7%	4%	4%	129%	-19%	53%	-19%
Zambia	69%	83%	62%	71%	-17%	-8%	8%	0%
Zimbabwe	62%	58%	60%	79%	21%	44%	-8%	47%
SADC	**17%**	**33%**	**19%**	**30%**	**2%**	**-1%**	**23%**	**6%**

Source: Calculated from Comtrade database, (2013)

The growth rates in shares were calculated over two periods, 2000 to 2005, and 2006 to 2010. In the first period of implementation of the trade protocol (represented by the period 2000 – 2005), the share of intra-SADC trade in all products increased by two per cent. The main contribution to this growth was made by South Africa, which increased its imports from SADC by 129 %. Table 2.5: Intra-SADC share and growth shares by country for agricultural and all products, 2000 and 2010Table 2.5shows that over the same period, intra-SADC trade share of agricultural products declined by one per cent. The two countries which had most reduction in their share of agricultural imports were Mozambique and South Africa, with declines of 28 % and 19 %, respectively. Zimbabwe's share of agricultural imports originating from SADC increased by 44 % during this period.

In second period, 2006 – 2010, the share of intra-SADC imports for all products increased by 23 % on average. This growth in share of all products was again led South Africa, with an average growth of 53 %. The average share of intra-SADC imports in agricultural products increased by 6 %. This growth was again motivated by Zimbabwe's growth of 47 %. Malawi experienced an imports share decrease of 35 % in agricultural products.

2.7 SUMMARY

The countries in SADC are at various levels of development, and therefore tend to have many differences, ranging from economic size, infrastructure, socio-economic status to trade. Poverty, hunger and food security are still major concerns in the region. As many as 20 million people are at a risk of being food insecure in some part of the year. South Africa is by far the largest member in terms of contribution to the SADC GDP and trade. As for the contribution of agriculture, countries that have a high share of agriculture in GDP have relatively low per capita GDP, compared to those with low contribution of agriculture.

Trends and patterns in trade show that the majority of SADC imports come from outside the region. SADC accounted for about one-third of total trade throughout the decade. SADC had a negative trade balance with the rest of the world on all products. However, agriculture trade balance is positive, but has been shrinking over time. The growth rate of shares of all products and agricultural products were both higher in the second half of the implementation of the trade protocol, compared to the first five years. This second period includes the period of global economic downturn, and therefore growth rates also reflect how countries coped under that environment.

CHAPTER THREE

NON-TARIFF MEASURES AND THEIR RELEVANCE AND IMPACT ON AGRICULTURAL TRADE

3.1 INTRODUCTION

Global economic and trade liberalisation has reduced tariff barriers substantially in the past few decades. At the same time, the relative importance of NTMs has increased. In recent years, bilateral trade agreements have tended to make provisions for NTMs (International Trade Centre (ITC), 2012). Many NTMs are introduced for regulatory purposes, i.e. safeguarding human health, plant safety, national security, consumer protection, and others. While these objectives are legitimate reasons for government to play a part, the challenge from the perspective of trade focuses on how to minimise the impact on foreign suppliers of goods and allow them to compete fairly in the market.

In this chapter, the NTMs are discussed in detail. The next section looks at various definitions of NTMs, as well as their use. Section 3.3 reviews the ways in which NTMs have been classified, up to the current and widely used nomenclature. In section 3.4, the way NTMs were handled in WTO negotiations since its formation are discussed. It is followed in section 3.5 by discussions on some studies on NTMs in southern and eastern Africa. Section 3.6 examines NTMs prevalent in agricultural trade. Section 3.7 looks at how NTMs affect trade, as well as the measures to evaluate them, while in section 3.8 selected case studies on NTMs are reviewed. The last section, 3.9, summarises the chapter.

3.2 DEFINITION OF NTMS

NTMs are generally understood to refer to any measure that causes trade distortion, as long as it is not a tariff. Therefore, the term is a residual category of measures and actions that restrict, to various degrees and in different ways, the market access of goods. Thus, an NTM can be defined broadly as any measure that causes a trade distortion, other than a tariff (Carrere & De Melo, 2011). A distortion in trade exists when the domestic price differs from a border price. These include export measures as well, such as bans and export subsidies. A distortion can also be introduced deliberately by governments, such a quantitative restriction. It may also be

the outcome of unintended consequences, such as from a regulatory action like sanitary measures.

The *functional* definition of NTMs deals basically with economic effects. Baldwin (1970) describes them as "non-tariff distortions", and this refers to any measures, public or private, that cause internationally traded goods and services, or resources devoted to the production of goods and services, to be allocated in such a way that potential real world income is reduced. Lloyd (1996) uses the same concept in the law of one price in the regional single market. He argues that NTMs are included together with other restrictions, such as taxes, which effectively prevent the law of one price from being implemented.

The *operational* definition of NTMs deals with the identification of these measures and provides the taxonomy of NTMs (United Nations Conference on Trade and Development (UNCTAD), 2012). This definition focuses on items that are included and excluded from the list of NTMs. Such a list may never be concluded because, theoretically, any measure can have price-raising, trade-reducing, welfare-reducing and other economic effects. The approach of drawing such an inventory is very important as the list can be harmonised with an analytical perspective. Therefore, the analysis of the economic effects should depend on such an inventory of measures.

By definition, NTMs cover a broad array of regulations affecting traded products. The term "NTM" designates a vast range of heterogeneous regulatory instruments (Cadot & Gourdon, 2012). Within all the trade distortions which are applicable to trade, some are justifiable, while others are not. When a distortion is introduced explicitly to protect domestic industry by restricting import demand, then it is classified as a non-tariff barrier (NTB). NTBs may include internal measures, such as production subsidies and many other administrative measures.

The key feature distinguishing NTBs from NTMs is that NTBs have protectionist intent. Some examples of NTBs include quotas, tariff-rate quotas, licensing regimes, import and export bans, and price bands. On the other hand, NTMs include all measures that distort trade. In many cases, it is really difficult to separate NTMs from NTBs, as measures which may have introduced to protect consumers from a known or perceived threat, may remain in place after the threat has been removed.

3.3 CLASSIFICATION OF NTMS

NTMs include both border measures and internal measures. These measures also seem to expand as time goes on. Therefore, capturing all NTMs in a single operation or classification is almost impossible. Even the design of such systems proves to be problematic, as some of the measures are behavioural rather that regulatory, for example corruption at border posts or unnecessary delays in processing some documentation. These problems furthermore translate into data access difficulties because if it is not classified, then it becomes complicated to compare across products or countries.

Over a period of time, various classifications of NTMs have been designed and adjusted owing to changes in trade policy environment. One of the earlier inventories on NTMs was undertaken in 1967 during the GATT negotiations (Basu, Kawahara & Dumesnil, 2012). The objective was to preserve such information with the aim of further initiating negotiations on NTMs. Indeed, the NTMs were on the agenda for the Tokyo Round of negotiations (1973 – 1979).

The earliest classification recorded was designed by Baldwin (1970) where he set out twelve different groupings of non-tariff trade restrictions[2]. In the 1980s, there were two other classifications. One was developed by The United Nations Conference on Trade and Development (UNCTAD) and the Trade Analysis Information Systems (Trains), and the other by Deardorff and Stern (Pacific Economic Cooperation Council (PECC), 2000). The UNCTAD–TRAINS classification was accompanied by a database that was internationally accessible (Bacchetta, Richtering & Santana, 2012). The database was developed in 1988 and has coverage of about 100 countries. The classification used a Trade Control Measures Coding System (TCMCS). It is divided into seven main categories, namely: price control measures, finance measures, automatic licensing, quantity control measures, monopolistic competition and technical measures; production and export measures; and technical barriers.

[2] Baldwin's twelve groupings were: quotas and restrictive state-trading; export subsidies and taxes; discriminatory government and private procurement policies; selective indirect taxes; selective domestic subsidies; restrictive customs procedures; anti-dumping regulations; restrictive administrative and technical regulations; restrictive business practices; controls over foreign investment; restrictive immigration policies; and selective monetary controls and discriminatory exchange rate policies.

This classification had two main weaknesses. The first is that it excludes measures applied to exports and production. Following the functional definition of NTMs, the two measures should be part of the classification. Measures that are supportive of export and production distort trade and therefore should have been included in the classification. Secondly, by the early 2000s, the database was outdated as there had been no further updating (Carrere & De Melo, 2011). The database was not maintained and updated regularly.

The classification has been adjusted to include an intent to indicate the impact of the measures (Wolfe, 2003). Five different categories were identified, this time covering restrictions as well as subsidies. The categories were **Measures to control the volume of imports; Measures to control the price of imported goods; Monitoring measures included price and volume investigations and surveillance.** Although this classification was an improvement on the previous ones, it still included some arbitrariness and overlapping attributes in several categories. For example, most measures have price and quantity effects.

The Deardorff and Stern classification of the 1980s was later revised in 1997 (Deardorff & Stern, 1998). The categories were **quantitative restrictions and related limitations on exports; Non-tariff charges and related Policies affecting imports; Government participation in Trade, Restrictive practices and general Policy; Customs Procedures and administrative practices;** and **Technical Barriers to trade**. This classification has grouped quantifiable measures into the same categories, and trade remedy actions into another. Government initiated measures were also grouped into a separate category.

Two of the broad categories of the Deardorff–Stern classifications are similar to those of UNCTAD–Trains, i.e. technical barriers to trade and quantity controls. However, the measures under each category are different. For example, quantity control of UNCTAD-Trains classification includes measures such as *administrative pricing, voluntary export price restraint, variable charges, anti-dumping measures* and *countervailing measures*. The same classification in Deardorff-Stern contains measures such as *import quotas, export limitations, licensing, counter trade, prohibitions, discriminatory bilateral agreements, domestic content and mixing requirements,* as well as exchange and *other financial controls*. Under Technical barriers, Deardorff and Stern included measures such as *health, sanitary regulations and quality standards; safety, industrial standards and regulations; packaging and labelling regulations, including trademarks*; and *advertising and media regulations*. The same category

under UNCTAD-Trains had measures such as *technical regulations, pre-shipment formalities, special customs formalities* and *obligations to return used products*.

Such confusions introduced serious difficulties in dealing with NTM measures, agreeing on the categories, and deciding on which ones to use (Basu *et al*., 2012). The confusion on measures, together with the shortcomings identified in the UNCTAD-TRAINS database, resulted in UNCTAD considering other options to classify and capture NTMs. In 2006, UNCTAD established what was called the Group of Eminent Persons on Non-Tariff Barriers (GEPNB). The terms of reference for the GEPNB were broad with regard to the NTMs and the existing database. But the significant one was for the team to "make recommendations on the issues of definition, classification and quantification of NTMs".

The first task was to come up with a commonly-agreed definition for NTMs. Eventually, the GEPNB decided to work with the definition of NTMs as "*policy measures, other than tariffs, that can potentially have economic effect on international trade in goods, services, changing quantities traded, or prices or both*". Using this definition, they classified NTMs according to a hierarchical tree structure where NTMs are disaggregated into 16 "branches" or chapters. These chapters were denoted by letters of alphabet, A through to P. Each branch consists of a "sub-branch" or 1-digit level, "twigs" or 2-digit level and "leaves", also known as 3-digit level.

Table 3.1 below shows the structure of this classification at the "tier" 1 or chapter level. In broad terms, NTM categories are classified into those that affect imports and exports. So, categories A through to O are applied to imports. Import measures are further classified into technical and non-technical. Categories A and B, SPS and TBT measures are referred to as technical measures. Categories C to O are non-technical. Non-technical measures cover a mixture of command-and-control types of measures (price controls, quantitative restrictions and prohibitions) and a disparate set of measures (Cadot & Gourdon, 2012).

Table 3.1: The MAST Hierarchical NTM Classification

Flow	Type	Code	NTM Description
IMPORTS	Technical	A	Sanitary and phytosanitary measures (SPS)
		B	Technical barriers to trade (TBT)
	NON-TECHNICAL	C	Pre-shipment inspection and other formalities
		D	Price control measures
		E	Licences, quotas, prohibitions and other quantity control measures
		F	Charges, taxes and other para-tariff measures
		G	Finance measures
		H	Anti-competitive measures
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restriction on post-sales services
		L	SUBSIDIES (excluding export subsidies under P700)
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin (RoO)
EXPORTS		P	Export related measures

Source: (United Nation Conference on Trade And Development (UNCTAD), 2009)

Some of the non-technical measures, such as pre-shipment inspection (category C), are easy to track. These are usually applied to all products. Others, such as taxes and para-tariff measures (category F), are also easier to track as they are often administered in a transparent way (Gourdon & Nicita, 2012). These measures, apparently, are applied to finance border-management administrations. At times, their functions are not always clear.

Measures G to O are important and some of them are relatively straightforward to identify (Nicita, 2011). For example, anti-competitive measures such as state trading (category H) and distribution restrictions (J). Others are very difficult to code at the product level, such as Trade-Related Investment Measures (TRIMS) (I) or intellectual property (N). Subsidies (L) are a particularly difficult case because of the definition that MAST (2009) used for financial contribution[3].

[3] Financial contribution by a government or government body to a production structure, being a particular industry or company, such as direct or potential transfer of funds (e.g. grants, loans, and equity infusions), payments to a funding mechanism and income or price support.

Subsidies are often granted to certain companies or sectors and not to others, depending on their location, ownership status (ethnic minorities, special groups and so on), or type (SMEs). It is difficult to track all subsidies granted under the numerous schemes typically in place to serve various societal purposes. Even more difficult is to decide when they are sufficiently prevalent to be ascribed to a particular product.

Rules of origin are another category of non-tariff measures. They are required in preferential trade agreements to identify which countries are eligible for reduced or zero tariffs. However, they can be designed in a way which makes them costly to satisfy, which limits the impact of the trade preferences. Rules of origin are also necessary to apply protection measures such as anti-dumping and safeguard measures (UNCTAD, 2009). Thus, including them in the MAST nomenclature gives an appearance of all-inclusivity but they are difficult to operationalise for quantitative work.

Lastly, export measures (category P) are of growing importance, particularly for foodstuffs in times of rising food prices. Gillson (2011) argues that export restrictions in times of high prices contribute to reducing incentives to expand production. The result is shortages which are not beneficial, both over time (because supply does not react) and across space (as producers in surplus regions are banned from arbitraging price differences). So, price spikes in deficit regions are not dampened by increased imports. Thus, export restrictions exert negative regional externalities and increase consumer price volatility.

3.4 NTMS IN THE WTO

The challenges relating to NTMs are not necessarily a new phenomenon. While the policy challenge has remained the same as in the early General Agreements on Tariffs and Trade (GATT), the specific issues, debates and solutions have evolved over time (World Trade Organisation (WTO), 2012). In the past, NTMs were often driven, or influenced, in terms of design by producer interests. The focus was on national measures and ensuring that the WTO principles of non-discrimination and transparency were upheld. This was done while avoiding protectionism.

The GATT was initiated mainly as the product of an initial tariff reduction negotiation among the 23 countries that was concluded in 1947 (WTO, 2012). Gardner (1956) argues that the

agreement was probably rushed to avoid the expiration of the Unites States' negotiating authority. The US Senate did not ratify the International Trade Organisation (ITO) Charter to regulate international trade (Salvatore, 2011). The US wanted to manage domestic agriculture, rather than leave it in the control of an international institution (McCalla, 1969). Eventually, the less ambitious GATT (relative to the ITO) was launched as a tariff agreement. GATT was the commercial chapter of ITO. In the early decades, GATT focused mainly on the negotiation and "binding" of tariff reduction. The issues of NTMs were on the table, but not as a core matter. They were mostly incorporated under commercial policy provisions in the ITO Charter (WTO, 2012).

However, later on the issues around deepening economic integration and the expansion of trade rules into new areas, such as agriculture, services and intellectual property, would add complexity to the debate (Gourdon & Nicita, 2012). They generated new trade frictions over domestic regulatory differences, drawing new constituencies, such as environmentalists and consumer groups, into the debate. As time went by, NTMs became more widespread and difficult to ignore.

The first five GATT negotiating rounds were devoted almost exclusively to tariff negotiations and the accession of new members (WTO, 2012). That means that Geneva (1947), Annecy (1949), Torquay (1951), Geneva (1956) and Dillon (1960-61) were focused mainly on protection from the point of view of tariffs. This is despite the fact that the negotiations leading to the Havana Charter (1947) for the planned ITO were dominated by intense debates about non-tariff measures and quantitative restrictions. Countries struggled to construct a universal legal system that could also encompass their often-conflicting domestic objectives and interests.

Then GATT drew a basic policy distinction between tariff and non-tariff measures. In particular, this move favoured the use of tariffs (Bacchetta *et al*., 2012). In addition to being revenue generating, tariffs were viewed as a "fairer" form of protection, more efficient in terms of their economic consequences and more amenable to reductions through negotiations.

Quantitative restrictions and other non-tariff measures were seen as inherently more discriminatory, more variable, and more disruptive of market forces (PECC, 2000). In other words, GATT opted for an easier route.

As a result of this option, GATT failed to agree on a comprehensive approach that covers all NTMs. Different types of NTMs were given varying treatments (Bacchetta *et al*., 2012). Some NTMs were prohibited outright. Quantitative restrictions were subjected to detailed and complex provisions. For example, Article XI of GATT clearly prohibited the introduction of new quantitative restrictions and required the elimination of existing ones (World Trade Organisation (WTO), 1994). However, the rule has three main exceptions, namely:

- Exchange controls for balance of payments purposes,
- Quantitative restrictions used in agricultural support programmes, and
- Those used by least-developed countries.

These exceptions represented some of the weaknesses of the outcomes of the first few rounds as they allowed discrimination, a key principle of GATT. Some NTMs were regulated, but not prohibited. GATT also did not make any specific reference to technical or health standards (WTO, 2012). However, Article XX explicitly recognised that measures "necessary to protect human, animal or plant life and health" were justified.

Some of the shortcomings were identified in cases where the articles indicated that other NTMs were considered too complex or controversial to be addressed through general rules or "codes of conduct" alone. This was in reference to Article VI on countervailing duties (WTO, 1994). State trading was also not prohibited, but GATT required that their purchases and sales be subject to market forces. Overall, the GATT rules failed to give sufficient and precise guidance for the international regulation on NTMs.

When the Kennedy Round was launched in 1964, there was expectation that some of the issues would be addressed. Unfortunately, the Round did not bring significant changes to the GATT rules on NTMs (WTO, 1994). The only positive outcome was the agreement on anti-dumping measures. So, the pressure[4] shifted to the Tokyo Round (1973 – 1979). Despite all

[4] The objective of the Tokyo Round on NTMs was stated as "to reduce or eliminate NTMs, or where this is not appropriate, to reduce or eliminate their trade restricting or distorting effect, and to bring such measures under more effective international discipline."

the expectations, the main achievement was the signing of the technical barriers to trade (TBT) or the standard codes, as it was known then.

Eventually, it was the Uruguay Round that marked another major expansion of the systems covering NTMs. It was in this round of negotiations that multilateral rules were expanded to include services trade and intellectual property protection. This was done through the General Agreements on Trade and Services (GATS) and the Trade-related Aspects of Intellectual Property Rights (TRIPS) Agreement, which introduced new disciplines across a whole range of measures (van Grasstek, 2013). However, those were not the only areas where the Uruguay Round expanded international regulation of NTMs.

The round was also the first to include agricultural trade which had largely been exempted from previous GATT negotiations (van Grasstek, 2013). Furthermore, the use of NTMs, such as import quotas and subsidies in agricultural policy, had enjoyed special status under GATT rules. Under the Uruguay Round's agriculture agreement, however, most remaining non-tariff restrictions were replaced by tariffs in a process known as "tariffication". New commitments were undertaken to discipline domestic support and export subsidies. In addition to improvements to the TBT Agreement, a new Sanitary and Phytosanitary Measures (SPS) Agreement was negotiated. The agreement deals specifically with agriculture-related standards.

By treating SPS measures under a separate and more rigorous agreement, negotiators have acknowledged the growing importance and prominence of food safety issues, as well as their increasing relevance to agricultural trade. This has also opened the possibility that countries might try to compensate for negotiated tariff and subsidy reductions through increased use of SPS measures (Croome, 1996). GATT disciplines on import licensing and rules of origin were also strengthened. The rules on subsidies were expanded and were classified into prohibited, permissible and possibly permissible subsidies.

It was from the Uruguay round that substantial work on NTMs was done. The current Doha Round has not moved very far from the gains of the Uruguay Round. It is also from the Uruguay Round that the current classifications of NTMs are based. Even though the Round has not done much in terms of eliminating, reducing or avoiding new introductions of NTMs,

it was successful in identifying them and creating even further awareness than the previous rounds.

Recently, NTMs have reflected a greater diversity in public policy concerns, including consumer interests. There is a growing focus on transnational measures, as well as encouraging regulatory cooperation, mutual recognition agreements and the international harmonisation of standards. Within these challenges, there are still data problems concerning NTMs, which appear highly fragmented. Then there are problems that are related to the application of NTMs owing to administrators not being trained as necessary to deal with such issues (Cadot & Malouche, 2012). This then increases the opaqueness of NTMs and escalates their effects.

3.5 NTMS IN SADC

The NTM challenges affect developed and developing countries differently, and differ from one trade arrangement to another and from country to country. It is well known that developing countries are affected more by NTMs because of the lack of resources to implement their own measures or to comply with requirements elsewhere (Cadot & Gourdon, 2012). This section of the chapter presents the NTMs applied by Southern African Development Community (SADC) countries to agricultural products. The same NTMs applied by the SADC countries are faced by the member states, while trading with one another.

The focus is, therefore, on the studies and surveys that were done in southern and eastern Africa on NTMs. These studies and surveys involve both the research and inventory of NTMs which were compiled for the region. For the research that was completed, attention is paid to data used for analysis or discussions, as well as the purpose of doing such work.

Generally, the studies on NTMs which focused on country comparisons relied on data from the TRAINS database or from some of the business surveys which were conducted with the companies that are involved in trade (Organisation for Economic Co-operation and Development (OECD), 2005; Donnelly & Manifold, 2005; Martinez *et al*., 2009). However, if one needed to do similar cross-country studies for SADC countries, then the TRAINS database is not very helpful. The database does not cover many countries in the SADC region.

The scarcity of NTM data in the SADC region limits the amount and quality of work that can be done in this area.

One of the surveys on NTMs was completed in 2006 by Mmasi and Ihiga (2007). The survey covered selected countries within the EAC, SADC and COMESA blocs. The scope of work was limited to interviews with stakeholders and border officials. The World Bank (2012), Charalambides and Gilson (2011), Mthembu-Salter (2007) and several consultancy studies (Imani Development, 2007; South African Institute of International Affairs (SAIIA), 2007) have looked at the NTMs in several SADC countries. The survey work by Imani (2007) included eleven SADC countries. Imani's survey depended upon respondents' information and perceptions of existence of NTMs in the analysis.

None of these surveys were developed further to construct a database of NTMs over a period of time. There was no follow up or building of a comprehensive information base on these measures. Therefore, the interpretation and inferences of the results were limited to a single period, which will be the year when the survey was done. Considering that some of the major problems with NTMs involve their escalation, these studies would not analyse that owing to a lack of time series information.

The main outcome of the Mmasi and Ihiga (2007) study was the identification of key NTMs as provided by respondents. The analysis of the identified NTMs, mainly SPS measures, was limited to the use of frequency and coverage ratios. These ratios reveal the presence of NTMs, as well as the products affected by such NTMs. The ratios do not determine the extent of the effect of such NTMs, nor indicate whether one type of NTM is more prohibitive than another.

In 2010, Trademark Southern Africa started collecting NTM data at the border posts of SADC, EAC and COMESA countries (TradeMark Southern Africa (TMSA), 2012). This data mainly relates to the challenges which are encountered at the borders as goods enter the market or are in transit across borders. The reporting of complaints is done by the traders or truckers as they experience challenges, and the matter is recorded to be taken further with the affected countries. There is also information recorded concerning notifications, such as SPS and TBT to the WTO and fellow SADC partners. This brings some of the information on these measures to light, and may lead to some action being taken on prohibitive measures.

The work is, however, not sufficient to explain what really happened in the previous years. Furthermore, its focus is narrow as it hardly includes issues beyond the border. In other words, it barely scratches the surface in terms of what is happening with NTMs. The classification of NTMs used has only eight categories, i.e.

- Government participation in trade and restrictive practices tolerated by governments,
- Customs and administrative entry procedures,
- Technical barriers to trade (TBT),
- Sanitary and phytosanitary (SPS) measures,
- Specific limitations,
- Charges on imports,
- Other procedural problems, and
- Transport, Clearing and Forwarding.

One key shortcoming of this reporting system is that it totally excludes NTMs which are imposed by exporters (export taxes, bans, subsidies, and other measures imposed on their products). Furthermore, the categories are too broad and can be very confusing to apply. There are regulatory issues, state trading and licensing requirements which are not necessarily part of what is happening at the border. Therefore, such NTMs will not make it to Trademark Southern Africa's portal, yet they do affect trade flows.

To close the gaps in the information about NTMs that exist in SADC, a detailed, comprehensive database on NTMs was compiled. This was done by gathering information from agencies within governments of the SADC countries, regional bloc secretariats, WTO agencies, as well as other surveys and studies that have such information on SADC. The regulations on agricultural trade were identified from such agencies. The regulations were coded according to the MAST taxonomy, and finally, such NTMs were matched with the products which are affected. The end result was an NTM database for ten SADC countries, covering the period from 2000 to 2010, in which 250 agricultural products, disaggregated at

the HS 4-digit level, were classified according to the latest internationally recognised NTM nomenclature.

3.6 NTMS PREVALENT IN AGRICULTURAL TRADE

Increasing regulations concerning food and agricultural products have led to increased use of NTMs, as more countries follow the Codex Alimentarius food standards. Thus, agricultural trade is increasingly affected by NTMs relative to non-agricultural products (WTO, 2012). Part of the reason is that the WTO allows countries to adopt appropriate protection for human, plant and animals under the SPS and TBT agreements. Members are even allowed to set more stringent measures if there is scientific evidence for such threats and risks (WTO, 2012). However, the protectionism seems to be escalated by the fact that there are no international food safety, animal and plant standards for the majority of food and agricultural products that are traded throughout the world. This results in countries developing their own standards which are different from others, within same region. Some of the most used NTMs include SPS and TBT, following their agreements which permit their use.

3.6.1 SPS Measures

The SPS agreement applies to all measures that directly and indirectly affect international trade. For any measure to comply with the SPS agreements, it should be necessary to protect human, animal life or plant life (WTO, 2012). This means that there has to be some level of risk assessment before considering the SPS application. In applying this, there must be consideration that it does not result in unfair trade. One of the main principles of the WTO is "non-discrimination, and thus for SPS measures to be compliant, they cannot be discriminatory or be a disguised restriction on international trade. So, the SPS measures must be based on scientific principle and there must be sufficient scientific evidence to justify the use of such measures. The scientific evidence is required to avoid arbitrary or unjustifiable use of the agreement.

Therefore, the measures may not be maintained without sufficient scientific evidence. Figure 3.1 shows the total SPS notifications (left axis) by WTO members since 1995, as well as the average maximum applied tariffs for agricultural products (on the right axis) by the same

members. Agricultural tariffs were higher than 100% before the year 2000. However, in 2008, they were reduced to lower than 20%, on average. As for SPS notifications, there were less than 200 of them in the year 1995. They then increased to the peak of about 2500 in the year 2007, before coming down to 1000 per year in 2009.

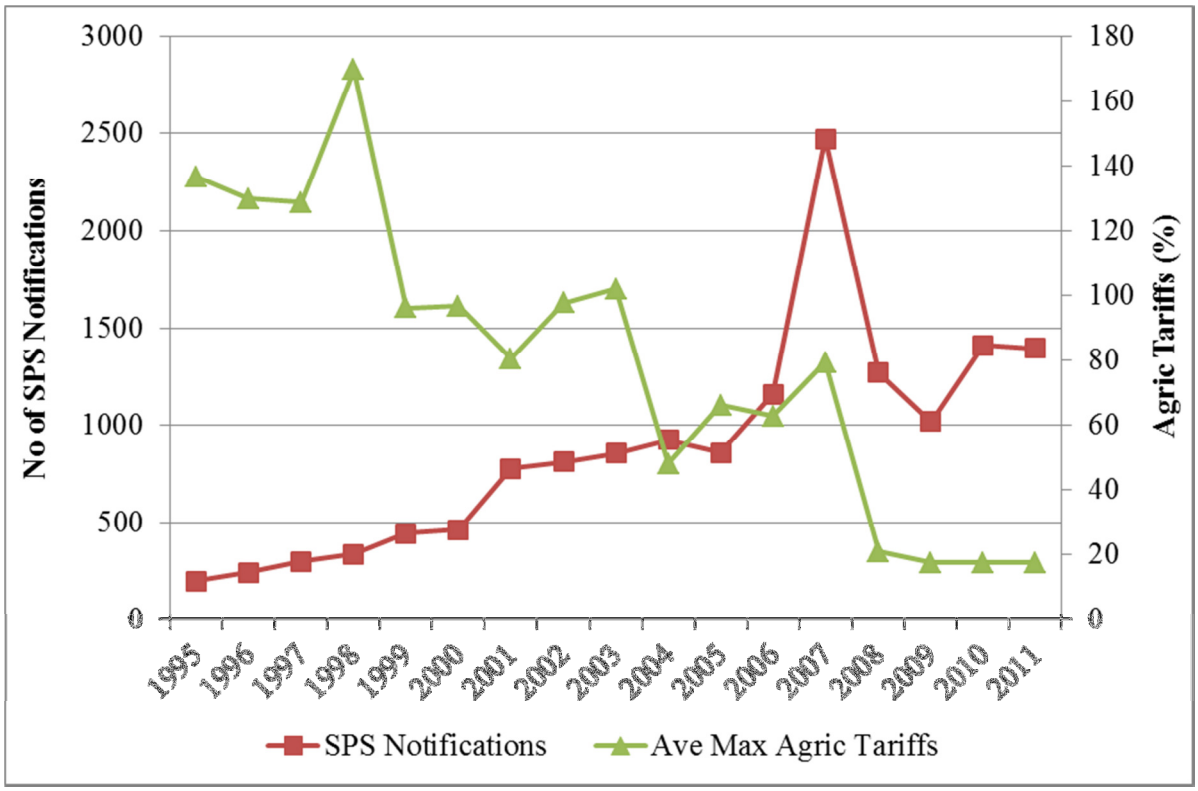


Figure 3.1: WTO SPS notifications and global average maximum tariffs (1995 -2012)

Source: Author's calculations from WTO (2012)

Basically, what is indicated by Figure 3.1 is the point that, as tariffs were declining, SPS measures were on the increase. This can also be translated to the general NTMs, in that they were also on the increase. Usually SPS measures are used as a proxy for NTMs, particularly in agriculture (Henson, 2004). This is because of the fact that these measures require notification, and thus one can determine their direction. Therefore, the prevalence of agricultural NTMs can be shown to have been on the increase in the last decade and half.

A comparison of the global picture of the trends in SPS measures and tariff protection of agricultural products was done against the ten SADC countries. The results are shown in Figure 3.3. The source for SADC SPS measures are not notifications, but prepared from the compiled NTM database. The SPS measures were increasing rapidly, starting with a total of

about 500 measures in 2000 to about 1 300 in 2010. Over the same period, SADC's average simple tariffs declined from around 15 % to about 4 %.

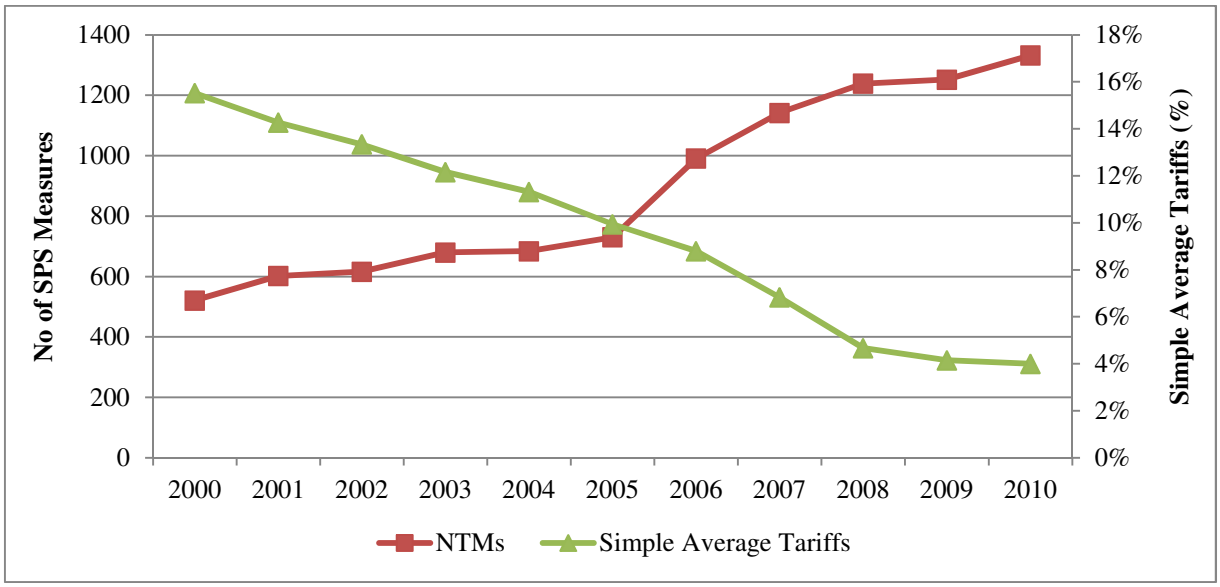


Figure 3.2: SADC SPS measures and the simple average tariffs of agricultural products, 2000 – 2010.

Source: Calculated from SADC Secretariat and compiled NTM database

Overall, SADC trends in trade barriers affecting mostly agricultural products are similar to the global trends. It is evident that SPS measures have been on the rise over the decade. At the same time, global tariff protection, as well as in SADC, was declining. This is also in line with what most studies have already indicated in terms of these two broad trade barriers.

3.6.2 3.6.2 TBT Measures

The purpose of the TBT agreement is to preserve the ability of the government and other technical groups to set the necessary standards, while at the same time guarding against unjustified standards to protect their domestic industries. Unlike the case of SPS agreement, TBT measures are not determined on the basis of scientific principle or evidence. They are applied when it is necessary for a legitimate objective (WTO, 2012). Legitimate objectives include national security requirements, prevention of deceptive practices, protection of human health or safety, animal or plant life or health, or the environment. In the case of TBT requirements, scientific data is not the only determinant of a legitimate objective.

3.7 TRADE EFFECTS OF NTMS

The different classifications and types of NTMs were discussed in the earlier sections. These differences also extend to NTMs' different effects. To gain basic understanding of the general effects, it better to look at it from the context of a static, deterministic partial equilibrium analysis of trade (Baldwin, 1991). This is done using the model of import demand under the perfect competition with a downward sloping curve.

In this case, an import may be a perfect substitute for domestic good, and thus the position of DD in Figure 3.3 is dependent on the price of a domestic good. Alternatively, it may be a perfect substitute, and thus DD is an excess demand curve. So, DD represents the quantity demanded, q, as a function of the domestic price paid by importers, p. Both price and quantity are expressed in logarithms.

In the absence of an NTM, the equilibrium price and quantity are p_0 and q_0, respectively. Export supply is represented by upward sloping SS curve. This implies that the importing country is large, as it affects the world price of a good. In the case of a small country, the supply curve would be horizontal. Nevertheless, the impact of an NTM would be the same for both a large and a small country.

When an NTM is introduced, very often it will shift the demand curve in one form or another. The cost for each unit imported will be higher under an NTM regime. This will shift the demand curve downwards and somehow steeper. This is due to the fact that prices are in logs and therefore the impact is on the slope. In order to find the domestic price of the imported good, one must then return to the original demand curve.

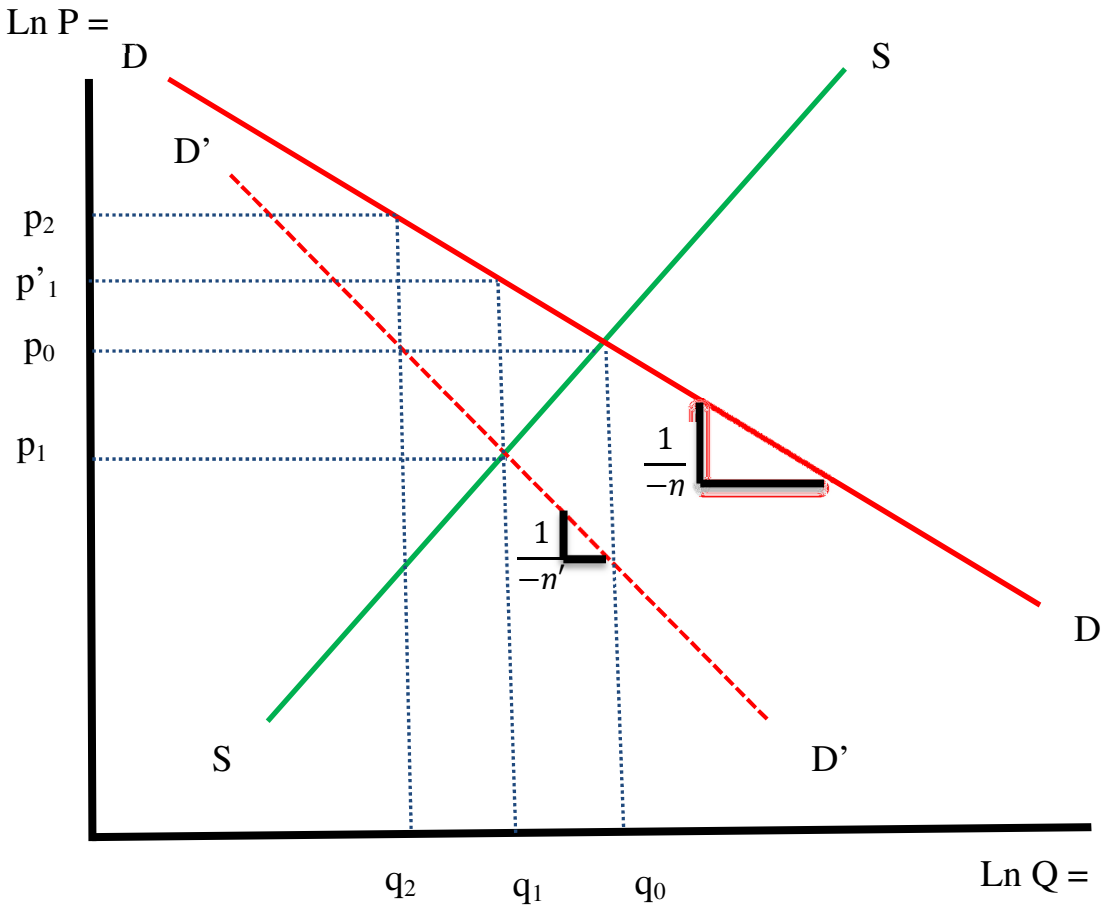


Figure 3.3: Price and quantity effects of an NTM

Source: Adapted from Deardorff and Stern (1998).

Therefore, in general, the introduction of an NTM will affect the *shape* and the *position* of the import demand curve. Therefore, the effects of NTMs are described in terms of these changes. Focusing on D'D' from Figure 3.3, it can be observed that it is to the left of the original import demand curve, and that it is steeper or less elastic. This is to be expected of a typical NTM. However, the trade interference can change both the position and slope of the import demand curve in either direction.

The changes in the position of the import demand curve can be measured in either prices or quantities. In terms of quantity, the easiest thing to observe from Figure 3.3 is the actual decline in quantity demanded. This is through a change in supply curve SS from q_0 to q_1. In the case of a horizontal supply curve, it will be from q_0 to some lower quantity.

From the perspective of prices, one may observe either p_1 or p_1 or both at the new quantity supplied and demanded. A typical example may be when an NTM is introduced in the form of

a quota allocated to domestic firms. The firms will pay p_1 for their imports and resell at p'_1 in the domestic market. The p'_1-p_1 will be the quota rent per unit or quota premium. These prices are not always observable.

The shortfall of the price-quantity measures is that they focus on the interaction of supply and demand, and not the nature and the response to the NTM. To put it differently, it is possible that two NTMs in different markets that are identical could have different effects on actual prices and quantities. This outcome could still be possible if the both markets are competitively supplied. The outcomes depend on the supply elasticities. The differences could even be greater if the markets are not competitively supplied.

This difficulty in comparing two markets can be handled by normalising the two import demand curves. The price before the introduction of an NTM can be normalised to a constant, thus holding p_0 constant. The quantity effect of the NTM can be evaluated by the drop from q_0 to q_2. Q2 represents the amount by which import demand will decline if the price paid to foreign suppliers for the import were to remain unchanged. Then, p_2 is the corresponding price that will prompt buyers to reduce their import quantity to q_2. So, the difference between p_2 and p_0 is a measure of NTM that can be directly be compared to a tariff.

One additional point about Figure 3.3 is the extent to which import demand is reduced. Since the price and quantity are expressed in log form, elasticity is just minus one divided by the slope of the demand curve ($\frac{-1}{\eta}$). The elasticity is small along D'D' compared to DD. To summarise from Figure 3.3, in general, price and quantity measures can show how NTM shifts the import demand curve. Furthermore, the size of change (amount of import demand elasticity) must be known, in order to fully ascertain the effect of NTMs: to know the full extent of the NTM effect, first one must know that amount of import demand elasticity. That is the case for most NTMs. This is despite acknowledging the differences in the NTMs, and hence their various effects.

Other effects of NTMs are discussed below, including those already explained through the use of Figure 3.3.

a) *Reduction of import quantities*. Sometimes this is the objective of imposing some of the NTMs. It has already been discussed in terms of how this reduction takes place, i.e. shift in demand and elasticity.

b) *Increase in the price of imports*. NTMs succeed in reducing imports by increasing the price of the imported product. Such price increases have other consequences in other sectors of the economy. One can think of raw materials and intermediate inputs if the imported product plays such roles in the economy.

c) *Change in the elasticity of demand for imports*. As has already been discussed in the context Figure 3.3, NTMs often alter the slope of the import demand curve, and this, therefore, affects the responsiveness of imports to price changes in that sector.

d) *Uncertainty of NTMs*. Most government policies may be considered to be uncertain, but NTMs seem to be the leader in this respect. Some of them become subject of investigations by regional and international institutions, which sometimes drag on for a several years. SPS measures are dependent on science to impose, and to dispute, while the anti-dumping measures are subjected to legal and economic disciplines.

e) *The welfare effects of NTMs*. It is normal to determine the welfare effects of a policy, so NTMs are subjected to such evaluations. As it was indicated in Figure 3.3, producer and consumer surplus capture the welfare effects of an NTM distortion.

f) *Resource costs*. Beyond the welfare effects, there are other costs which are accrued owing to the imposition of NTMs. These include the direct costs of administrative burdens. These include the costs of enforcing the rules. Other costs are attributable to resources which are lost owing to rent seeking and related behaviour. These may be attributed to time and resources wasted by individuals and firms in their efforts to secure the profit opportunities and other benefits that are created by NTMs.

While NTMs fall within different categories, they have various effects on trade. They do reduce imports by increasing prices and decreasing the elasticity of import demand. Furthermore, the have implications for resources used, as their effects may not be once off, or

affect only immediate products. The welfare implications of NTM distortions and the uncertainty related with their use are some of the important concepts around NTM effects.

3.8 CASE STUDIES OF ESTIMATED TRADE AND WELFARE EFFECTS

One of the most evident impacts of NTMs is an increase in trade costs (Obsfeld & Rogoff, 2000). These costs are eventually passed on to consumers. Subsequently, the relatively high prices to consumers will result in reduction in demand for those products. Eventually, owing to the elastic nature of import demand, the response of consumers will lead to lower trade flows.

There have been several studies which have estimated the quantity effects of NTMs. Andriamananjara, Dean, Feinberg, Ludema, Ferrantino and Tsigas (2004), for example, estimated that the removal of certain categories of NTMs could yield global welfare gains of $US 90 billion. The study used the year 2001 as the base. This estimate involved identifying particular policies of interest, quantifying their effects on prices using econometric methods, and simulating the effects of the resultant price gaps in a Computable General Equilibrium (CGE) model. In another study, Wilson, Mann, and Otsuki (2005) estimated that trade facilitation in developing countries could raise global merchandise trade by $US 377 billion (9.7 per cent) in 2000-2001.

There are relatively few quantitative analyses that compare the effects of NTMs and tariffs. Fugazza and Maur (2008) have stated that in 14 of 26 global regions, the ad valorem tariff equivalent of NTMs, calculated using the results of Kee, Nicita and Ollareaga (2004), is higher than the average tariff. In studies which have focused on particular products and markets, the impact of NTMs is often found to be higher than that of tariffs.

The impact of SPS measures on United States beef exports from 2004–2007 ($11 billion) has been estimated to be almost twice the impact of tariffs and tariff-rate quotas (TRQs) ($6.3 billion) (United States International Trade Commission (USITC), 2008). In another study focusing on United States agricultural exports to India, the effects of removing India's NTMs on United States exports were found to be of approximately the same order of magnitude as those for removing India's tariffs (United States International Trade

Commission (USITC), 2009), although the role of NTMs for a single product (wheat) accounted for most of the NTM effects.

3.9 SUMMARY

The definition of NTMs has been discussed in detail, and NTMs were distinguished from non-tariff barriers, which are imposed with the intentions of restricting trade. Various classifications were also discussed, the emphasis being on the latest and most detailed NTM nomenclature designed by UNCTAD. The WTO has, over half a century of its existence, been trying to deal with the protectionism that is brought about with the NTMs. However, it was only at the end of the Uruguay round in the mid-1990s that a substantial amount of work was done around the classification, as well as concluding some of the agreements regarding NTMs. Unfortunately, it was also around that period that incidences of NTMs started to increase. In the rest of this study, the definition and classifications of NTMs which will be used are those endorsed by the Group of Eminent Persons on Non-Tariff Barriers (GEPNB).

The increase in NTMs also coincided with the period of substantial declines in tariff protection. These increases affect trade for both developing and developed countries. Such effects are observed through changes in trade volumes, price changes, elasticities, resource costs, and welfare. Most of the research on NTMs shows that, overall, NTMs have a negative effect on trade.

CHAPTER FOUR

MEASURING NTMS IN INTRA-SADC AGRICULTURAL TRADE

4.1 INTRODUCTION

The increasing incidences of NTMs imply that countries have to constantly adjust their trade policies and trade strategies in order to respond to current trends. This increasing use of NTMs also implies that gains from market access depend on the ability to comply with such requirements. As a result, there is growing concern that protectionism is on the increase. Such concerns can only be validated if the impacts of NTMs can be evaluated and compared with the declining effects of tariffs. However, to evaluate NTMs, they must first be quantified.

The previous chapter discussed some of the reasons why there is a need to describe, classify and store various types of data. In this chapter, the focus switches to the methods of evaluating such information, introducing measures for evaluating the impact of NTMs, and the SADC NTM situation. These methods, which are discussed in section 4.2, vary depending on the availability and the suitability of data to various measures. The availability of NTM data in SADC is discussed in section 4.3, as well as motives for collecting and compiling the SADC NTM database. The process which was followed to compile this database, as well as the sources for such information, are discussed. In the last two sections of this chapter, the data is evaluated for various indicators of NTM protection, patterns and trends over the period of the study. The last section presents conclusions drawn from the chapter.

4.2 EXISTING APPROACHES FOR MEASURING NTMS

NTMs are very diverse and are also considered to be opaque and therefore it is generally difficult to measure their impact. There has been increasing effort in the recent years to quantify NTMs as a result of their continued use. The decreasing tariff protection on a global scale has also added more impetus to seek ways to measure NTMs (WTO, 2012). From the research side, this procedure is important in improving the analytical work in this area. The measuring of NTMs is also needed by policymakers to evaluate the benefits of reducing them. This will also aid policymaking in assessing the impacts of dealing with policy measures

around NTMs. In this section, four of the methods which were used in recent analysis are discussed, namely inventory, price-gap, quantity-based and simulation.

Inventory methods basically identify the NTMs that are being applied, as well as the products affected by such NTMs, and calculates an index for comparison across countries and between products (Nicita & Gourdon, 2013). The price gap method, also called the tariff equivalent method, estimates the level of *ad valorem* tariff that would have an equally trade restricting effect on the NTM in question (Ferrantino, 2012). Quantity-based methods seek evidence to indicate that the presence of NTMs results in lower trade flows, or that in their absence, trade flows are relatively higher. Simulation approaches use models to represent economic conditions consistent with economic principles to estimate the impacts of NTMs on consumption, prices, welfare and trade flows (Ferrantino, 2006). These include general equilibrium and partial equilibrium models

4.2.1 Inventory approach

The inventory approach is used mainly to summarise the information on the presence of NTMs. There has been considerable effort made in developing inventory methods since the earlier work by Yeats (1991). These methods simply measure the existence of NTMs across products. They identify the prevalence of NTMs and identify the products on which such measures are concentrated. The approach allows the development of an estimate of the extent of trade covered by the NTM (coverage ratio) or their frequency of application (frequency index) in specific sectors. The method is based on the UNCTAD Database on Trade Control Measures (Bora, Kuwahara & Laid, 2002).

The frequency ratio indicates percentages of products that are affected by NTMs, regardless of whether the products were imported or not. It uses imports of the products that are facing NTMs as weights. This adjustment accounts for the presence or absence of NTMs, but not value of imports covered. So, the method will not measure the restraining effect of the NTM (Schlueter, Wieck, & Heckelei, 2009). Accordingly, the frequency ratio or index shows the percentage of import transactions covered by a group of NTMs for an exporting country. It does have a weakness in that it does not reflect relative values of affected products. Therefore, the method cannot provide an indication of the importance of the NTMs to an exporter, or among the exporting items.

The Frequency index (F) of NTMs imposed by country *j* is calculated using the following formula:

$$F_i^{kt} = \left[\frac{\sum\left(D_i^{kt} M_i^{kt}\right)}{\sum M_i^{kt}}\right] * 100 \quad (4.1)$$

Where *D* is the dummy variable reflecting the presence or absence of one or more NTMs on good *k*. M indicates whether there are imports of good *k*, and is also a dummy variable. Subscripts *i* and *t* refer to country and period, respectively. A low ratio implies that the NTMs are less restrictive, and vice versa for the higher frequency ratio.

An alternative method is the estimate that shows the coverage ratio as a percentage of trade that encounters NTMs for an exporting country for a selected sector or industry. It is basically a ratio of the imports that face NTMs to the value of total imports. In order for one to get the measure of importance of NTMs on imports, then the coverage ratio is used. The ratio measures the percentage of imports that is subject to one or more NTMs. The calculation for coverage ratio (C_k) is given as follows:

$$C_i^{kt} = \left[\frac{\sum\left(D_i^{kt} V_i^{kt}\right)}{\sum V_i^{kt}}\right] * 100 \quad (4.2)$$

D is defined the same way as in the Frequency index. *V* represents the value of imports of product *k*. The interpretation of the ratio is similar to that of frequency index, i.e. the lower the ratio, the less restrictive the NTM regime.

Coverage ratio uses the value of imports as weights. The weights will be low in cases of low volume of imports or where there are no imports for a given product in a specific year. That situation will effectively result in a lower coverage ratio (de Frahan & Vancauteren, 2006). In cases involving NTBs, i.e. import bans, it is likely that the volume of imports will be low, resulting in a low coverage ratio. The ratio will be interpreted as a situation of less restrictive NTM regime, even though the reason such ratio is low is because of the presence of NTM or NTMs. This paradox represents one of the weaknesses of coverage ratio, as well as the frequency index.

Some of the weaknesses of these measures include the fact that they do not provide any information on the economic impact that NTMs may have on prices, production, consumption or trade (Nicita & Gourdon, 2013). Furthermore, some NTMs which are covered by these two measures may not be operative. In other words, they may have no effect on price nor distort the production or consumption pattern. For example, a quota that is imposed on imports where the volume of imports is less than the set quota will not have any effect on prices, production or consumption. However, it will still be captured by these measures. At the other extreme, an NTM that is more trade distorting than others will not be reflected as such in these measures.

Despite the weaknesses of coverage and frequency ratios, they still provide an indication of the extent of protection provided by NTMs (Schlueter, Wieck, & Heckelei, 2009). They are useful in identifying NTMs and products affected. They are also practical in cases where the NTM data is limited. The ratios may also be used in econometric studies as explanatory variables. They can also be used as explanatory variables in bilateral trade at aggregate levels or at the sector level. Examples of such research work include that by Leamer (1990) and Harrigan (1993).

4.2.2 Price gap method

The price gap procedure estimates the degree to which NTMs raise domestic prices above international prices. Alternatively, it is used to compare goods affected by NTMs and those that are not affected. The difference between the high price of imports induced by NTM and the world price that would prevail in the absence of distortions can be treated as a tariff equivalent (Ferrantino, 2006). The removal of NTMs can be simulated in a partial equilibrium or computable general equilibrium (CGE) framework using familiar methods for simulating the effects of tariff changes.

If measured correctly, the price gap or wedge can be used to approximate the extent to which domestic prices would fall if NTMs were to be removed. The measures have been the basis of most of the empirical work that has been done in quantifying the effects of NTMs (Bhagwati & Srinivisan, 1975; Roningen & Yeats, 1976; Baldwin, 1989; Deardorff & Stern, 1998). For the results to be reliable, comparison needs to be made between same products. Prices of

domestic and imported products must be compared at the same point in the distribution chain to make sure that other factors, such as taxes or transport costs, are not responsible for the different outcomes, and then incorrectly attributed to NTMs.

The method can be used to incorporate detailed specific information about the workings of policy (Disdier, Fontagn´e & Mimouni, 2007). The tariff equivalent results can be used to compare NTMs with tariffs and used in simulation. The key challenge is that price data are not always readily available for many countries ((Kalaba & Kirsten, 2012); (Winchester, 2008); (WTO, 2012); (Liu & Yue, 2009)). Secondly, it is difficult to make two price measurements for the same good, the one which fully reflects the effect of the NTM and the other unaffected. There is a need for adjustments for transport costs, and wholesale and retail margins. It is also difficult to make comparison for products of different quality mix.

4.2.3 Quantity-based approach

Quantity-based approaches measure the difference between the observed quantity of imports (distorted) and the estimated (quantity in the absence of NTMs). In other words, instead of measuring the price effect, one can estimate quantity effects of an NTM (Ferrantino, 2012; (Helpman, Melitz, & Rubinstein, 2008)). These measures directly estimate the impact of an NTM on the volume of trade. There are measurement problems associated with this approach (Pacific Economic Cooperation Coucil, 2000). It thus requires a very robust econometric model in the attempt to measure what the volume of trade would have been without NTMs.

Using this approach, one estimates the quantity or value effect of NTMs as the difference between the observed imports under the NTM and the level of imports that would have been observed without NTM. It is expected that the observed imports will be lower, as NTMs are assumed to be restrictive. This requires that a certain level of imports be set, which will be considered to normal in the absence of NTM. The quantity approach is preferred when the NTM is prohibitive and block imports completely. In this case, there will be no price of imports on which the price gap can be based upon. It is also useful in the case of highly differentiated products and there exist many different prices which are difficult to measure.

Gravity models are also very useful in determining the quantity levels (Bergstrand, 1985). According to the gravity model, a high degree of the variation in the value or volume of trade

between partners can be explained by the size of the partners' economies (Head & Mayer, 2014). That means more trade is expected to take place between partners with higher GDPs. Furthermore, the likelihood of trade is less between more distant partners and more trade is expected between partners sharing a common border or a common language. The estimates of the gravity model can be used to generate out-of-sample estimates of what normal trade would be between country pairs for which the trade value is usually lower. From the basis of the gravity model, one can argue that it was designed to measure the volume (quantity) of trade, given such variables. So, the premise of the gravity model is also a quantity-based approach.

4.2.4 Simulation approach

Simulation approaches refer to the tools which are used to estimate the effects of NTMs on trade flows, consumption, welfare, GDP, and even employment ((Jayasinghe, Beghin, & Moschini, 2010); (Otsuki, Wilson, & Sewadeh, 2001); (Calvin, Krissoff, & Foster, 2008); (Disdier, Fontagn´e, & Mimouni, The Impact of Regulations on Agricultural Trade: Evidence from the SPS and TBT Agreements, 2007). They have been used to analyse the effects of tariffs, and thus have a framework that already incorporates economic theory. They estimate the effect of NTMs taking into consideration the economic conditions that are consistent with basic economic principles. They also allow the use of multiple variables and can accommodate policy changes. So, the simulation approaches can evaluate the effects of NTMs, as well as their removal.

General and partial equilibrium models are some of those that fall under this category. The methods vary from simple approaches to the most complex applications. The applications may vary from a spread sheet-type simulation to the backward-forward and multiplier linkages of partial and general equilibrium models ((Fugazza & Maur, 2008); (Andriamananjara, Dean, Feinberg, Ludema, Ferrantino, & Tsigas, 2004); (Wilson, Mann, & Otsuki, 2003). The general equilibrium models provide analysis of the relationships between products, sectors, industries and countries, while simulation on partial equilibrium models help with the analysis of narrowly defined product- and sectors-specific problems and then leave out some of the linkages which are not relevant to the problem in question.

Now, simulating the effects of NTMs requires that a tariff equivalent or similar measure be estimated, using either the econometric, partial equilibrium or general equilibrium model ((Disdier & Marette, 2010); (Bacchetta, Richtering, & Santana, 2012)). Because simulation takes into account economic theory, it is able to produce estimates of a much wider variety of impacts of changing NTMs. Furthermore, the results are usually very specific about the causal factors (Kee, Nicita, & Ollareaga, 2009); (Kirk, 2010). Some weaknesses of the simulation approach, particularly general equilibrium, include the amount of time needed to prepare and run the model, as well as its sensitivity to assumptions. As for the assumptions, it is advisable that sensitivity analysis be performed to find out how important these assumptions are.

4.2.5 Approach adopted in this study

The price gap method will be adapted and adjusted in this study to evaluate the impact of NTMs on intra-SADC trade. The gravity model is the econometric model which will be used to estimate the effects of NTMs on trade and convert these to tariff equivalent measures. The gravity equation gets integrated into the Bayesian approach using the threshold model, as explained in chapter 1. Then, in that case, NTMs are separated from the rest of trade costs, and in that way their impacts are estimated on a product basis.

Two measures were developed to measure NTMs at different levels. They are referred to as protection margins of NTMs (PM NTM) measure and the Regional Trade weighted NTM (RT NTM) measure. These methods take into consideration the varying effects of NTMs, as well as the way they are introduced. Therefore, each measure approaches the effect of NTMs differently from others.

a) Protection Margin (PM NTM) measure

The PM NTM is a measure that compares NTMs between members of a regional integration group. The measure is premised on the notion that members of regional integration are not equally protective. So, it evaluates how an individual member's NTMs are different (protective), relative to the rest of the region. In other words, the measure attempts to answer the question, "*what happens to the overall protection when a particular member of the region introduces an NTMs*"?

So, the PM NTM is calculated as follows:

$$PM\ NTM = \sum \frac{\in NTM_{r-i}^{kt} + 0.5NTM_{i}^{kt}}{n} * 100 \quad (4.3)$$

Where, $\in NTM_{r-i}^{kt}$ represents the count of NTMs in the region, on product *k* in period t, as imposed by other members that are lower than the number of NTMs of the country *i*. NTM_{i}^{kt} represents the number of NTMs of country *i* in period *t* for product *k*. And finally, *n* is the number of countries in the region and *r* refers to the region. The PM NTM measure ranges from 0 to 100, where the lower index reflects low protectionism and vice versa for the high index.

If all countries have the same number of NTMs on the product, ideally those NTMs will not reflect protectionist intent. This, of course, assumes that the requirements of complying with such NTMs are the same. In that case, there will be harmonisation, and thus trade would flow relatively easily, compared to products where there are diverse requirements. To put it in perspective, if all countries have the same standard requirements in the region, then that standard will not be restrictive of intra-regional trade, irrespective of how high it is.

b) The Regional Trade weighted NTM (RT NTM) measure

The RT NTM measure considers the importance of regional trade by individual members of the regional bloc for each product. Unlike the PM NTM, which measures the effect of NTM protection by a member, RT NTM measures the effect on a product and intra-regional trade. It considers the share of the affected product in intra-regional trade. This measure is mathematically formulated as follows:

$$RT\ NTM = \frac{X_{ir}^{kt}}{\sum_{k=1}^{n} X_{ir}^{kt}} NTM_{i}^{kt} * 100 \quad (4.4)$$

Where X represents the value of exports of product *k* from country *i* to the region, *r*. NTM_{i}^{kt} is the number of NTMs of product *k* in period *t* that are faced by these exports. So, the first term on the left represents a proportion of country *i* exports to the region's total imports.

Therefore, TR NTM is a measure of NTMs that is weighted by the share of the affected country's contribution to intra-regional trade.

A positive relationship between the share and the NTMs is assumed. A mix of high NTM incidences and larger intra-regional share is expected to be more trade restricting. It implies that if there are more NTMs on a product that has a relatively large contribution of regional trade, then the intra-regional trade will be negatively affected. So, the outcome of that will be a substantial limitation of intra-regional trade. The lower values imply that NTMs are less prohibitive towards regional trade, while higher values indicate them being more protective of regional trade.

These two measures can all be calculated at the product level of HS 4-digit, HS 2-digit, or any level of aggregation. Then, in this way, the effects of NTMs can be examined across all agricultural products. The results of the two measures are used to compare NTMs across the countries and between products. These two developed measures will be augmented into the gravity model later on in this study.

The NTM and trade data are then used in the gravity equation (Tinbergen, 1962) to estimate various trade costs. First, the gravity equation is adapted to the Bayesian approach, as discussed in chapter 1. This is to allow isolation of the NTM trade costs from all the other trade costs. Then, the impacts of NTMs in SADC can be estimated for various agricultural products with a threshold. The three new measures are developed in this study.

The Bayesian approach was preferred owing to its ability to update knowledge about the unknown in a statistical model using the observations (Congdon, 2010). The revised knowledge is expressed as in the posterior density. The sample observation being analysed provides new information about the unknowns. Then, the prior density of the unknowns represents accumulated knowledge about them before observing or analysing the data.

4.3 DATA AND APPROACH FOLLOWED TO MEASURE NTMS IN SADC

Trade flow data used is from the Comtrade database, which is hosted by the Secretariat of the United Nations. It is accessible through an online tool called the World Integrated Trade Solutions (WITS). The database has information on international merchandise trade statistics

(United Nations Statistics Division, 2012). The database relies on countries to provide such trade information. However, in cases where the countries do not report data, there will be data gaps. In our sample of SADC countries there are several gaps which presented different challenges.

4.3.1 Trade flow data challenges in SADC

Trade data is never complete or without problems (ITC, 2013). Therefore, there is a need to explain it further, in detail and in context. The trade data for developing countries and countries in transition tend to have more challenges than developed countries. There is a need to provide more explanation than in the cases involving the developed countries, as well as to take some corrective steps before utilising some of the datasets for analysis (Guo, 2010). So, in this case, SADC trade had some gaps that needed to be filled with some known methods of addressing missing data. That is accomplished using mirror data and average trade growth where prior time series data existed.

The countries affected by these data gaps are Mozambique, Swaziland and Zimbabwe. South Africa plays a different role in this missing data, as it does not report on its trade with SACU partners. Therefore, South Africa's official trade statistics are under-reported by the amount of SACU trade. Furthermore, in cases where SACU countries are not reporters, this data cannot be estimated by means of mirror data. This is also part of the reason why Lesotho is not included in the sample of SADC countries in this analysis.

This South African problem also has a serious impact for the challenges which are faced by Swaziland trade data. Swaziland has not reported any trade flows to COMTRADE since 2008. So, there are three missing years in the period of analysis. In the period when Swaziland reported data, 2000 – 2007, it is observed that the majority of its trade was with South Africa. On average, about half of all Swaziland agricultural exports went to South Africa, while about 87% of all Swaziland imports originated from South Africa. Therefore, using mirror data to estimate Swaziland trade for 2008 – 2010, when South Africa was not reporting, would have resulted in more data problems.

The case of the Mozambique trade data gap affects trade flows for the year 2000. These trade flows were not reported to the COMTRADE database for that year. This applies for both

imports and exports of Mozambique. Zimbabwe's trade data challenges are similar to those of Mozambique, i.e. not reported to the COMTRADE database. The missing data is for the import flows of Zimbabwe for the years 2000 and 2003. Export flows of Zimbabwe are also missing for the year 2003.

4.3.2 Methods of addressing data challenges

Theoretically, if all countries recorded trade data, then for every trade flow, there are will be reports. One report will be prepared by the exporting country, and another by the importing country. If only one country has recorded, then there will still be one report for the trade flow. Then, and this is where mirror statistics play an important role, that one recorded trade flow can be used to calculate trade information for both countries.

The trade data for Mozambique and Zimbabwe was corrected by means of mirror statistics. The data reported by their trading partners was inverted and used to fill the gaps for these two countries. If country *i* is missing trade data, i.e. exports, but its trading partner, country *j* that supposedly imported that product *k* in period *t*, then the missing values were estimated as follows:

$$X_{ij}^{kt} = M_{ji}^{kt} \tag{4.5}$$

Implying that the missing figure which was supposed to be X_{ij}^{kt}, exports of product *k* from country *i* to market *j* in period *t* was estimated using the reported import data, M_{ji}^{kt} by country *j* for the same product in the same period. This case is reversed for missing export data.

The results of this estimation are shown in Figure 4.1. There were three trade flows which were estimated for the year 2000 and two flows for the year 2003. For the year 2000, these flows involve Mozambique imports and exports, as well as Zimbabwe imports. The estimated import value (mirrors) of Mozambique is substantially higher than their corresponding 2001 reported values. This is not expected. Usually, the values of mirror imports are expected to be under-valued, since they are based on values of reported exports, which figures do not include the freight, insurance and other costs related to moving the goods from origin to destination.

The 2000 mirror data representing Mozambique exports and Zimbabwe imports are not substantially different from their corresponding 2001 values.

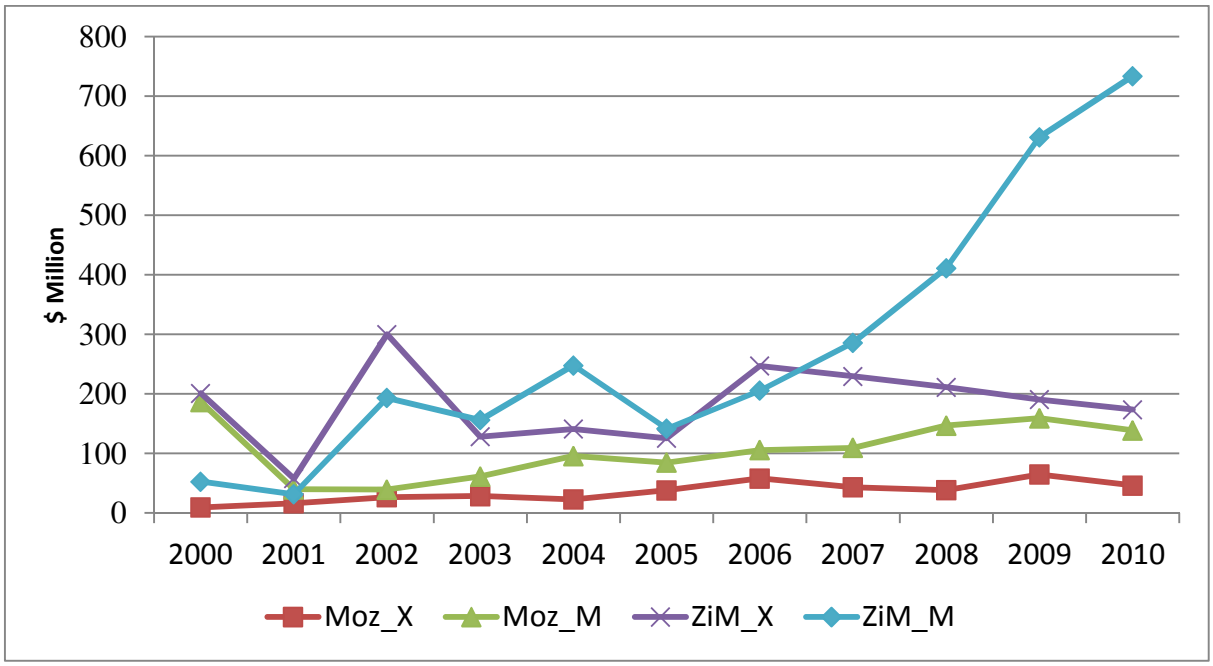


Figure 4.1: Mozambique and Zimbabwe reported and estimated (2000 and 2003) trade flows with SADC using mirror data

Source: Estimated from Comtrade (2013)

The mirror data for 2003 involving only Zimbabwe trade flows appears to be on a decline from 2002. The export values remain relatively unchanged for the subsequent two years, while imports increase and then decline. When one looks at both trade flows for Zimbabwe up to 2007, the trend has been going up for a year, then down the following year. Therefore, these estimates, particularly for 2003, can be considered to be fairly consistent with the reported data.

The Swaziland data was estimated using the average growth rate of the first eight years, which was then used to close the gaps for 2008, 2009 and 2010. The estimation of this trade, using the average growth rate, was done at the HS 4-digit product level. For South African trade data, only officially reported data was used. In other words, trade with SACU members is excluded. The main reason is because of the inability recapture that data in the form of a mirror.

The closing of missing Swaziland data was done by performing regression analysis to fit it an exponential curve. The method of least squares criterion was used to find the best fit for each product (Gujarati, 1995). The years 2000 to 2007 were used as independent variable, while the trade values for that period represented the dependent variable. So, the missing trade value for each product was estimating using the linear function,

$$X_{iw}^{kt} = mT + c, \tag{4.6}$$

Where X_{iw}^{kt} is the dependent variable (trade values). It represents imports or exports of country *i*, Swaziland, to the world (*w*) for product *k* in period *t*. *m* is the coefficient to be estimated and T is the independent variable, represented by the period in years (2000 – 2007), *c* represents the constant. So, if a zero constant is assumed, then it means that the regression can be run to find the value of *m*, which can be used to estimate the values of X_{iw}^{kt}, or trade for each product in the missing years. In cases where data could not be estimated owing to the missing trade values in the years 2000 – 2007, the average trade values for the affected product were used as estimates.

The estimated trade flows were adjusted using the GDP for those years. In other words, the average ratio of trade to GDP was maintained as it was in the previous eight years. This was also taking into consideration the fact that the three years where data was missing also constituted a difficult period economically throughout the world. In the final step, the value of SADC trade was allocated according to the average share of the previous eight years.

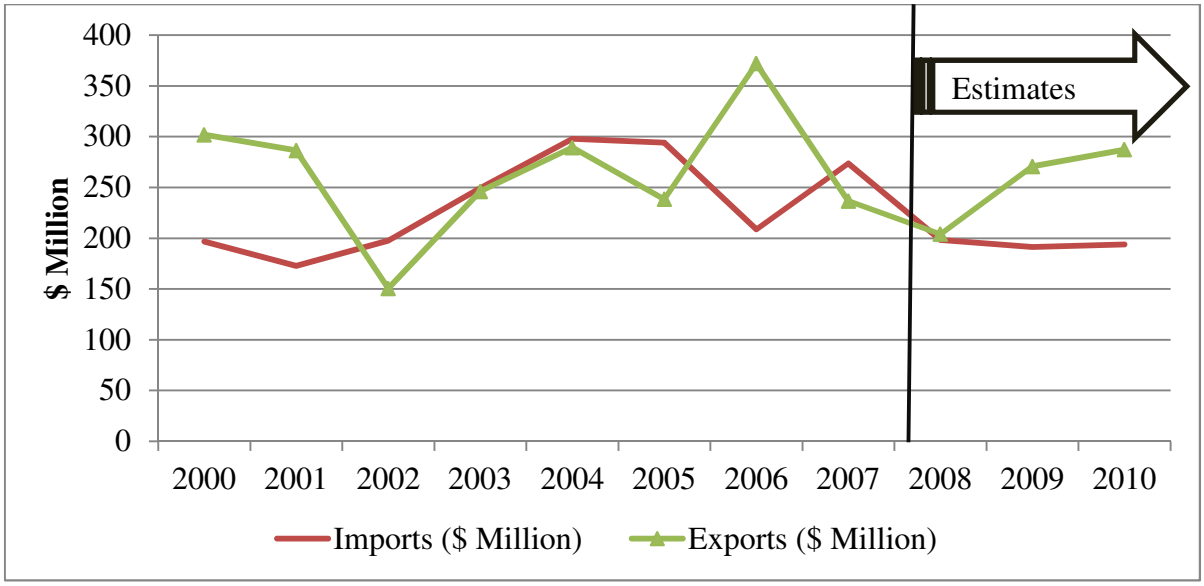


Figure 4.2: Swaziland reported and estimated trade flows with SADC

Source: Estimated from Comtrade (2013)

The results of Swaziland trade flow estimations for the period 2000 to 2010 are shown in Figure 4.2. The estimated imports show a sign of levelling off. But they were still on a decline which started in 2007. As for the estimated exports, they show a recovery, also following a decline which started much earlier than imports, in 2006. These methods of trying to close the data gaps provide the second-best option in the absence of reported data. Accordingly, they are very useful in bridging that data gap.

4.3.3 Challenges with the methods of data correction

It is widely recognised that the mirror statistics method has its own challenges; hence it is also referred to as "the second best solution". This is an acknowledgement that it does not entirely solve the trade data problems. One of the shortcomings of this method is that it is not helpful if two partners are not reporting. In our sample, that is the problem experienced between South Africa and Swaziland, as well as between South Africa and Lesotho.

The second problem of using mirror statistics has to do with the valuation. Mirror statistics invert the value of reported imports, which are in c.i.f terms (i.e. including costs of transport and insurance), and make them exports, which should be free of those costs. In the same way, imports of mirrored statistic are in f.o.b. terms (free on board), which means they are recorded without freight and insurance costs. In other words, mirror data overstates exports and understates imports.

Thirdly, the number of reporting countries from which mirror data is drawn changes from one period to the next. Therefore, mirror trade statistic may show an increase or a decrease owing to more reporters coming in, rather than actual trade increasing. This may distort the estimate being used.

In this study, analysis was conducted with these shortcomings. It is believed that, overall, the gains of having data are more important than not having data at all. The weakness of using the average growth to correct Swaziland data is that the trend may have changed, particularly given that the three years coincided with global recession. However, it is felt that the GDP adjustment brings it closer to reality. The main confidence, that these shortcomings have not influenced the results of the analysis, comes from the fact that only 5% of trade flows were constructed through these methods.

The absence of a single dataset on NTMs in SADC countries implies that several studies needed to rely on a variety of sources. In many instances, it is well known and acknowledged that NTMs do exist. The difficulty is with obtaining reliable data over a period of time and across several countries. Therefore, the estimation of economic effects gets limited to a single product or single market. It thus becomes problematic to do comparisons across economies or to aggregate across sectors. The available data sources on NTMs in SADC were not sufficient to allow such estimations.

The point of departure in compiling the dataset was from sources that have partial NTM information. Some sources had highly aggregated NTM information, while others did not have sufficient data for the full period which the study sought to cover. In short, there is no single repository agency of NTMs at the SADC Secretariat or national levels. That is due to the fact that laws and regulations affecting trade are developed by different government agencies and regulatory authorities.

The sources can broadly be categorised into three groups, namely WTO, governments and private or research reports. The WTO documents which were used include the notifications to the WTO, such as SPS, TBT, schedules of concessions or commitments, trade policy reviews, monitoring reports and dispute reports. The WTO was a very helpful source in this regard as its members are required under the principle of transparency to notify such policy decisions

and changes (World Trade Organisation (WTO), 2010). The WTO framework has more than 200 notifications, the majority of which involve the NTMs (Bacchetta *et al*., 2012). These have been helpful in understanding what measures have been introduced by SADC member states, as well as the year in which they were introduced.

Government reports include policy documents, legislation and other gazetted information. This would include policy documents, Acts, and national plan documents, i.e. five-year plans and long-term plans. These reports are in the public domain, and very often such measures are clearly stipulated when they are going to be introduced. What sometimes is not understood or explained in detail is how they will be implemented. And that may also not indicate whether the measures share being enforced or not. However, the important indicator is the intent to use such measures, and the fact that once such measures are announced publicly, the communication with the affected stakeholders is considered to have taken place.

Private and research reports cover information gathered from private institutions, unpublished and published research in journals, by consultants, non-governmental organisation and surveys which have been done. This also includes information that was gathered in interviews with government officials in several SADC countries. All information, particularly from interviews and private research, was checked and confirmed with authorities and through other official documents to make sure that what were included were not just opinions.

Trademark Southern Africa is one of the institutions that have made important contributions towards identifying NTMs in SADC. It started a process of publicly reporting NTMs at the border posts within SADC, EAC and COMESA (TradeMark Southern Africa (TMSA), 2011). The reporting of complaints is done by the traders or truckers as they experience challenges, and the matter is recorded to be taken further with the affected countries. However, other affected parties may report such incidences, irrespective of whether they are at the border or are actively participating in trade. The institution will investigate such complaints and reports, and provide feedback on the findings.

4.3.4 Problem of observed zero trade

Despite problems with lack of reporting, reported data also has some problems. These problems are in the form of a high percentage of reported zero trade. Reported zero trade may

mean several things. First, it may be the case that, indeed, there was no trade between the trading partners. Secondly, it may be a case of rounding off reported low-value trade to the nearest round number. With the Comtrade database using US$ 1 000.00 as their smallest unit, this may affect many products from the least developed countries (LDCs) and developing countries, particularly at a high level of product disaggregation. The third possibility is that no trade data was recorded, and not necessarily that trade did not take place.

The way researchers deal with observed zero trade has several implications. If zero trade is ignored, then this leads to sample selection bias. Sample selection bias occurs when a subset of the data is systematically excluded owing to a particular attribute (Haq, Meilke & Cranfield, 2011). The temptation to omit data with zero trade is generally high when the gravity model is estimated owing to the log-linear functional specification. This is because the log of zero is undefined. However, the exclusion of the subset can influence the statistical significance of test results, as well as lead to biased findings (Helpman *et al*., 2008; Hillberry, 2002; Jayasunghe, Beghin & Moschini, 2010).This may further lead to incorrect statistical and economic inferences.

Several researchers have dealt with zero trade in different ways. Jayasunghe *et al*. (2010) ignored zero trade, arguing that zero data was a true reflection of a situation where there was no trade. McCallum (1995) and Frankel (1997) also ignored zero trade. Raballand (2003) substituted zero trade with very small numbers. This approach is rather arbitrary and does not have theoretical foundations as to what those numbers mean. Linders and de Groot (2006), Helpman *et al*. (2008) and Haq *et al*. (2011) used variations of the two stage approach where in the first stage; a selection model consisting of observed data and country-specific variables is estimated. In the second stage, the potential positive trade and observable trade flows are estimated in what is called an outcome model. In other words, zero trade is substituted by potential trade which was estimated based on the observed trade and country characteristics.

The challenges of zero trade are, therefore, two-fold. First, it is the presence of such trade, and second, is the question of how to handle that trade. The SADC trade has a very high percentage of zero trade for the six product groups – animals, cereals, horticulture, oilseeds industrial and processed products. These are aggregations of HS 4-digit products, implying there has already been an attempt to control for the high percentage of zero trade which can be observed from Figure 4.3. This is the comparison of positive and zero trade values of nine

bilateral trade pairs for the six product groups over a period of eleven years. Zero trade contributes between 35 % and 38 % of total observed trade. The lowest zero trade percentage is observed in the processed product group (35 %), while the highest is in horticultural products, with 38 % of zero trade values.

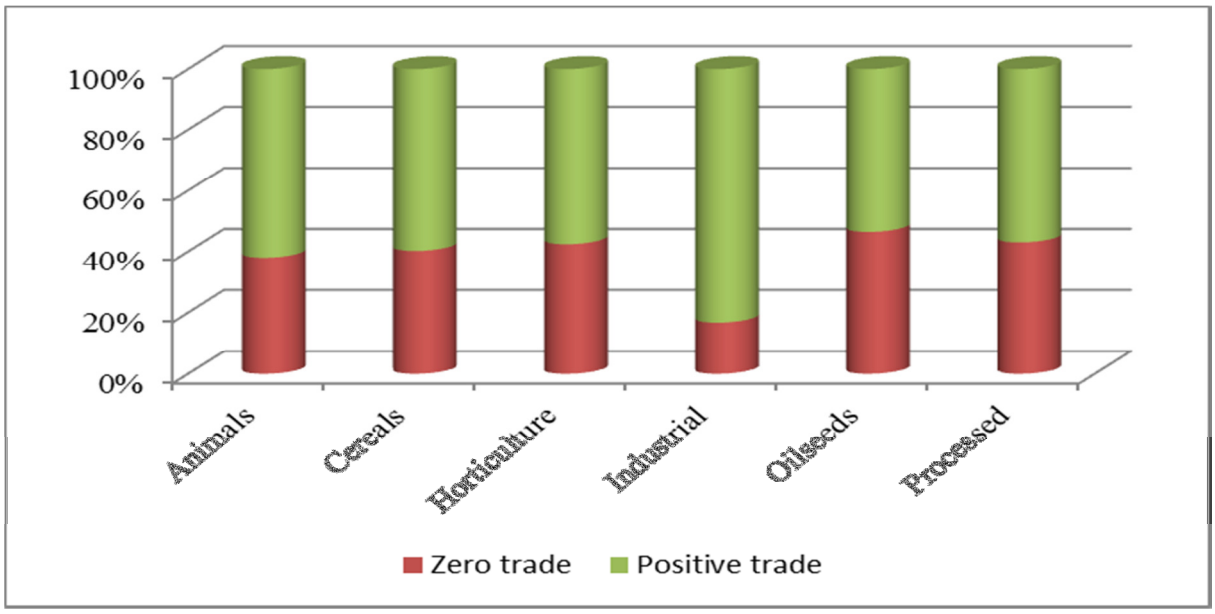


Figure 4.3: Percentage of positive and zero trade within SADC trade

Source: Calculated from the UNCOMTRADE database, (2013)

Considering the high percentage of zero trade in the sample, it important that data be handled properly. Zero trade cannot be ignored, as it may contain useful information. Throwing that information away might lead to loss of information that may possibly explain low trade volumes, including zero trade. This is important because the focus of this study is on NTMs, and is an attempt to explain low trade volumes, and also to understand the patterns of such low trade volumes. An explanation of the trade patterns may reside in the zero trade values.

The zero trade values are handled in a similar manner to those in Haq *et al*. (2011), Helpman *et al*. (2008) and Linders and de Groot (2006), and by estimating the threshold, as explained in Chapter 1. To estimate this threshold, the gravity equation is integrated into the Bayesian approach. The Bayesian approach is preferred because it can update information about the unknown in a statistical model using the observed data (Congdon, 2010). The observations are analysed to provide new information about the unknowns, in this case the threshold. The model is estimated for observable trade flows, i.e. greater than zero. Then, the outcomes from the observable data are used to estimate the probability of positive trade flows, i.e. the

threshold. Although this is a two-stage process, it is done in one process, hence the Bayesian approach is deemed appropriate. The integration of a gravity model into the Bayesian approach is discussed in detail in Chapter 5.

4.4 BUILDING OF THE SADC NTM DATABASE

The MAST classification, as endorsed by the GEPNB, was greatly useful in simplifying data collection. Given that all known NTMs have categories within this classification, it becomes easier to look for data. The challenge was to classify laws and regulations into the appropriate NTM categories. In all SADC countries for which data was gathered, none had a single repository of NTM information. Furthermore, laws and regulations affecting trade are enacted by different government agencies.

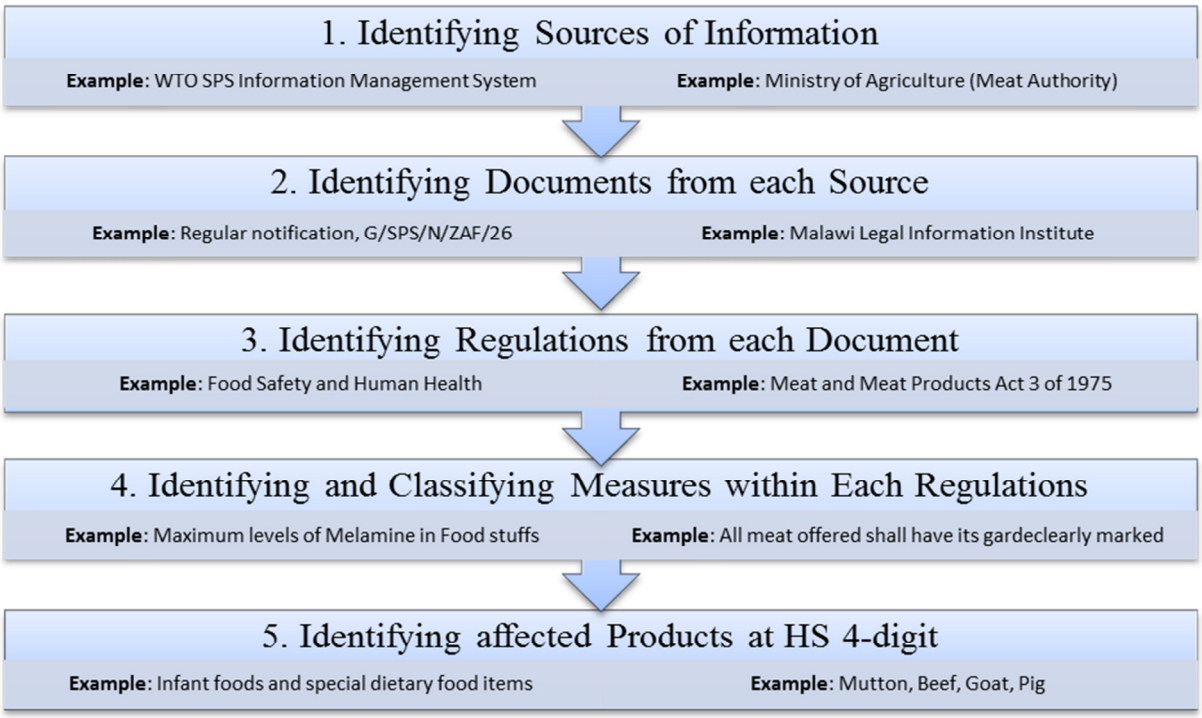


Figure 4.4: Process of compiling SADC NTM data

Figure 4.4 provides a summary of the process followed in building the SADC NTM database. Most of the data was gathered through documentation gathering. In the *first* step, sources of information were identified from various government agencies and institutions. The sources of data varied, depending on the country. In many countries, information is published online. Some countries publish information on the official government website, others on the

parliament websites. Some of the documents were gathered from the regional Secretariats, i.e. the SACU Secretariat in the case of SACU countries, SADC Secretariat, COMESA, EAC, and Indian Ocean Community (IOC). The WTO SPS management system was helpful in obtaining those regulations which were already notified.

Next, documents which contain regulatory measures, such as Acts, government gazettes and other government regulations, were collected in step *two*. An inventory of the documents on trade regulations was also compiled to continue the process of database building. Trade and other regulations affecting trade are published in various documents and websites. Some regulations are published in one or several documents. For example, the agency responsible for trade promotion would publish the regulations, and the government department responsible would do the same. Some examples of the document titles include, Import and Export Control Act, Tobacco Act, Food Act, Animal and Disease control, and others. The WTO policy documents have notification numbers which makes it easy to find them on the WTO database of documents.

In the *third* step, regulations arising from such documents were identified. One document may contain one or several regulations. All regulations which were identified were recorded. Then, in that way, NTMs were matched with the products. In some instances, a regulation may be called a law, in others an Act, sometimes an ordinance, directive, an order, notification or a decree. Attempts were made to identify all such regulations. This included having to look at additional and separate documents to verify whether what is deemed to be a regulation, indeed applied as such.

In the *fourth* step, those regulations were then classified into various categories. Once all measures within each regulation were identified, the process of classifying them then started. This implied that each regulation needed to be clearly read through to find the corresponding NTM code. Some of the regulations were clearly straightforward, but others presented great challenges in deciding which NTM code each belonged to. For example, the codes for most measures on export (category P) and rules of origin (category O) were fairly easy to find, as there are very few of those categories. In some cases, a regulation may fit into two categories. For example, the labelling requirement for food products does fit as an SPS requirement (A31), as well as a TBT (B31). The same thing applies to marking – A33 or B33. In such cases, one code was selected.

In some cases, some regulations were not detailed enough to classify. For example, if a regulation states that there is prohibition or licensing requirements, more details will be needed to classify that regulation. There are about seven different subcategories across various categories involving prohibitions. The same applies to licensing requirements. Therefore, when there were no sufficient details, it was difficult to classify. In that case, follow-ups were made with the officials in the department, agency, even private businesses or individuals, of that country through email, telephone calls or personal interviews. Where possible, additional documents were requested to seek clarity on such regulations and to classify them correctly.

In cases where a code could not be found or decided on, the codes at the end of each NTM chapter were applied. That is what *n.e.s.* stands for, "not elsewhere specified". These are all the codes in the MAST classifications ending with 9. However, in most cases where doubt existed, the authorities were contacted in the country for clarity.

Lastly, the products affected were identified. The matching of products affected was not an overly difficult process. The challenges come were the regulations are applied on a product which cannot be differentiated at HS 4-digit level. For example, some regulations will be applicable only to yellow or white maize. However, in the harmonised system (HS) nomenclature at HS 6-digit, the two are not distinguished from one another. In that case, the regulation will be coded on the product as if it applies to both.

The period covered for compilation of NTMs is 2000 to 2010. These NTMs were compiled for agricultural products only. The products included were those covered by the WTO definition of agricultural products, and were defined at HS 4-digit level. In total, NTMs on 247 products were compiled for ten SADC countries. These countries included the four SACU members (South Africa, Botswana, Namibia and Swaziland), and Malawi, Mauritius, Mozambique, Tanzania, Zambia and Zimbabwe. Five SADC countries were excluded for various reasons such as lack of data, late accession and non-ratification of the SADC trade protocol. A summary of the results of SADC NTMs can be viewed in Appendix C, Table C.1 and Table C.2.

4.5 AN INVENTORY OF SADC NTMs AFFECTING AGRICULTURAL PRODUCTS

4.5.1 NTMs over time

Overall, more than 4 400 NTMs were identified in the agricultural sector of SADC as at the end of 2010. However, the numbers of NTMs indicated in 2000 were not all introduced that year, but represent an aggregation of earlier NTMs up to that year. Basically, all the years are accumulations, as NTMs are hardly reduced, with exception of temporary bans. SADC NTMs on agricultural products introduced in the year 2000 numbered just over 2000. This was an aggregation for all ten SADC countries included in the study. Figure 4.5 shows a steady upward sloping trend, implying growth in NTMs between the years 2000 and 2004. Then, from 2005 to 2007 there is evidence of steep upward slope. Then another steady rise is observed from 2008 to 2010.

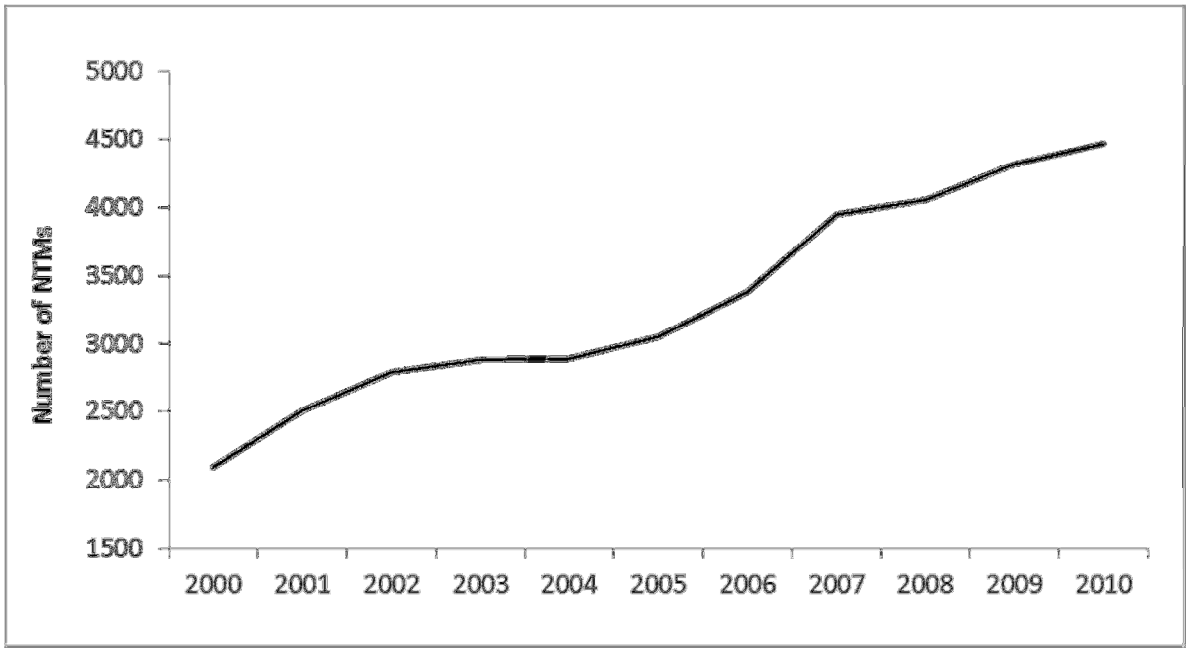


Figure 4.5: Aggregated SADC NTMs from 2000 to 2010

Source: NTM Database compiled by author, 2012

The sharp rise of NTMs towards the year 2007 is thought to be a response to the deadline for the launch of the SADC Free Trade Area (FTA). SADC FTA was launched in 2008, so may be countries were waking up to the reality that tariffs needed to be reduced substantially between 2005 and 2008. More than two-thirds of SADC countries had back-loaded their

phase down schedules, so at that time there were still many tariff lines to be reduce. That may have motivated those countries to increase the use of NTMs.

4.5.2 NTMs by country

As was explained in the previous section, the application of NTMs was on the upward trend since the year 2000. However, not all countries were increasing NTMs at the same rate. Figure 4.6 shows NTMs by the ten SADC countries for the first year (2000) and last year (2010) of the study period. This helps to provide a comparison of where the countries were at the beginning, relative to 2010. It is evident that some countries started at very low levels of NTMs.

Six SADC countries had fewer than 200 NTMs on agricultural products. These were Malawi (MWI), Mauritius (MAU), Mozambique (MOZ), Tanzania (TAN), Zambia (ZMB) and Zimbabwe (ZWE). All these countries mid-loaded and back-loaded their tariff phase down schedules (Southern African Development Community (SADC), 2000). The remaining countries started at high levels of NTMs. They all had NTMs of 200 and higher in 2000. Coincidentally, all of them were SACU members. South Africa (ZAF) was a clear leader, with more than 400 NTMs, followed by Swaziland (SWA), while Botswana (BWA) had the least NTMs among SACU countries, with 220.

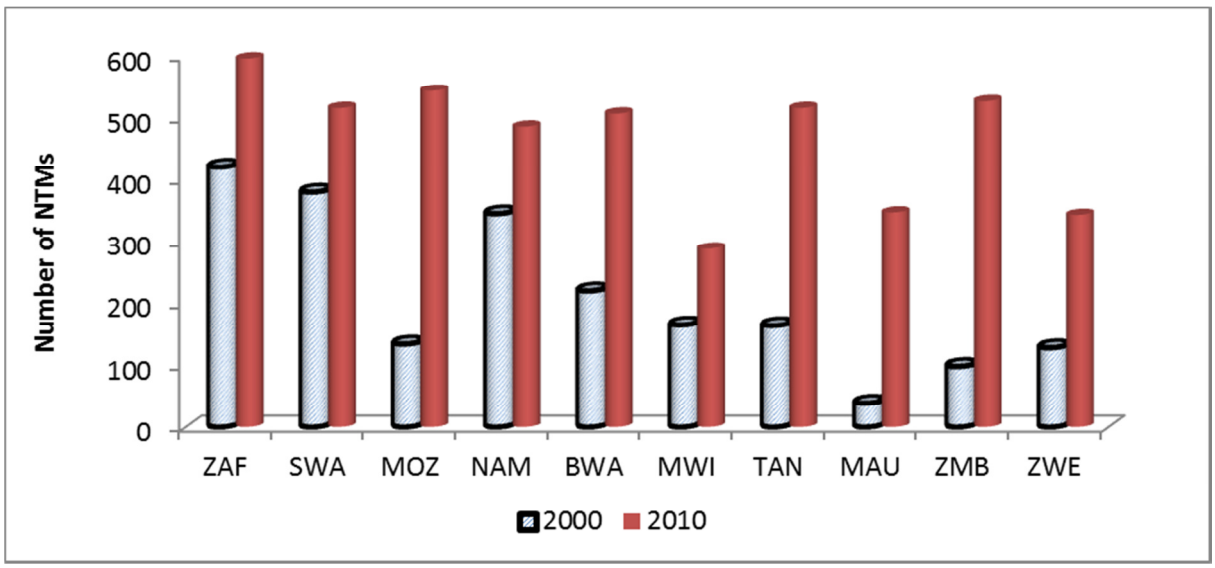


Figure 4.6: SADC NTMs by country for the years 2000 and 2010

Source: NTM Database compiled by author, 2012

In 2010, South Africa was still the leader with close to 600 NTMs applied on the imports of agricultural products. About 80% of these NTMs were contributed by three categories. SPS measures (category B) contributed 37%, then licensing, quantitative restrictions and other prohibitions (category E) accounted for 22%, and TBT measures (category A) added 18%. Most of these were on products such as beverages, spirits and vinegar (17%), Fruits (15%), Meat products (14%) and Dairy products (13%). Five other countries had NTMs around the 500 mark, and these are Zambia, Tanzania, Botswana, Namibia and Swaziland. Malawi, Mauritius and Zimbabwe had relatively low NTMs in 2010, at around 300 and lower. Malawi is the country that applies the least NTMs. By the 2010, it still had less 300 NTMs, which was lower than what other countries had a decade ago.

SACU did not only start with high levels of NTMs, it also increased the use of NTMs substantially over the period. One of the possible explanations of growth in NTMs of SACU countries is attributed to the SACU Agreement of 2002, which established industrial policy (Southern African Customs Union (SACU), 2004). This led to the introduction of infant industry policy measures in subsectors such as dairy, beverages and meat (Charalambides & Ngwenya, 2011; Grynberg, 2011) in Swaziland, Botswana and Namibia.

This does not imply that other countries have not done anything to grow their NTM base. Most countries were still below SACU countries' levels in 2010, mainly because they had started from a very low base. However, when one looks at the average growth of NTMs by all the countries, it becomes apparent that all countries had intentions to make use of more NTMs. Zambia was the fastest increasing country, with a growth of more 430% over the ten-year period. This implies that, on average, Zambia had added more than 43 NTMs that affect agricultural products. It was followed by Mozambique, with an average of 41 new NTMs per year over the ten-year period, and then Tanzania with 35. Malawi is also the least in terms of adding NTMs, with an average of 12 NTMs per year.

There is a noticeable relationship between the countries' use of NTMs and tariff reduction. *First*, concerning the countries which were front-loading the tariff phase down, SACU started at higher levels of NTMs than any other country. *Secondly*, countries which were back-loading and mid-loading started increasing their NTMs at about the same time when major reductions were required to happen, that is from 2005. *Thirdly*, the country that has the least NTMs in terms of numbers and growth, has not adjusted its tariff schedule since 2000

(Southern African Trade Hub (SATH), 2011). The implication is that, since there was no tariff adjustment, one can argue that they did not see the need to adjust NTMs. Overall, the pattern of NTM use is consistent with tariff reduction, and therefore the two can be considered to be substitutes.

4.5.3 NTMs by product category

The NTM counts for different agricultural products were aggregated at the HS 2-digit level for reporting. However, the database has a count at the HS 4-digit level. In the year 2000, four product groups at HS 2-digit level had NTMs of around 200 in all SADC countries. These were dairy (cheese, milk, yoghurt and others), beverages (wine, alcohol and spirits), fruits, and meat products. These groups are followed by vegetables and cereals, with NTM numbers of between 100 and 200. Figure 4.7 shows that the rest of the product groups had NTMs of less than 100 in the first year of the period of analysis.

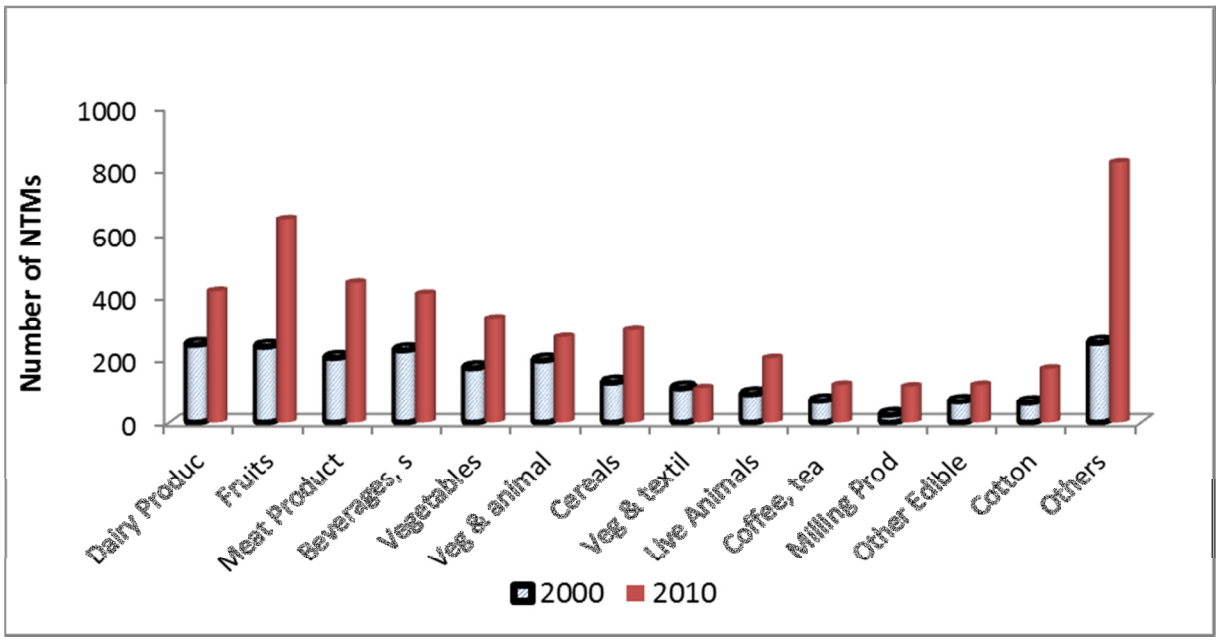


Figure 4.7: NTMs by product category for the years 2000 and 2010

Source: NTM Database compiled by author, 2012

By the year 2010, fruits had taken over as the leading product group in terms of number of NTMs. By that time, the group had accumulated a total of more than 600 NTMs. The product groups following fruits, at a long distance, are dairy, beverages and meat products. They had accumulated about 400 NTMs. Cereals, vegetables and live animals are the third tier of product groups in terms of the use of NTMs.

Overall, all products have increased their NTMs. This is also reflected by the last category, "others", which is an aggregation of all products which are outside the top twelve product groups. The highest growth rates were in products such as cocoa and cocoa products, vegetable materials, and animal skins. As for other products, in the year 2000 most of them had few NTMs, but then accelerated in their use of over time.

Another way of looking at how NTMs have increased over time is through an evaluation of the growth rates. Starting with those had more than 200 NTMs in 2000; fruits were clearly the fastest growing group, at about 170% over the period. That means that, on average, 40 NTMs were added by the SADC countries per annum. Meat products had a growth of about 120%. Those products growing from a low base include tea, coffee and spices, as well as fats and oils of vegetables and animals, growing at a rate of more than 600% over the period. However, the fact that the far right bar of Figure 4.7 increased substantially implies that almost all products have realised some increases in the use of NTMs.

Figure 4.8 depicts the composition of NTMs by product groups for the years 2000 and 2010. In the year 2000, when there were a total of 2094 NTMs, three products groups accounted for one-third of all NTMs. Dairy and fruits had a share of 12% each, while beverages accounted for 11% of the total NTMs in that year. They were followed by meat (10%), vegetables (8%) and cereals (6%).

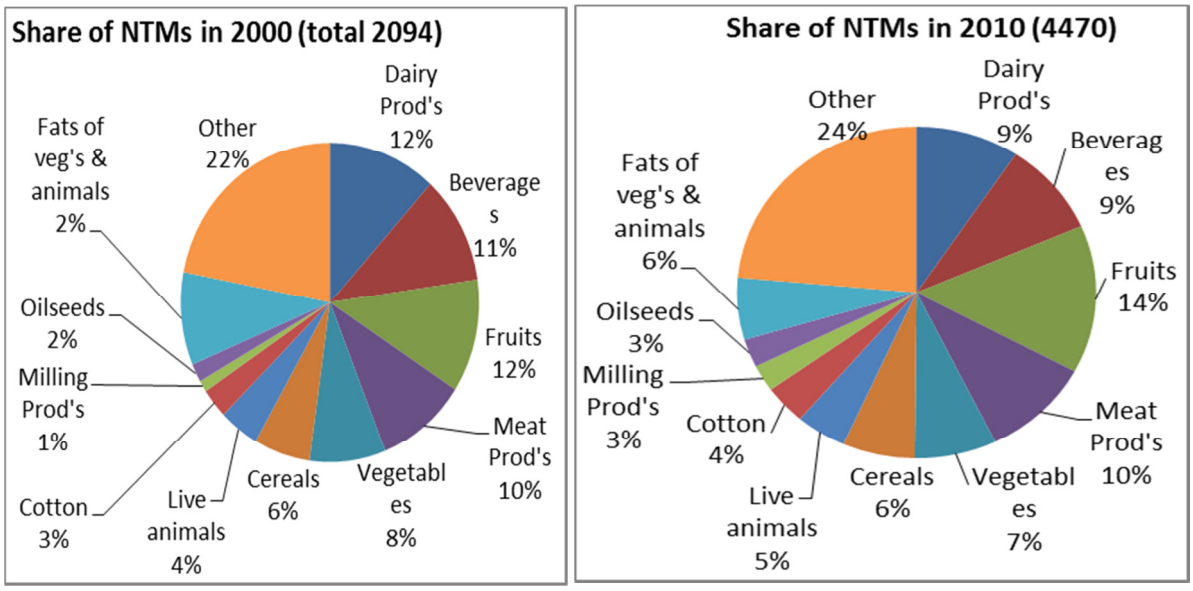


Figure 4.8: Share of NTMs by product, 2000 and 2010

Source: NTM Database compiled by author, 2012

In 2010 the total number of NTMs had grown to 4470. Two of the top three products had lost their share in the number of NTMs and only fruits maintained the same share as in 2000. The share of both dairy and beverage products declined from that in 2000 to less than 10% in 2010. The shares of products, such as meat and cereals, had not changed. Fats of vegetables and animal oils tripled their share of NTMs over a decade. Overall, with the exception of the fruits and fats of vegetables and animals, all products appear to maintain about the same share for both periods.

4.5.4 NTMs by measure category

The use of NTMs by category shows that SPS measures were preferred in 2000. Figure 4.9 shows that from 2094 NTMs which were compiled in the ten SADC countries in 2000, 485 were SPS measures. This represented more than one-fifth of all NTM categories. They are followed by the SADC rules of origin; licensing, quotas and bans, and export measures. The use of rules of origin and export measures is clearly a concern for regional integration. This is mainly because they are supposed to facilitate intra-regional trade. The fact that their use is so prevalent, yet SADC trade has not improved, implies that they may be serving the opposite of what SADC aims to achieve in terms of regional integration.

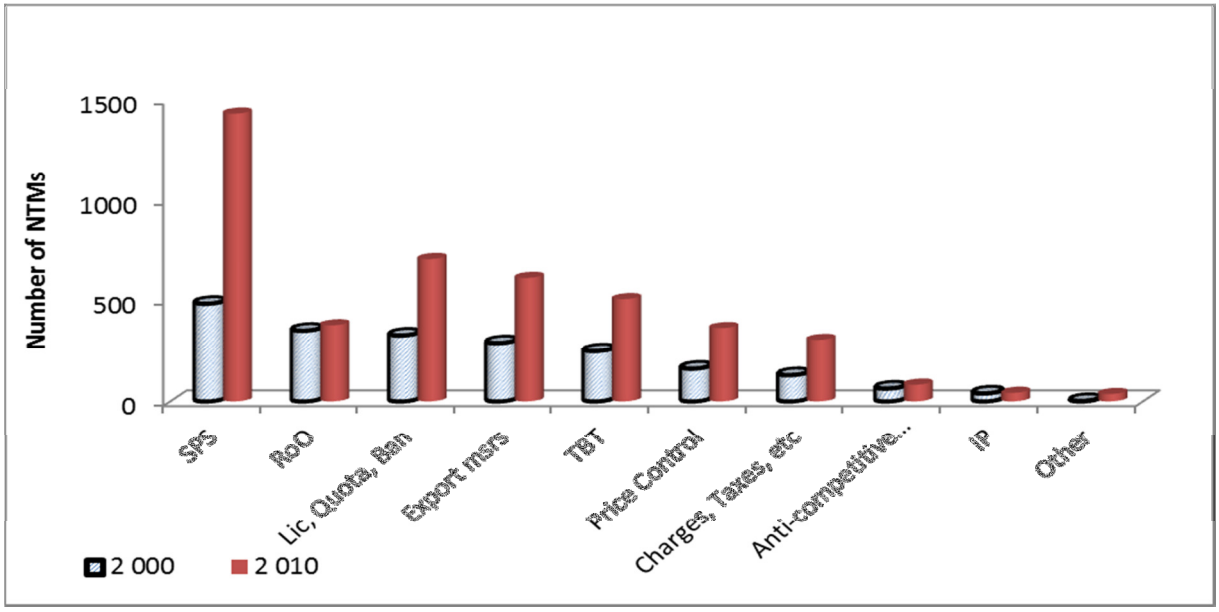


Figure 4.9: SADC NTMs by category, 2000 and 2010

Source: NTM Database compiled by author, 2012

Figure 4.9 shows that SADC countries consolidated their use of SPS measures over the period under survey. By the year 2010, SPS measures had increased from less than one-quarter of all NTMs used to more than one-third. Licensing, quotas and bans, as well as export measures, increased substantially. Rules of origin have not increased in numbers, mainly because SADC only adjusted these once over the period, in 2007 (SATH, 2011). That adjustment has not changed the rules substantially.

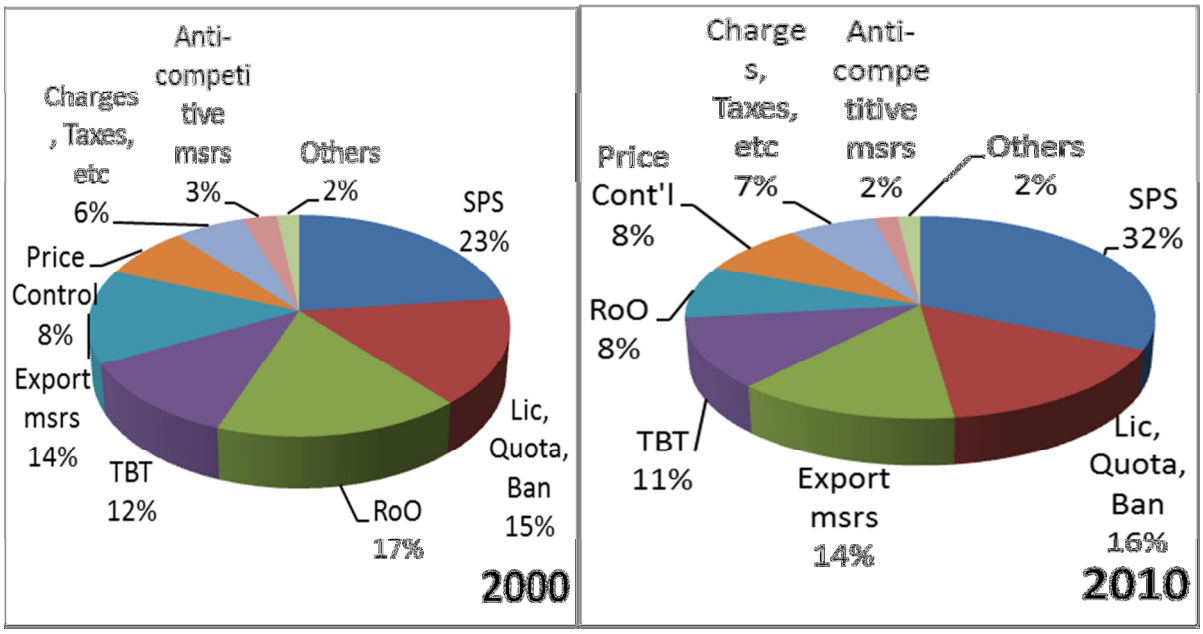


Figure 4.10: Share of SADC NTMs by Category, 2000 and 2010

Source: NTM Database compiled by author, 2012

The growth in SPS use can be seen in Figure 4.10, where their share increased from 23% in 2000 to 32% in 2010. Rules of origin measures have lost half of their share, mainly because they are negotiated at regional level. No country can introduce them unilaterally. The rest of shares of NTM categories remain more or less the same as in 2000.

The application of SPS measures was expected to dominate most NTMs owing to three reasons. First, these are regulations for food safety, animal and plant health protection (WTO, 2010). Therefore, they are expected to be in the majority for agricultural products. The second reason has to do with the fact that their use is allowed by the WTO, as long as it can be justified. Thirdly, when these measures applied, they tend to be accompanied by other procedural requirements, which add another layer of measures. An example of the latter is where an importer introduces a measure and in order for the supplier to comply with the

measure, the exporter may be required to do inspection, ensure traceability, labelling and packing.

Half of the 1400 SPS measures applied in SADC are accounted for by five sub-categories. About 20% of applied SPS in SADC are classified as *systems approach* (Sub-category A130). This sub-category of SPS is applied in a combination of one or two independent SPS measures. For example, to check whether the exporter complies with the requirement, both inspection and testing may need to be done. Some measures may include pre- and post-harvest treatments.

Registration requirements (Sub-category A150) by importers account for 11% of all SPS measures in SADC. This applies to importers of products affected by identified SPS measures. In the registration process, importers may have to comply with certain requirements, provide certain documents and even pay a certain amount in registration fees. Registration may also be required at multiple institutions, i.e. Ministry of Health, Agriculture, Trade and Industry or agencies of such ministries.

Tolerance limits for residues (sub-category A210) and *inspection requirements* (sub-category A840) each account for 10% of SPS measures. UNCTAD (2010) defines tolerance limits for residues as a measure that establishes a maximum residue limit (MRL) or "tolerance limit" for substances in foods and feed, which are used during their production process but are not their intended ingredients. Requirement for product inspection in the importing country may be performed by public or private entities. In some cases it may be similar to testing, but does not include laboratory testing. The other half of SPS measures is contributed by 25 other sub-categories of NTMs.

In summary, the use of SPS measures may have to do with the fact that WTO rules allow them. As long as they do meet the requirements, then members can apply them, and as long as they are also notified to the WTO. Rules of origin and export measures are worrying, as they seem to be contradicting the objectives of SADC. They are supposed to help promote regional trade, but there is no evidence of such outcomes. However, the fact that share of rules of origin declined by half in 2010 may be an encouraging sign that if further appropriate measures are taken to sanction NTMs by regional institutions, as in the case of rules of origin, generally NTMs may start declining. And only those that are necessary should be introduced.

4.6 DESCRIPTIVE STATISTICS

There are various approaches to identifying the importance of trade measures and assessing their effects on international trade. These methods include simple inventory measures, computation of price gaps and estimation of ad valorem equivalents (Gourdon & Nicita, 2012). Since at this stage the purpose is to explain the NTM data collected, the focus will be on the simple inventory measures. The two that are utilised are frequency index and coverage ratio.

The frequency index captures the percentage of products that are affected by one or more NTMs. It considers only the presence or absence of an NTM. From there, one can observe the percentage of products which are affected by one or more NTMs. The frequency index (F) of NTMs imposed by country *j* is calculated using the following formula:

$$F_j = \left[\frac{\sum D_i M_i}{\sum M_i}\right] * 100 \tag{4.7}$$

Where D is the dummy variable reflecting the presence or absence of one or more NTMs on good *i*. M indicates whether there are imports of good *i*, and is also a dummy variable. This measure, Frequency index, does not indicate the relative value of affected products. Therefore, it does not provide any indication of the importance of NTMs on overall imports.

In order for one to get the overall measure of importance of NTMs, the coverage ratio must then be used. The coverage ratio measures the percentage of imports that is subject to one or more NTMs. The calculation for coverage ratio (C_j) is given as follows:

$$C_j = \left[\frac{\sum D_i V_i}{\sum V_i}\right] * 100 \tag{4.8}$$

D is defined the same way as in the Frequency index. V represents the value of imports of product *i*.

The use of NTMs within SADC varies considerably among countriesFigure 4.11 provides a brief summary of frequency indices for the two periods 2000 and 2010. This was for the 240

HS 4-digit agricultural products. As was expected, all SADC applied more NTMs in 2010 than in 2000. Overall, in 2000 a product imported into SADC had 80% probability of being affected by the NTMs.

The utilisation of NTMs by individual countries differs from one to another. Mauritius and Malawi were the two countries that applied the least NTMs. In the year 2000, about 10% of imports into Mauritius were affected by NTMs, while in Malawi it was about 30%. The countries which applied more NTMs were all SACU members, Botswana, Namibia, South Africa and Swaziland. About 53% to 63% of agricultural imports into the SACU area were affected by NTMs.

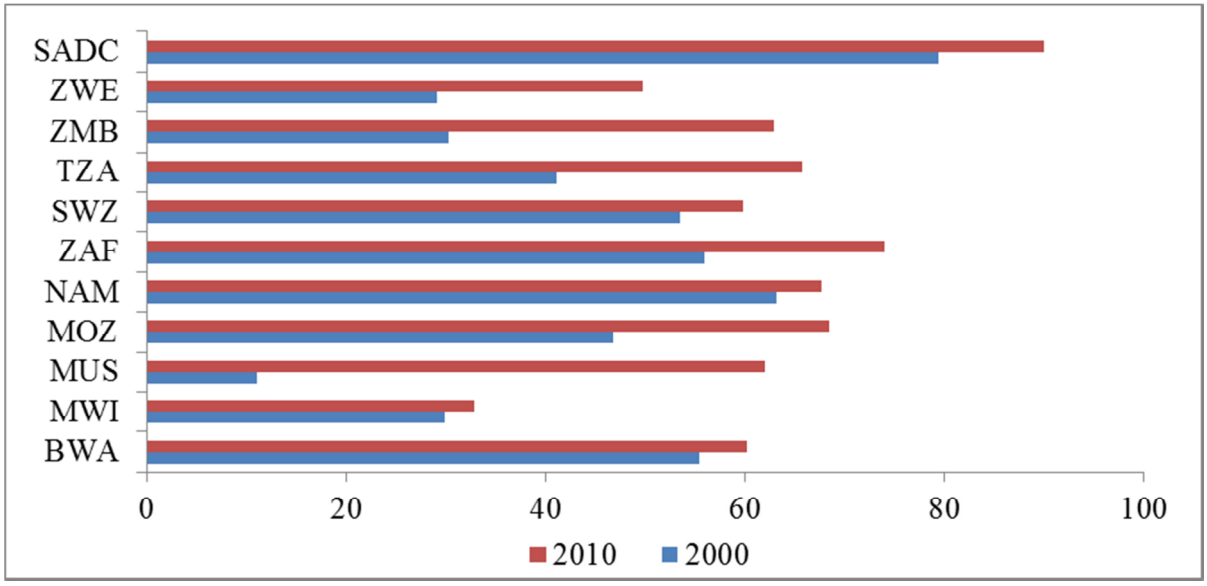


Figure 4.11: Frequency indices for 2000 and 2010, by SADC country

Source: Calculated from author's NTM dataset.

There was an increase in the application of NTMs by SADC countries in 2010, when compared with the year 2000. This is the case for all countries as depicted in Figure 4.11. Only Malawi applied NTMs on less than 50% of agricultural imports. In the rest of SADC countries, NTMs affect more than 50% of imports. The use of NTMs in Namibia, Mozambique and South Africa affect around 70% of all agricultural imports. For SADC overall, the likelihood of an imported product being affected by at least one NTM is 90%.

The summary of percentages of imported products that are affected by at least one NTM is shown by Figure 4.12 for the years 2000 and 2010. Overall, 95% of SADC imports by value

were affected by NTMs in 2000. Mauritius, Zimbabwe and Malawi were the two countries where imports were least affected by NTMs. In Mauritius, only 10% of imports by value were affected by NTMs, in Zimbabwe 34% of imports were affected by NTMs, and 36% in Malawi. Imports into the SACU countries and Mozambique faced more NTMs.

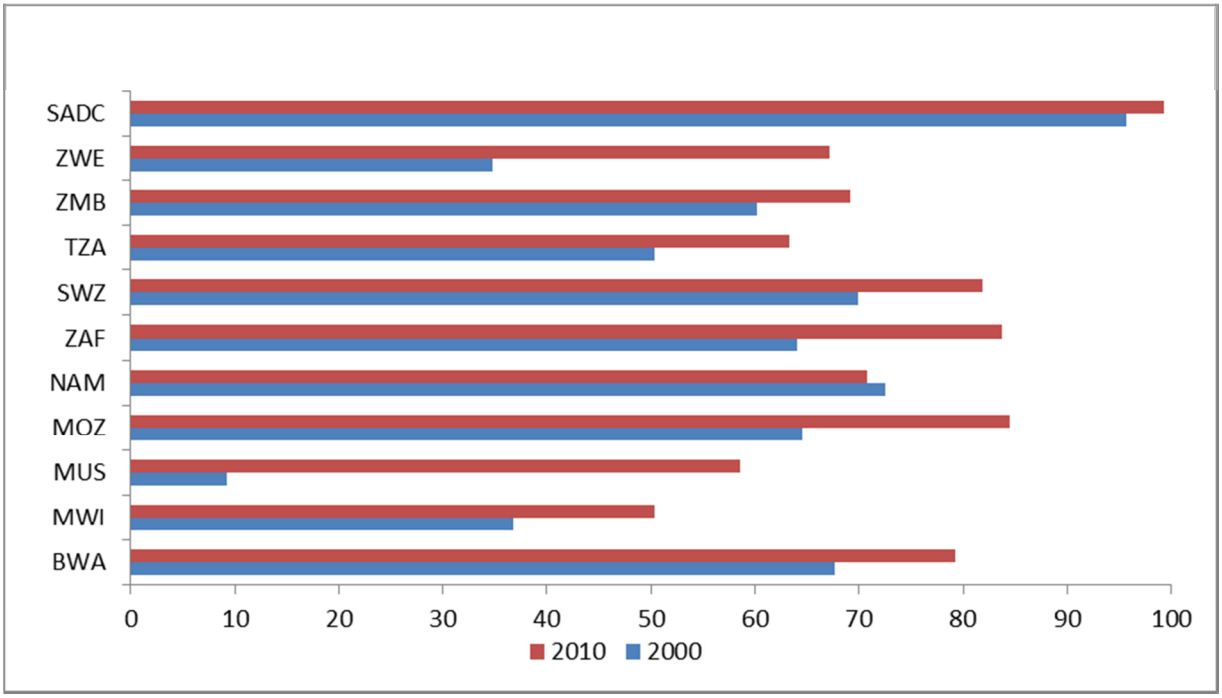


Figure 4.12: Coverage ratios for 2000 and 2010, by SADC country

Source: Calculated from the compiled NTM dataset.

According to the coverage ratio indicator, in 2010 almost all agricultural imports into SADC were affected by NTMs. The ratio is 99% for all SADC imports, implying that high value imports are affected by NTMs. The coverage ratio was higher for all SADC countries in 2010 compared to 2000, meaning that over time more NTM measures were introduced. Malawi had the lowest coverage ratio of 50%, while SACU countries and Mozambique had NTM measures affecting more than 80% of agricultural imports into those countries.

A comparison between coverage ratio and frequency index was done for the year 2010 and the results are shown in Figure 4.13. Mauritius and Tanzania are the only two SADC countries which show a coverage ratio being lower that the frequency index. For all other countries, the coverage ratio more than the frequency index is indicated. This implies that large volumes were traded in products where NTMs are extensively used.

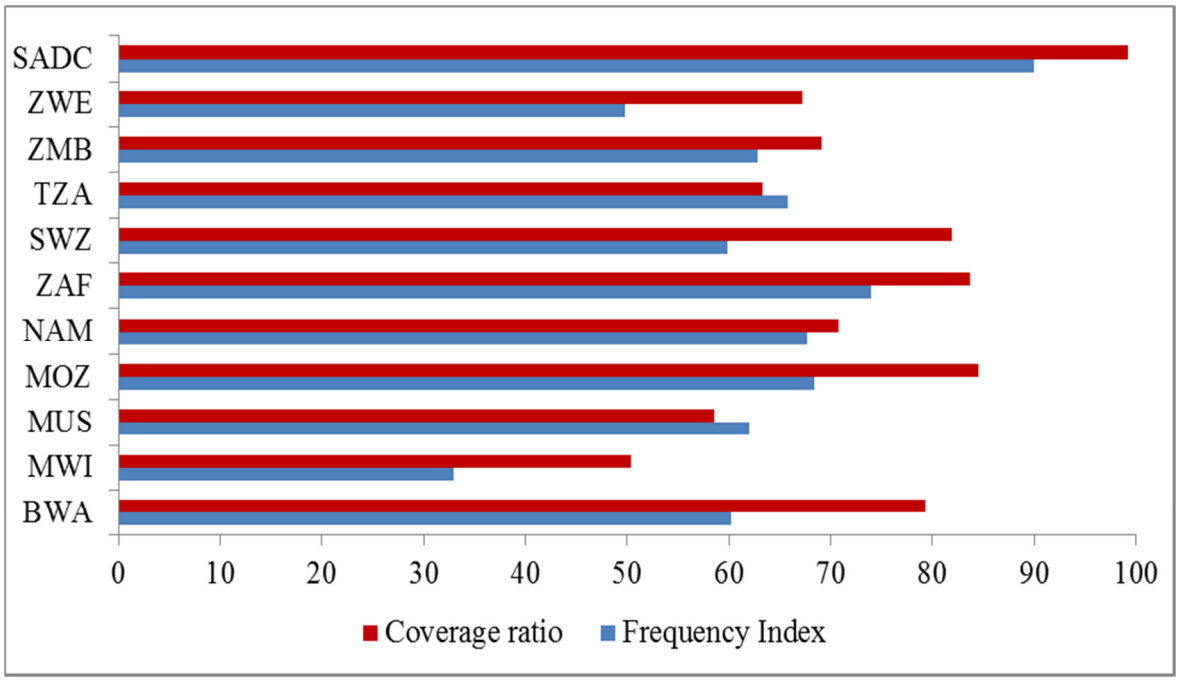


Figure 4.13: Frequency indices and Coverage ratios for 2010, by SADC country

Source: Calculated from the compiled NTM dataset.

The incidence of the use of NTMs depends on the percentage of products or imports affected by NTMs, and the number of NTMs affecting each product. The frequency index and coverage ratio measures do not take into account whether more than one type of NTM is applied on one product. For example, a product may be subjected to an SPS standard, a technical measure on quality and a licencing measure. This would imply high regulation on the affected product. Nevertheless, they still provide an indication of the intent to use these NTMs from the compiled data.

The frequency index and coverage ratios at HS 2-digit level are presented in the tables appearing in Appendix A. At that level, both ratios are very high. The tables are ranked in the ascending order of the last column, coverage ratio for 2010. Most countries have 100% coverage ratio for the top five products. The products that are ranked highest include dairy, meat products, and cereals.

4.7 SUMMARY

Several methods of evaluating NTMs were discussed. They range from simple inventory methods to more complex econometric and general equilibrium types. The price gap method is the one preferred in this study, particularly for the ability to estimate the tariff equivalent

effects. The methods which were used to collect SADC NTM information were also described. In the collection and classification of SADC NTMs, the recent UNCTAD nomenclature was followed, as opposed to the earlier classifications which had some contradictions.

In SADC, the use of NTMs seems to follow the global trend. They have been on the rise over the ten-year period in question. The SPS measures are also the most used in the trade of agricultural products. The two inventory methods (frequency and coverage ratios) were used to evaluate NTMs in SADC for the years 2000 and 2010. There is evidence supporting the argument that NTMs were on the rise in SADC. The ratios are high in the latter period, relative to the earlier periods. Comparison of coverage ratio with frequency index reveals that the coverage ratio is higher than the frequency index. This implies that large volumes were traded in products where NTMs are extensively used. This can also be an indication of extent to which these SADC NTMs are trade restricting.

CHAPTER FIVE

CONCEPTUAL FRAMEWORK AND EMPIRICAL MODEL

5.1 INTRODUCTION

In order to develop a better approach of estimating trade costs, one must first understand how trade flows in the context of regional integration. The first step of regional integration is to create an environment that is favourable to the members, and less so to non-members (WTO, 1994). Then from there, the macroeconomic goals of development and growth are integrated with trade and investment, as those are seen as key pillars joining both trade and macro goals through regional integration.

The conceptual framework was premised on the linear model of regional integration. In the next section, the interaction of macro, sectors and regional integration is discussed in detail, leading to the impacts and feedback mechanism. However, prior to the impacts, there is a process of utilising trade instruments which leads to such impacts. That process is not always understood fully, as some of the elements are seldom quantified.

The conceptual framework links with the econometric model through NTMs and tariffs via their impacts. The econometric model is adapted to isolate tariff and trade costs from all other types of trade costs. Then their effects can be estimated separately, using the Bayesian approach. It has already been mentioned that some of the elements are not observable and quantifiable, and that the Bayesian approach updates knowledge about the unknown and unobservable in a statistical model using those variables that are observed (Congdon, 2010). The sample observation being analysed provides new information about the unknowns. Then the prior density of the unknowns represents accumulated knowledge about them before observing or analysing the data.

5.2 CONCEPTUAL FRAMEWORK

The formation of regional organizations is something new that started with the formation of the WTO. It took place worldwide under different circumstances, formations and for different purposes. In the 1850-1890 periods formal regional cooperation was initially taking shape in Europe (Jackson & Sorensen, 1999). These early organisations were driven by industrialization. After the end of the Second World War, the establishing of numerous regional organizations received a lot of attention. Examples are the North Atlantic Treaty Organization (NATO), the security organization established in 1949 or the economic organization of the European Coal and Steel Community (ECSC) established in 1951 (McCalla, 1969). Especially since the 1960s there has been an upsurge of interest in regionalism encouraged by the deepening of existing regional organizations

In recent formations, countries decide to be part of the regional integration bloc for the purposes of economic development (Appleyard & Field, 1998). It is clearly understood that economic development will happen when there is sustainable economic growth (Aguilar, 1993). In pursuit of economic growth, trade and investment are seen as key contributors. This is mainly through imports and exports, as well as foreign direct investment flows (Salvatore, 2011). However, in order to attract such investment and continue to trade, there is a need for good governance in the countries, as well as the regional institutions. Furthermore, this is also needed to administer and oversee the regional integration activities.

However, integration is not taking place across all **sectors**. Some sectors play a very important role in integration and therefore are prioritised in pursing economic growth through trade and investment (Khandelwal, 2004). Sectors such as agriculture, industry and transportation are central to regional integration (SADC, 2009). At times, regional integration is evaluated on the basis of some of these key sectors. Other sectors, such as services, military, government services and other, hardly feature in the regional integration.

Regional integration is usually implemented in stages, or through what is referred to as a linear integration model (Penson *et al*., 2010). It starts from the point where a country is independent in implementing trade and investment policies. Then it moves from preferential trade agreements (PTAs) to economic and political union, where member countries are completely integrated. A regional trading bloc is a group of countries within a geographical

region that protect themselves from imports from non-members in other geographical regions, and who look to trade more with each other (Salvatore, 2011). The way they protect themselves is by lowering trade barriers between the members, but then maintain them for when they are trading with non-members.

Preferential Trade Area

PTAs exist when countries within a geographical region agree to reduce or eliminate tariff barriers on selected goods imported from other members in the area (Ethier, 2007). This is often the first small step towards the creation of a trading bloc (Appleyard and Field, 1998). Agreements may be made between two countries (bilateral) or several countries (multilateral). It is the least ambitious means of integration (Eaton & Kortum, Technology, Geography and Trade, 2002). Usually, it is used as a first step towards higher levels of integration (WTO, 2012); (Freund & Ornelas, 2010)).

Free Trade Area

Free Trade Areas (FTAs) are created when two or more countries in a region agree to reduce or eliminate barriers to trade on all goods coming from other members. The WTO (1994) stipulates what constitutes an FTA and how long the negotiations should last. Article XXIV of General Agreements on Trade and Tariffs (GATT) specifies that substantially all trade should be free of duties for an FTA to be formed, while negotiations should not take more than a decade ((Levy, 1997); (Ethier, 2007)). Such FTAs also need to be notified to the WTO (Appleyard & Field, 1998). Some of the known FTAs around the world include, SADC, North American Free Trade Area (NAFTA) and European Free Trade Agreement (EFTA).

Customs Union

A customs union involves the removal of tariff barriers between members, plus the acceptance of a common external tariff against non-members (WTO, 1994). However, in some cases countries will have different import quotas and some trade remedies (Ornelas, 2005). The common external tariff implies that members may negotiate as a single bloc with third parties, such as with other trading blocs, or with the WTO (Grossman & Helpman,

1995). Some examples include SACU, East African Community (EAC) and *Mercado Comun del Sur* (MERCOSUR) or Southern Common Markets.

Common Market

A *common market* is the first significant step towards full economic integration (Ethier, 2007). The integration moves further from simple trade in goods, and free services trade and free movement of people and capital are part of the agreement (Estevadeordal, Freund, & Ornelas, 2008). This means that barriers to trade in goods, services, capital, and labour are removed (Khandelwal, 2004; (Egger & Larch, Interdependent Preferential Trade Agreement Memberships: an Empirical Analysis., 2008)). In addition, as well as removing tariffs, non-tariff barriers are also reduced and eliminated.

Key characteristics are the common establishment of trade liberalisation programmes, common external tariffs, coordination of macroeconomic policy and adaptation of some sectoral agreements (Salvatore, 2011). For a common market to be successful there must also be harmonisation at the level of micro-economic policies, and common rules regarding competition practices. The European Union is the best-known example implementing this higher form of regional integration.

Monetary Union

Monetary union is the first major step towards macro-economic integration, and enables economies to converge even more closely (WTO, 1994). Monetary union involves abandoning multiple currencies and adopting a single, shared currency. This means that there is a common exchange rate, a common monetary policy, including interest rates and the regulation of the quantity of money, and a single central bank. The EU is the prime example of having achieved this level of integration. Even in this case, not all EU 27 members have adopted the Euro as their currency.

In SACU there exists what is called the common monetary area. The South African currency, the Rand, serves as an anchor currency. Botswana is the only member of SACU that does not participate in the common monetary area (Patroba & Nene, 2013). Other regional integration groups considering Monetary union include MERCOSUR, Andean Community and Central American Common Markets community.

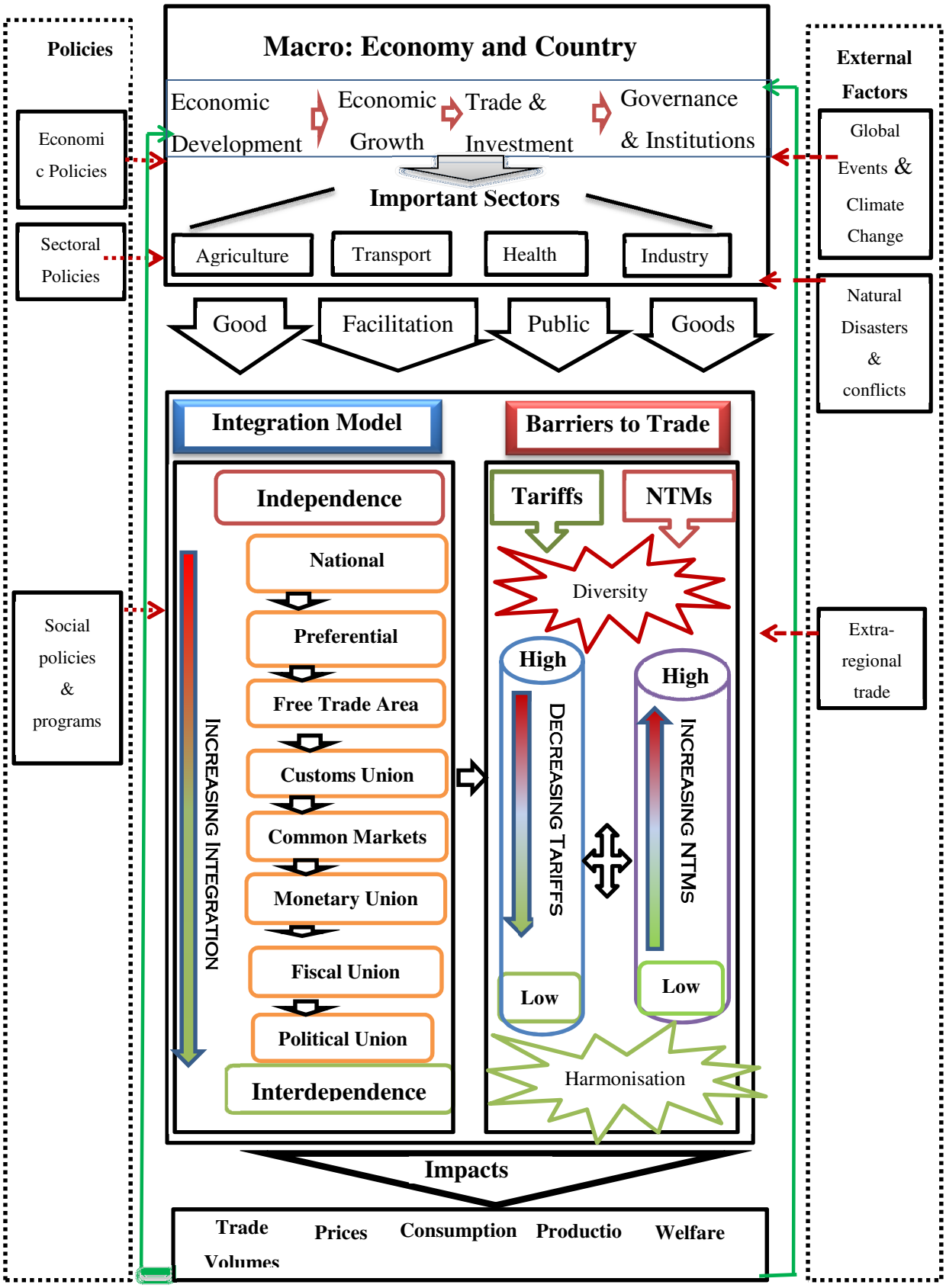


Figure 5.1: Integration and trade policy instruments framework

Fiscal Union

A fiscal union is an agreement to harmonise tax rates, to establish common levels of public sector spending and borrowing, and to jointly agree national budget deficits or surpluses (Salvatore, 2011). The majority of EU states agreed a fiscal compact in recent years, which is a less binding version of a full fiscal union (Levchenko, 2007). The challenge with full fiscal union is the inability to react to shocks that are not experienced by all the members of a union (Mooslechner, 2013).

Political Union

Fiscal and Monetary Union are key stages towards compete integration (Appleyard & Field, 1998). They involve a single economic market, a common trade policy, a single currency and a common monetary policy (Aguilar, 1993). The term "economic union" is usually applied to a trading bloc that has both a common market between members, and a common trade policy towards non-members, but where members are free to pursue independent macro-economic policies (Levchenko, 2007).

The presence of an economic union is a stage towards complete economic integration (Grossman & Helpman, 1995). It involves a single economic market, a common trade policy, a single currency, and a common monetary policy, together with a single fiscal policy, tax and benefit rates (Ethier, 2007). In short, it is a complete harmonisation of all policies, rates, and economic trade rules. Once that stage has been reached, then a political union can be formed with a single leader as the head of the union (Freund & Ornelas, 2010). Such a union, however, is more aspirational than realistic.

Overall, as countries or members move through the stages of integration, they move away from sovereignty or dependence towards interdependence with other nations. With that process, the power for an individual country to make certain decisions or influence policy diminishes as the country integrates further or deeper (Oguledo & Macphee, 1994). Such powers are ceded to supra-national institutions, such as the Secretariat, inter-government parliament or central bank.

Trade barriers

Reducing and eliminating **trade barriers** is the main activity in the process of moving through stages of integration (Viner, 1950). It is almost the single most important activity in the early stages of integration, at least up to the customs union stage (WTO, 1994). Because of the focus of trade is on goods, and less on services and investments, these activities are mainly related to tariffs and NTMs. Emphasis becomes focused on reducing the tariff barriers, and is guided by Article XXIV of the GATT (WTO, 1994). The tariffs have largely declined over time, following from the completion of the Uruguay Round and also because more countries have acceded to the WTO, other integration groups, bilateral agreements and multilateral arrangements.

As for **NTMs**, there is sufficient literature showing that they have been on the increase. As countries join other integration groups, they adopt new rules and regulations (Bacchetta, Richtering, & Santana, 2012). Other factors contributing to NTMs, particularly in the agricultural sector, have to do with the issues around food safety, health measures, new diseases or other risks being discovered (World Bank, 2010). There are other reasons which are based on the need to maintain competitiveness, to replace the declining tariffs, and the general bureaucratic nature of the way governments operate (Cadot & Malouche, 2012).

Early stages of integration are also characterised by **diverse** types of trade barriers (Ethier, 2007). In the cases of tariff barriers, when tariffs are high, there will be different tariff rates and formulas within members. As they integrate deeper and reduce tariffs further to lower levels, then the tariffs schedules of respective members will start to converge or **harmonise** (van Grasstek, 2013)**.** When they reach the customs union stage, there will be full harmonisation of tariffs, as all members will have a common external tariff.

The move from diversity to harmonisation in the case of NTMs is slightly different to tariffs (Lloyd, 1996). Harmonisation is achieved by adopting and implementing similar standards, regulations and policies. Therefore, the high or low incidences are not necessarily indicators of harmonisation or diversity (Demaria, Rau, & Schlueter, 2011). Nevertheless, the fewer regulations and standards between members, the easier it becomes to move to common standards, relative to when there are many standards.

The way an integration bloc deals with various trade barriers and shifts from diversity to harmonisation leads to various **impacts** on trade volumes, prices, consumption, production and welfare (Ornelas, 2005). For example, low tariff levels, ceteris paribus, are expected to result in higher trade volumes, compared to the period prior to reducing such tariffs. The prices in the importing market are also expected to be lower than before liberalisation, as tariffs were adding extra burden (Estevadeordal, Freund, & Ornelas, 2008) (Deardorff & Stern, 1998). Then, low prices should lead to high consumption levels, which will encourage production from the exporting country. Welfare will thus be enhanced in both the importing and exporting countries owing to high consumption, and higher production in the respective markets (Helpman, Melitz, & Rubinstein, 2008).

Such impacts will provide some feedback to the sectoral macro-levels for further responses. Such responses may be through **policy interventions** to deal with the changing environment in the market (Grossman & Helpman, 1995). Some policies may also be implemented in such a way that they react directly to the integration process. There are also **external factors** which may enhance or complicate the integration process (van Grasstek, 2013). Examples include global recession, natural disasters, political instability or relations of some members with non-members.

In this study, components of trade policies and trade barriers are examined in the context of regional integration and policy making. The regional integration model is usually driven by the *political process*, such as decision taken by Heads of States or Ministers of Trade Industry. However, policies that should make the integration model beneficial to national government goals need to be designed and implemented by *policy makers*. Policy makers and analysts must find a combination of trade policies, particularly with regard to NTMs and tariffs, the fits the national government goals and regional integration model.

Such combination of various NTMs and tariffs, as well as how they are applied, eventually has some impact on intra-regional trade shares. And the outcome of such combinations, as well as the resulting trade volumes, provides some feedback into the economic policies. Therefore, if the combination of trade policies that leads to preferred outcomes is understood, then such policies will be implemented. If the outcomes of such policies are desired in terms of trade flows and welfare, then countries will continue to implement them. If the results are not desirable, then an improvement in policies, either formulation or implementation will be

required. This implies that the sectoral policies, macroeconomic and the integration model will be reviewed, and thus, the cycle starts again.

5.3 INTEGRATING NTMS INTO THE GRAVITY MODEL

The gravity model has been known for many decades since the seminal work of Tinbergen (1962). The model was based on Newton's law of universal gravitation which states that planets are mutually attracted in proportion to their sizes and proximity. In the same way, Tinbergen (1962) proposed that countries trade in proportion to their respective GDPs (size) and proximity. Over time, the popularity of gravity models in empirical applications has been defined by its extensive application to different fields of enquiry, such as migration flows, recreational traffic, commuting, tourism, and interregional and international trade of commodities (Bergstrand, 1985; Oguledo & Macphee, 1994).

In principle, the gravity equation has been successfully used as a baseline in many empirical studies on quantifying international trade flows since its inception by Linnemann in 1966 (Egger, 2002; Evenett & Hutchinson, 2002; Cheng & Wall, 2005). In the context of international trade flows, the economic size of a trading partner (its GDP) is an important determinant of bilateral trade. Other factors that may serve as stimulating or restraining forces related to the trade flows between the two countries include contiguity, distance, and whether countries have similar or different historical, traditional, cultural or regions values (Helmers & Pasteel, 2005)).

In the general form, gravity equation is multiplicative:

$$X_{ij} = GS_i M_j \phi_{ij} \tag{5.1}$$

Where X_{ij} is the value of exports from country i to country j. G represents a variable that does not depend on either i or j, such as global events, or international trade regulations. S_i comprises exporter specific factors. M_j denotes importer-specific factors that make up importer demand, such as national income. Lastly, ϕ_{ij} represents the ease or difficulty of exporter i access to the market j.

Earlier criticism of the gravity model was that it is just an econometric tool without theoretical grounding. Bergstrand (1985) and (1989)) in his early work showed a direct link with monopolistic competition. Eaton and Kortum (2002) derived the gravity equation from the Ricardian model, while Helpman *et al*. (2008) and Chaney (2008) obtained it from the theoretical foundation of international trade in differentiated goods with firm heterogeneity.

The recent work of the gravity model and trade research has continued to highlight the importance of deriving specifications and variables used in the model. Anderson and van Wincoop (2003) showed that, by controlling for the relative trade costs, one can observe the propensity of country *j* to import from country *i*. They argued that bilateral trade is determined by *j*'s trade costs towards *i,* relative to *i*'s overall *resistance* to imports and to the average resistance facing exporters in *i*. In other words, bilateral trade is not only determined by the absolute trade costs between the two countries.

The standard gravity model is estimated in log-linear format, given that equation 5.1 above is multiplicative. The multiplicative form comes from the original analogy of the gravity equation (Head & Mayer, 2014). However, linear demand systems and translog forms have been used ((Ottavio, Tabuchi, & Thisse, 2002); (Feenstra, 2003); and (Novy, 2013). This then results in the equation:

$$lnX_{ij} = lnG + lnS_i + lnM_j + ln\phi_{ij} \tag{5.2}$$

Several variables are used to capture trade costs (ϕ_{ij}). Many empirical studies use bilateral distance as a proxy of trade costs (Gebrihiwet, Ngqangweni & Kirsten, 2007; Haq *et al*., 2011; Eaton & Kortum, 2002; Linders & de Groot, 2006; Raballand, 2003). Other variables are also considered and used together with the bilateral distance, such as dummies for islands, landlocked countries and common borders. Dummies for common language, adjacency or other cultural features are used to capture information costs. The problem with estimation of equation 5.4 above is that the multilateral resistance terms are not observable. However, where some parts of the multilateral resistance terms are observable, it is better to estimate those attributes separately from the unobserved. By adapting the gravity using the threshold model, the effects of observed official NTMs can then be estimated.

5.3.1 Adapting the gravity equation to a basic threshold model

In the previous section, the gravity equation was explained, and how it is used to estimate various trade costs. This section explains how the threshold is explained and integrated into the gravity equation. Now the key focus is to use that gravity equation to adapt it to the Bayesian approach. In doing so, the NTM trade costs are also isolated from all the other trade costs. Then, the impacts of NTMs in SADC can be estimated for various agricultural products with a threshold.

The model used was fit using the Markov Chain Monte Carlo (MCMC) methods of the latent threshold family. For estimation of the latent threshold model, an MCMC algorithm is developed by extending standard analytical and MCMC methods for the dynamic regression model to incorporate the latent threshold structure (Nakajima, 2012). The model and associated MCMC algorithm deals with the presence zero sufficiently (Abidoye, Herriges, & Tobias, Controlling for Observed and Unobserved Site Characteristics in RUM Models of Recreation Demand, 2012). It also permits a non-parametric specification of the NTM variable. Furthermore it allows for the inclusion of country-specific effects within the threshold tobit framework.

The gravity model used is adapted from equation 5.23 above and extended to the latent threshold model similarly to Ranjan and Tobias (2007) and Eaton and Tamura (1994). Eaton and Tamura modelled, T_{ijk}, bilateral trade between countries i and j in product type k as follows:

$$\mathrm{Ln}\left(T^{*}_{ijk}+\tau_k\right)=\alpha_k+\beta_k\ln(GDP_i)+\beta_k\ln\left(GDP_j\right)+z_{ij}\vartheta_k+\varepsilon_{ijk},\ \varepsilon_{ijk}\sim N(0,\sigma^2) \qquad (5.3)$$

Where:

$$T_{ijk}=\begin{cases} T^{*}_{ijk}\ if\ T^{*}_{ijk}>0 \\ 0\ if-\tau_k<T^{*}_{ijk}\leq 0 \end{cases} \qquad (5.4)$$

In the above, GDP_i and GDP_j are as described earlier, i.e. gross domestic products of countries i and j, and z_{ij} denotes vector of other characteristics that vary across i and j. These

would include distance, language, border and colony. ϕ_{ij} from Equation 5.1 above is replaced by the variable z_{ij}. All other parameters of the model are allowed to vary across the type of good, *k*.

τ_k is the threshold parameter, as defined and discussed in chapter 1. When $\tau_k = 0$, then the framework is a standard Tobit model. However, given that the model is in log format, the log of zero or negative number will present problems. And if τ_k is greater than zero, the model will then use the observed trade values, T_{ijk}.

The economic meaning of τ_k is that it represents desired amount of bilateral trade (Ranjan & Tobias, 2007). It may also be considered to be the amount of trade that is lost in transit or eroded ((Head & Mayer, 2014); (Melitz, 2003)). When trade is quantified in value terms, the threshold represents potential trade that could be lost due to high trade costs, and thus renders trade uneconomical and unprofitable. If the threshold is too high, countries may not trade, even if they produce tradable goods. Therefore in the model, the preferred trade is not zero, as it will not make any economic sense. All SADC countries are assumed to have some level of preferred agricultural trade. And, if this amount of desired trade is very small, then trade will not take place.

Ranjan and Tobias (2007) formulated this threshold bilateral trade between country *i* and *j* in good *k* as, $W^*_{ijk} \equiv T^*_{ijk} + \tau_k$. Now equations 5.3 above and 5.4 above can be written as follows:

$$Ln(W^*_{ijk}) = \alpha_k + \beta_k lnGDP_i + \beta_k lnGDP_j + z_{ij}\vartheta_k + \varepsilon_{ijk} \tag{5.5}$$

Where:

$$T_{ijk} = \begin{cases} W^*_{ijk} - \tau_k \; if \; W^*_{ijk} > \tau_k \\ 0 \; if 0 < W^*_{ijk} \leq \tau_k \end{cases} \tag{5.6}$$

In this formulation, the actual observed trade, T_{ijk}, is equal to zero if the preferred trade falls below the threshold $\boldsymbol{\tau_k}$. It is then equal to $W^*_{ijk} - \tau_k$ if desired trade exceeds threshold. Therefore, trade will take place if desired trade exceeds the amount that will be lost. And that

trade will be equal to W^{*}_{ijk} -τ_k. As it was explained in the theoretical implications of the threshold, trade will not occur if the amount of trade is less than the amount that will be lost.

5.3.2 Country effects

In the previous section, a threshold was integrated into the gravity equation. Now the gravity equation is transformed to derive the country effects. The general gravity equation, such as the one in equation 5.3 above, can be transformed as follows:

$$\log(T^{*}_{ijk} + \tau_k) = \alpha_k + \gamma^k_i + \gamma^k_j + z_{ij}\vartheta_k + \varepsilon_{ijk} \quad (5.7)$$

Where γ^k_i denotes specific effect for country *i* in good *k*, and similarly for γ^k_j with respect to country *j*. Then, equation 5.7 above can be further reduced to Equation 5.3 above to $\gamma^k_c = \frac{\alpha_k}{2} + \beta_k \ln(GDP_c)$, where c = 1,2,…, C. C is the total number of countries in the sample. In this way, bilateral country effects can be added to the regression model. There are also specific-country effects which affect bilateral trade which form part of the multilateral resistance terms discussed earlier. The multilateral resistance was used and estimated in other studies by Anderson & van Wincoop (2003); Dean, Feinberg, and Ferrantino (2005); and Kee, Nicita, and Ollareaga, (2009). So, there is motivation to include the country-level parameters γ_i and γ_j. The country effects are included by combining equation 5.3 above and 5.7 above, as follows:

$$\gamma^k_c = w_c\pi^k + u^k_c, \text{ c= 1,2,…….C, } u^k_c \sim N(0, \sigma^2_{\gamma_k}) \quad (5.8)$$

Where w_c represents a set of country characteristics, such as GDP, and other covariates, such as NTMs, distance and border. π^k is the incorporation of the country-level parameters γ_i and γ_j. u^k_c is a random error, which also allows the equation to generate country effects and to permit correlation patterns of trade volumes within countries. The parameter $\boldsymbol{\sigma^2_{\gamma_k}}$ is estimated within the model. It characterises the extent of variations between countries.

So, adding NTMs to equation 5.5 above leads to:

$$\gamma_c^k = \pi_1{}^k \log(GDP_c) + \pi_2{}^k (NTM_c) + u_c^k \tag{5.9}$$

5.3.3 Joint posterior distribution

In order to facilitate computation, data is transformed to augment the parameter space with latent data T^*_{ijk}. These parameters are assumed to be independent across types of products *k a priori* (Koop & Poirier, 2004). Now, a separate estimation can be used for each type of good and the subscript *k* can be dropped, since a separate analysis for each type of product is to be conducted.

Let $\lambda = [\gamma\ \theta\ \sigma_\varepsilon{}^2\ \sigma_\gamma^2\ \pi\ \tau]$ denote the parameters of the model. The joint posterior distribution of λ and the latent T^*_{ijk} defines the augmented, posterior density for the parameters in the model (Abidoye, Herriges, & Tobias, Controlling for Observe and Unobserved Site Characteristics in RUM Models of Recreation Demand, 2012). By Bayes Theorem the posterior density is obtained as:

$$p(\{T^*\}, \lambda | T) \tag{5.10}$$

Where T^* denotes the vector of latent trade values T^*_{ij} stacked over countries and it is defined the same way. The joint posterior in equation 5.9 above can be written as:

$$\begin{aligned} &p(\{T^*\}, \lambda | T) \propto p(T^*, T\lambda) p(\lambda) \\ &= p(TT^*, \lambda) p(T^*\lambda) p(\lambda) \\ &= p(\lambda) \prod_{i,j=1}^{n} \left(\left[I\left(T_{i,j} = T_{ij}^*\right) I\left(T_{ij}^* > 0\right) + I\left(T_{ij} = 0\right) I\left(-\tau < T_{ij}^* \leq 0\right) \right] p\left(T_{ij}^* \lambda\right) \right) \end{aligned}$$

With I(.) denoting the standard indicator function. The conditional density $p(T_{ij}^*\lambda)$ follows from a change of variable ε_{ij} to T^*_{ij} in $\log\left(T_{ijk}^* + \tau_k\right) = \alpha_k + \gamma_i^k + \gamma_j^k + z_{ij}\vartheta_k + \varepsilon_{ijk}$ equation 5.7 above. This produces:

$$p(T_{ij}^* | \lambda) \propto \frac{1}{T_{ij}^* + \tau} \exp\left(-\frac{1}{2\sigma_\varepsilon^2} \left[\ln\left(T_{ij}^* + \tau\right) - \gamma_i - \gamma_j - z_{ij}\theta\right]^2\right), T_{ij}^* > -\tau \tag{5.11}$$

The form of equation 5.11 above presents a challenge in that it is a conditional density. So, it is *reparameterised* to a traditional form, and computationally it is easier to work with. It is easier to work with $V_{ij}^* \equiv \ln(T_{ij}^* + \tau)$ rather than T^*_{ij}. Since the Jacobian of the transformation is just $exp(V^*_{ij})$, it follows that:

$$p(V^*, \lambda|T) \propto \prod_{i,j=1}^{n}([I|T_{ij} = \exp(V_{ij}^*) - \tau)I(V_{ij}^* > \ln(\tau) + I(T_{ij} = 0)I[V_{ij}^* \leq \ln(\tau)]] * \phi(V_{ij}^*; \gamma_i + \gamma_j + z_{ij}\theta, \sigma_\varepsilon^2))p(\lambda). \quad (5.12)$$

To complete the model, we specify the priors for the remaining parameters. The prior $p(\lambda)$, is specified as follows:

$$\theta \sim N(\mu_\theta, V_\theta)$$
$$\sigma_\varepsilon^2 \sim IG(a_1, a_2)$$
$$\sigma_\gamma^2 \sim IG(b_1, b_2)$$
$$\tau \sim p(\tau).$$

The notation N refers to the normal distribution. $IG(.,.)$ represents the inverse gamma distribution and is parameterised as in (Koop, Poirier and Tobias (2007.). These priors combine to yield a conditional posterior distributions that are easily recognised and sampled.

5.3.4 Posterior simulator

So far, the posterior conditions of the model have been derived and reported in the previous section. Next, it is proceeded to fit the model using the Gibbs sampler. This is because the joint posterior distributions take unrecognisable forms, and thus make them difficult to draw from. So the Gibbs sampler draws from the conditional posterior distributions for individual blocks or partitions of the parameter space because often they fall within well-known distributional families (Abidoye, 2010). Drawing from posterior conditional distribution sequentially effectively leads to drawing from joint posterior distribution of interest (Ranjan & Tobias, 2007).There are risks of autocorrelation problems in the simulation, so several blocking steps are required. All the posterior elements of Equation 5.12 above are denoted as $\Gamma = [\lambda V^*]$, and Γ_{-x} represents all elements of Γ other than x. The blocking is described in the following six steps:

Step 1: $\tau, V^*, \Gamma_{-\tau}, v^*, T$

The previous work in this area (Koop & Poirier, 2004) shows high degrees of autocorrelation between the latent data V^* and the threshold parameter τ. In this case, these elements are grouped together into a single block using method of composition (Abidoye, 2010). This blocking can be written as:

$$p(\tau, V^*|\Gamma_{-\tau}, v^*, T) = p(\tau, V^*|\Gamma_{-\tau}, v^*, T)p(V^*|\Gamma_{-v^*}, T)$$

The first density on the right hand side of the equation is proportional to the standard Tobit likelihood $p(T, |\Gamma_{-V^*})$, times the prior $p(\tau)$. Thus,

$$p(\tau, V^*|\Gamma_{-\tau}, v^*, T) \propto \prod_{i,j:T_{ij}=0} \Phi\left(\frac{\ln(\tau)-\gamma_i-\gamma_j-z_{ij,\theta}}{\sigma_\varepsilon}\right) * \prod_{i,j:T_{ij}>0} \frac{1}{T_{ij}+\tau} \exp\left(\frac{1}{2\sigma_\varepsilon^2}[\ln(\tau) - \gamma_i - \gamma_j - z_{ij}, \theta]^2\right) \quad (5.13)$$

The distribution is not a standard form. However, since τ is a scalar, $p(\tau)$ is employed to be uniform over the discrete set of support points. The posterior conditional for V^* is obtained as follows:

$$p(V_{ij}^*|\Gamma_{-V_{ij}^*}, T) \sim \begin{cases} TN_{(-\infty,\ln(\tau))}(\gamma_i - \gamma_j - z_{ij,}\theta, \sigma_\varepsilon^2) & if\ T_{ij} = 0 \\ \ln(T_{ij} + \tau) & if\ T_{ij} > 0 \end{cases} \quad (5.14)$$

From equation 5.13 above, $TN_{(a,b)}(\mu, \sigma^2)$ is a normal density with mean μ and variance σ^2 (Nakajima, 2012).The density has been truncated to the interval *(a,b)*. The conditional density in equation 5.16 above follows a standard Tobit model where the latent data is drawn from and filled in when no trade data occurs, i.e. $T_{ij} = 0$. When trade occurs, $V_{ij}^*$is known. So, the posterior conditional $p(\tau, V^*|\Gamma_{-\tau}, v^*, T)$ is drawn from equation 5.9 and independently from equation 5.14 above.

Step 2: $\gamma, \theta|\Gamma_{-\gamma,\theta,}T$

For the second blocking,

$$V_{ij}^{*} = \gamma_i + \gamma_j + z_{ij}\theta + \varepsilon_{ij}$$
$$= d_{ij}\gamma + z_{ij}\theta + \varepsilon_{ij}$$
$$= \bar{z}_{ij}\bar{\theta} + \varepsilon_{ij}$$

Where $\bar{z}_{ij} = [d_{ij} z_{ij}]$ and $\overline{\theta} = [\gamma' \theta']$

So, d_{ij} is a 1 x C vector containing two ones in the position of *ith* and *jth* countries and zeros everywhere else. From this notation, it follows that:

$$\overline{\theta} | \Gamma_{-\theta,\gamma}, T \sim N(Dd, D) \tag{5.15}$$

Where: $D = \left(\frac{\overline{Z}'\overline{Z}}{\sigma_\varepsilon^2} + V_{\overline{\theta}}^{-1}\right)^{-1}$, $d = \frac{\overline{Z}' V^{*}}{\sigma_\varepsilon^2} + V_{\overline{\theta}}^{-1}\mu_{\overline{\theta}}$

$\overline{Z}$ represents the matrix derived from stacking $\overline{z}_{ij}$ over *(i,j)*, and V^{*} is also derived from stacking V^{*}_{ij} such that:

$$V_{\overline{\theta}} \equiv \begin{bmatrix} \sigma_\gamma^2 I_c & 0 \\ 0 & V_\theta \end{bmatrix}, \mu_{\overline{\theta}} = \begin{bmatrix} W_\pi \\ 0 \end{bmatrix}$$

Where: $W_\pi = [logGDP\ I_c]$.

Step 3: $\sigma_\varepsilon^2 | \Gamma_{-\sigma_\varepsilon^2}, T$

$$\sigma_\varepsilon^2 \Gamma_{-\sigma_\varepsilon^2}, T \sim IG\left[\frac{n}{2} + a_1\left(a_2^{-1} + 0.5\sum_{i,j}(V_{ij}^{*} - \gamma_i - \gamma_j - z_{ij}\theta)^2\right)^{-1}\right] \tag{5.16}$$

Where *n* is the total size.

Step 4: $\pi | \Gamma_{-\pi}, T$

$$\pi | \Gamma_{-\pi}, T \sim N(D_\pi d_\pi, D_\pi) \tag{5.17}$$

Where: $D_\pi = (\frac{W'W}{\sigma_\gamma^2} + V_\pi \quad ^{-1})^{-1},\ d_\pi = W'\gamma/\sigma_\gamma^2$

Where π is the parameter on GDP and NTM, while W denotes the two variables stacked for each country.

Step 5: $\sigma_\gamma^2|\Gamma_{-\sigma_\gamma^2}$,T

$$\sigma_\gamma^2\Gamma_{-\sigma_\gamma^2}, \mathrm{T} \sim IG\left[\frac{c}{2} + b_1 + 0.5(\gamma - W_\pi)'(\gamma - W_\pi))^{-1}\right] \quad (5.18)$$

The posterior simulator involves iterative drawing from equations 5.13 above to 5.18 above.

Finally, it is important to conduct a test concerning the role of NTMs on intra-SADC trade. It is useful to find out whether the NTMs are important determinants of intra-SADC trade of agricultural products. The results of such tests are the mainstay of the next chapter.

5.4 ESTIMATION TESTING

The algorithm described in Sections 5.3.3 and 5.3.4 have been used to run the posterior simulator for 100 000 iterations discarding the first 10 000 of these as the burn-in. Results from these runs suggest that the chain mixes reasonably well and appears to converge within a few hundred iterations.

Although the point estimates are suggestive of good performance, any MCMC-based inference can be affected by the degree of correlation among the parameter draws over sequential iterations. We present diagnostics test for our sampler including the *numerical standard errors* (NSE), inefficiency factors and convergence diagnostics (Geweke, 1992). The Monte Carlo standard error (*numerical standard errors*) indicates the variation that can be expected in the moments of the MCMC estimates if the simulation were to be repeated. The mean estimates can be obtained as:

$$NSE(\bar{\vartheta}_m) = \sqrt{\frac{\sigma^2}{m}}\sqrt{1 + 2\sum_{j=1}^{m-1}\left(1 - \frac{j}{m}\right)\rho_j}, \quad (5.19)$$

Where ϑ represents an arbitrary scalar parameter of interest, m denotes the number of post-convergence simulations, $\bar{\vartheta}_m$ represents our estimate of $E(\vartheta|y)$ as the sample average of our post-convergence draws, ρ_j represents the correlation between simulations j periods (iterations) apart and $\sigma^2 \equiv Var(\vartheta|y)$.

This is related to the effective sample size metric that gives the size of an independent sample giving the same numerical variance as the MCMC sample (Koop, Poirier, & Tobias, 2007). A high degree of correlation will lead to a slow mixing that may prevent exploring all areas of the posterior as needed. These *inefficiency factors* can be calculated by using the definition of the *numerical standard errors* (NSE) of a Monte Carlo estimate with correlated draws.

5.5 CHAPTER SUMMARY

Regional integration is a complex, inter-government-driven process which is implemented as if the goals are easy to achieve. Most regional integration blocs followed a linear model of starting from a basic tariff reduction and progressing to a more complex and interdepending country block. However, many blocs have not progressed beyond the customs union stage.

In the conceptual framework, the key component of the process is in the mix of barriers to trade, which is where most of the instruments of integration are situated. The mix of such instruments, mainly tariffs and NTMs, is crucial in determining the outcomes of integration. If the mix is trade enhancing, it results with trade outcomes that enhance attainment of integration objectives. The feedback mechanism also stimulates the policies and strategies that are responsive to the process of integration.

That mix of policies in the framework was integrated with the foundations of the gravity model. This was to develop a mathematical model that will help to estimate the impacts of trade instruments. Then, the transformation from the basic gravity model to the threshold was derived in detail to isolate the trade costs attributable to NTMs from other types of trade costs. The parameter that determines the desired trade levels was explained. The parametric components of the model, together with the priors, were explained. The posterior distribution and simulator were explained in order to support the methodology to evaluate how regulatory framework in the form of NTMs explains the trade volumes of agricultural products.

CHAPTER SIX

ARE NTMS RESPONSIBLE FOR SLOW REGIONAL INTEGRATION IN SADC?

6.1 INTRODUCTION

The results of the threshold gravity model that was integrated into the Bayesian approach are discussed to determine whether NTMs have impact on intra-SADC trade. Six equations were estimated for each group of products following equation 5.9 in the previous chapter and the subsequent variable transformations. For each product group, two models were tested for the impacts, i.e. RT NTMs and PM NTMs, as explained in equations 4.3 and 4.4 from Chapter 4, respectively. For each model, three types of NTMs were tested as to whether different types of NTMs influence intra-SADC trade. The estimation procedure is illustrated in Figure 6.1.

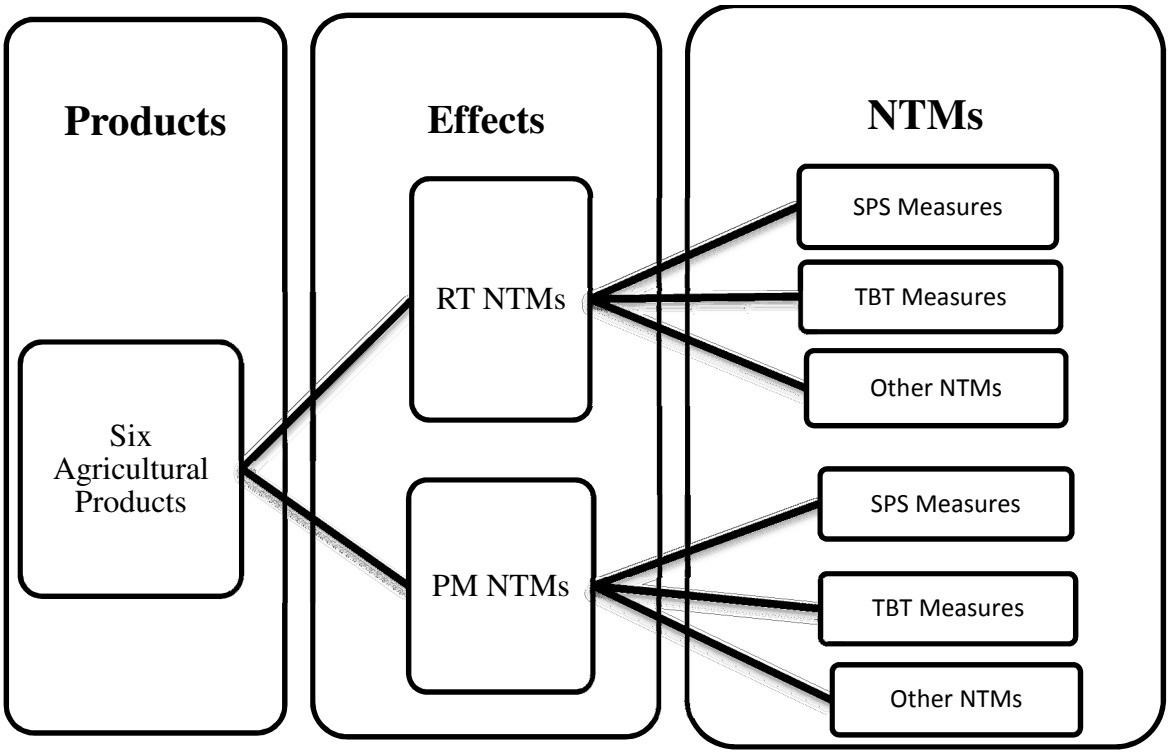


Figure 6.1: Breakdown of agricultural products estimation procedure

The next section explains the estimation results for the RT NTMs effects. Then section 6.3 elaborates on the estimation results the PM NTMs. Section 6.4 provides additional expiations as well as determinants with regard to the results, and the last section summarises the whole chapter.

6.2 ESTIMATION OF REGIONAL TRADE ON NTMS

The estimated results of the model involving only the SPS measures are shown in **Error! Reference source not found.** The dependent variable in all six equations was the log of bilateral trade for the ten SADC countries over the eleven-year period from 2000 to 2010. The explanatory variables include language, border, log of distance, NTMs and log of GDP. In addition, the results of the latent variable, as well as the variances of the residual and country-specific intercept, are shown in the table. The coefficients as well as the probability of a positive distribution, given a set data are reported in the table. Those variables that have a probability of at least 90% are bolded.

Table 6.1: Posterior means and probabilities of SPS measures from the RT NTMs model

Variable/Product	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed
Ln Distance (km)	-0.008	0.011	-0.072	0.326	-0.153	-0.124
P(Distance >0|y)	0.516	0.573	0.296	0.996	0.118	0.176
Language	**0.912**	**1.172**	**1.257**	**0.827**	**0.776**	**1.781**
P(Language >0|y)	0.993	0.999	1.000	0.996	0.971	1.000
Border	**2.334**	**3.110**	**2.014**	**1.349**	**2.425**	**2.218**
P(border >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
τ_k	**235.043**	**246.564**	**244.714**	**220.466**	**237.478**	**240.106**
P(τ_k>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
σ_ε^2	**3.661**	**4.300**	**2.663**	**2.784**	**3.916**	**4.717**
P(σ_ε^2>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
$\sigma_{\gamma k}^2$	**0.425**	**0.334**	**0.426**	**0.317**	**0.616**	**0.503**
P($\sigma_{\gamma k}^2$ >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
SPS NTMs	0.461	**3.909**	-1.429	**5.365**	1.620	-1.642
P(SPS NTM >0|y)	0.600	1.000	0.125	0.997	0.698	0.299
Ln GDP	**0.841**	**0.619**	**0.915**	**0.656**	**0.962**	**0.818**
P(GDP >0|y)	1.000	1.000	1.000	1.000	1.000	1.000

When it comes to estimating the effects of SPS NTMs, the *distance* variable does not appear to be an important determinant of intra-SADC trade. This is the case for all six product groups. However, *border* and *language* are important, as they have high probability of explaining intra-SADC trade. The means of *border* variable are higher than those of *language*.

The variance parameter of the distribution of the SPS NTM parameter is estimated by $\sigma_{\gamma k}^2$. So, the variance of product-specific intercept varies from 0.31 for industrial products to 0.61 in the case of oilseed products. The variance of parameter of the residual term σ_{ε}^2 ranges between 2.66 and 4.72. Since this is statistically different from zero, it implies the presence of heteroscedasticity. This implies that the country-specific effects need to be estimated separately, rather than by a single intercept.

The latent variable τ_k is calculated over the historical mean, i.e. 2000 to 2010. Since the NTM variable was centred on the zero mean in equation 5.16 above, so τ_k indicates the distance between the historical mean and the threshold. It represents the level (values) that would induce bilateral trade. In order for trade to occur, the trade value should not fall by more than the historical mean, *less* the threshold level. For example, in the case of trade in *Animal* products, bilateral trade will take place as long as the trade value is not less than the difference between historical mean and a value of about $US23 5043. If trade falls by more than that, then bilateral trade will not take place.

The type of NTM that is being estimated in this case is SPS, one of the WTO-sanctioned NTMs. All products show weak evidence of SPS measures' influence, except for cereals and industrial products. The results show that SPS measures highly influence intra-SADC trade of cereal and *industrial* products. The coefficient for the GDP is positive and has a very high probability for all products. It is also consistent with the literature on gravity model as it indicates that bilateral trade increases as countries' economic conditions improve.

The results for another category of WTO-sanctioned NTMs, TBT measures, are presented in Table 6.2. The log of distance variable is influential of bilateral trade for *industrial* products. The coefficient of *distance* variable is 0.178, while the sign is also positive. This outcome for the sign is inconsistent with the theory, as it suggests that as *distance* (proxy for transportation costs) increases, intra-SADC trade will also increase.

The *border* and *language* variables are highly influential of intra-SADC trade, while the coefficient of *border* is also greater than one for all the six products. The border variable coefficients range from 1.27 for *industrial* products to 3.12 in *cereals*. Both language and

border variables have a positive sign, indicating that they contribute positively towards intra-regional trade.

Table 6.2: Posterior means and probabilities of TBT measures from the RT NTM model

Variable/Product	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed
Distance (km)	-0.019	-0.118	-0.066	**0.178**	-0.144	-0.137
P(Distance >0|y)	0.482	0.166	0.316	0.966	0.131	0.148
Language	**0.935**	**1.461**	**1.090**	**0.922**	**0.791**	**1.780**
P(Language >0|y)	0.996	1.000	0.998	0.997	0.975	1.000
Border	**2.337**	**3.122**	**2.031**	**1.267**	**2.370**	**2.232**
P(border >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
τ_k	**235.026**	**246.253**	**244.585**	**220.943**	**237.450**	**240.055**
P(τ_k>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
σ_ε^2	**3.674**	**4.595**	**2.608**	**2.832**	**3.824**	**4.710**
P(σ_ε^2>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
$\sigma_{\gamma k}^2$	**0.432**	**0.401**	**0.414**	**0.427**	**0.610**	**0.463**
P($\sigma_{\gamma k}^2$ >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
TBT NTMs	0.074	**0.621**	**1.584**	0.834	-1.455	**5.199**
P(TBT NTM >0|y)	0.544	0.985	0.984	0.803	0.120	0.973
Ln GDP	0.865	0.877	0.835	0.962	0.977	0.803
P(GDP >0|y)	1.000	1.000	1.000	1.000	1.000	1.000

The latent variable is highly significant, ranging between $US220 943 for *industrial* products and $US246 026 for *cereals*. Variances for the residual and for the intercepts were highly significant. This implies that there is presence of heteroscedasticity and country-specific effects. The TBT NTMs are influential for *cereals*, *horticulture processed* products. The coefficient for processed products is very high, implying more influence of TBT products compared to *horticulture* and *cereals*. Finally, the GDP variable is highly influential of intra-regional trade for all products. The sign of the GDP variable is positive, indicating that as the economic performances improve, so does intra-SADC trade.

The *other* group of NTMs which are not sanctioned by the WTO also have influence on trade. This other group includes all NTMs under the MAST nomenclature, excluding the TBT and SPS measures. The objective of estimating these NTMs separately from the TBT and SPS is to examine whether WTO encourages protectionism or encourages countries to use non-WTO-sanctioned NTMs. Table 6.3 presents the results of intra-SADC trade in six agricultural products involving *other* NTMs.

The estimated posterior mean of the log of distance for *industrial products* shows a high probability and has a positive sign. The results of language and border variables are similar to those for the TBT and SPS models. They are highly influential of trade and have a positive sign. The latent variable is also highly influential in determining intra-regional trade. The two variances are showing presence of country-specific effects, as well as heteroscedasticity. The coefficient for *other* NTMs has high probability for *industrial*, *cereals*, *animals* and *horticultural* products. The GDP variable is highly influential and contributes positively to intra-regional trade.

Table 6.3: Posterior means and probabilities of Other NTM measures from the RT NTM model

Variable/Product	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed
Distance (km)	0.109	-0.068	0.116	**0.211**	-0.159	-0.110
P(Distance >0|y)	0.826	0.314	0.843	0.977	0.107	0.209
Language	**0.747**	**1.342**	**0.940**	**0.887**	**0.793**	**1.729**
P(Language >0|y)	0.984	1.000	0.998	0.996	0.974	1.000
Border	**2.382**	**3.136**	**2.001**	**1.267**	**2.425**	**2.211**
P(border >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
τ_k	**234.848**	**246.247**	**245.058**	**220.665**	**237.462**	**240.151**
P(τ_k>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
σ_ε^2	**3.567**	**4.493**	**2.438**	**2.857**	**3.922**	**4.655**
P(σ_ε^2>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
$\sigma_{\gamma k}^2$	**0.338**	**0.375**	**0.290**	**0.402**	**0.621**	**0.491**
P($\sigma_{\gamma k}^2$ >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
Other NTMs	**1.438**	**1.774**	**1.749**	**2.791**	-0.202	-2.730
P(Other NTM >0|y)	0.989	0.9000	0.998	0.908	0.474	0.181
Ln GDP	**0.598**	**0.746**	**0.488**	**0.884**	**0.979**	**0.815**
P(GDP >0|y)	1.000	1.000	1.000	1.000	1.000	1.000

In summary, the section has looked at the results of three estimated models involving WTO-sanctioned NTMs, SPS and TBT, as well as other NTMs which are not sanctioned by the WTO. The general trend that is observed from the results indicates that the distance variable is not that influential to trade. In few cases where distance had some influence, it had a positive sign, which is not consistent with the literature and expectation of the gravity model. Language and border variables have generally high probabilities and they are positive in all the three models. The estimate of latent variable is also very influential of intra-regional trade. The product group that has the lowest threshold is the *industrial*, and the one with the highest is *cereals*. The intercept and residual variances indicate presence of country-specific effects,

as well as heteroscedasticity. On the product side, *industrial* and *cereal* products are influenced by at least two from the three types of NTMs.

6.3 ESTIMATING THE PROTECTION MARGINS OF NTMS

The protection margin of NTM compares margins of protection between members of a regional integration group. The measure is premised on the notion that members of regional integration are not equally influential of intra-SADC trade when applying NTMs. So, it evaluates how an individual member's NTMs are different (protective), relative to the rest of the region. As a result, the NTM variables used are as explained in Chapter 4. The same six products as in section 6.2 are estimated, and the three groups of NTMs are still considered for explaining various effects on intra-SADC trade.

The SPS NTM related results of the model are presented in Table 6.4. The distance still has no substantial influence on intra-SADC trade. Only two products, *industrial* and *processed* products have a positive sign which is inconsistent with the literature and gravity model expectations. *Border* and *language* variables are all influential for all products, as well as having the expected sign. The results of the two variances are similar to the previous models on the RT NTM models. Therefore, there is support for country-specific effects, as well as different intercepts.

The PM NTM model shows that SPS measures influence only three product groups, *animals, cereals* and *industrial*. The results are almost similar to the SPS model of RT NTMs, which showed that *cereal* and *industrial* products are influenced by SPS measures. The influence of GDP variable is high for all products and it also has a positive sign.

Table 6.4: Posterior means and probabilities of SPS measures from the PM NTM model

Variable/Product	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed
Distance (km)	-0.066	-0.188	-0.038	0.109	-0.119	0.028
P(Distance >0|y)	0.314	0.059	0.408	0.884	0.179	0.613
Language	**0.721**	**1.054**	**1.184**	**0.971**	**0.834**	**1.360**
P(Language >0|y)	0.966	0.992	0.999	0.998	0.980	0.998
Border	**2.259**	**3.074**	**2.011**	**1.248**	**2.438**	**2.306**
P(border >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
τ_k	**235.135**	**246.562**	**244.882**	**220.194**	**237.351**	**240.348**
P(τ_k>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
σ_ε^2	**3.621**	**4.896**	**2.605**	**2.892**	**3.808**	**5.110**
P(σ_ε^2>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
$\sigma_{\gamma k}^2$	**0.434**	**0.386**	**0.426**	**0.405**	**0.590**	**0.413**
P($\sigma_{\gamma k}^2$ >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
SPS NTMs	**0.547**	**0.872**	-0.168	**0.755**	-0.481	-0.991
P(SPS NTM >0|y)	0.907	0.987	0.330	0.977	0.109	0.014
Ln GDP	**0.868**	**0.854**	**0.867**	**0.914**	**1.007**	**0.819**
P(GDP >0|y)	1.000	1.000	1.000	1.000	1.000	1.000

The estimates and probabilities for the TBT measures from the PM NTM model are shown in Table 6.5. The *distance* variable results show high probability for *industrial* products. The sign is positive, and is against expectations. Intra-regional trade of *industrial* and *oilseeds* is not highly influenced by *language*. The border variable is highly influential as it was the case in the previous models. The most important part of the results show is that all products are influenced by TBT NTMs. The latent variable is also highly influential of intra-regional. GDP is highly influential under the TBT measures model of the PM NTMs. It also has an expected sign in terms of theory and the gravity equation. This confirms that GDP is important for both economic growth, and provides possibilities for trade, both in terms of supply and demand in the intra-regional market.

Table 6.5: Posterior means and probabilities of TBT measures related to the PM NTM model

Variable/Product	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed
Distance (km)	-0.045	-0.158	-0.034	**0.145**	-0.176	-0.184
P(Distance >0|y)	0.387	0.084	0.426	0.941	0.076	0.070
Language	**0.661**	**0.946**	**0.907**	0.393	0.448	**1.614**
P(Language >0|y)	0.957	0.990	0.993	0.880	0.848	1.000
Border	**2.367**	**3.228**	**1.999**	**1.258**	**2.486**	**2.277**
P(border >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
τ_k	**235.022**	**246.132**	**244.739**	**221.276**	**237.387**	**239.995**
P(τ_k>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
σ_ε^2	**3.850**	**4.773**	**2.711**	**2.877**	**4.078**	**4.725**
P(σ_ε^2>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
$\sigma_{\gamma k}^2$	**0.395**	**0.305**	**0.391**	**0.347**	**0.536**	**0.481**
P($\sigma_{\gamma k}^2$ >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
TBT NTMs	**0.666**	**1.199**	**0.853**	**1.194**	**0.946**	**0.743**
P(TBT NTM >0|y)	0.970	0.997	0.994	1.000	0.994	0.981
Ln GDP	**0.823**	**0.778**	**0.729**	**0.880**	**0.886**	**0.831**
P(GDP >0|y)	1.000	1.000	1.000	1.000	1.000	1.000

The results of protection margins of *other* NTMs shown in Table 6.6 are similar to those of corresponding models of RT NTM. The same four products *animals*, cereals, *horticultural* and *industrial* products are still influenced by *other* NTMs. This shows that the use of *other* NTMs induce same trade-response from the four products, but with different magnitude. The RT NTM model coefficients are higher than those from the PM NTM model.

The latent variable is influential of intra-SADC trade, indicating the response of zero trade in respective products groups. The threshold for industrial products is lower than all other products. The residual variance has a high probability, indicating that it is not constant and therefore supports the view that the model be estimated with the country-specific effects. As for the language, border and GDP variables, they are also consistent with the expectations.

Table 6.6: Posterior means and standard deviations of other NTMs measures from the PM NTM model

Variable/Product	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed
Distance (km)	-0.095	-0.194	-0.093	0.090	-0.222	0.074
P(Distance >0|y)	0.217	0.051	0.223	0.843	0.040	0.727
Language	0.419	**1.421**	**1.083**	**0.903**	**0.910**	**1.352**
P(Language >0|y)	0.859	1.000	0.999	0.996	0.983	0.999
Border	**2.313**	**3.109**	**1.903**	**1.186**	**2.392**	**2.166**
P(border >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
τ_k	**234.620**	**246.142**	**244.543**	**220.061**	**237.421**	**240.424**
P(τ_k>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
σ_ε^2	**3.678**	**4.634**	**2.598**	**2.910**	**3.937**	**4.707**
P(σ_ε^2>0|y)	1.000	1.000	1.000	1.000	1.000	1.000
$\sigma_{\gamma k}^2$	**0.366**	**0.385**	**0.407**	**0.399**	**0.649**	**0.403**
P($\sigma_{\gamma k}^2$ >0|y)	1.000	1.000	1.000	1.000	1.000	1.000
Other NTMs	**1.216**	**0.649**	**0.619**	**0.796**	0.443	-1.139
P(Other NTM >0|y)	0.999	0.956	0.948	0.988	0.860	0.003
Ln GDP	**0.824**	**0.849**	**0.811**	**0.957**	**0.962**	**0.806**
P(GDP >0|y)	1.000	1.000	1.000	1.000	1.000	1.000

In summary, protective margins of NTMs evaluate the effect of one country introducing an NTM, *ceteris paribus*. These PM NTMs were estimated for three groups of NTMs – SPS, TBT and *other* NTMs. In general, all the three models show that distance does not play an important role in determining intra-SADC trade. However, the border and language variables are highly influential, and have expected signs. The *latent* variable also has a positive sign and is accordingly highly influential in intra-SADC trade. The product group that has the lowest threshold is *industrial*, and the one with the highest is *cereals*. The variances support estimating different intercepts in the form of country-specific effects. The NTMs variable is also influential in three model for all products, except oilseeds (in other and SPS models), horticulture (in the SPS model) and processed products (also in the SPS model). The GDP variable is also consistent with the gravity model theory. Of all the product groups, *cereal* and *industrial* products are consistently influenced by all these variables at varying probability levels.

6.4 DISCUSSION OF THE EMPIRICAL RESULTS

The importance and role of NTMs in global trade were explained in the earlier chapters. They are important in explaining agricultural trade as they are mainly applied on these products. In this chapter, the role of NTMs in SADC trade of agricultural products is examined. NTMs

were expected to show high influence on agricultural trade in the SADC region. The effects of these NTMs were estimated for six groups of agricultural products. These products are animal products, cereals, horticulture, industrial, oilseeds and processed products. Given that there are nearly 200 types of NTMs at the highest level of disaggregation, they were grouped into three groups. The groups consisted of two WTO-sanctioned NTMs, SPS and TBT measures, also called technical measures. The third group is an aggregation of all other NTMs which are not sanctioned by the WTO.

Two types of effects were estimated. First, the effects of NTMs were estimated to ascertain whether a country's share of trade in individual product groups has any effects on intra-SADC trade. So, these were referred to as regional trade effects of RT NTM. The second effects of NTMs evaluate how intra-SADC trade is affected when the margins of protection change, or when a particular country changes its NTMs, or PM NTM. Accordingly, the results are explained in terms of variable signs, products, country-specific effects, and NTM indices.

6.4.1 Signs and magnitudes of variables

The coefficient of the distance variable requires a detailed explanation because it has a sign that is in contrast to the gravity model and research expectations in this area. The sign of distance variable in relation to trade is expected to be negative. This indicates that the further away trade partners are from each other, the lower the levels of trade volumes are expected. Furthermore, since the distance is also used as a proxy for trade (mainly transport) costs, capturing information on infrastructure, transport costs and other missing information related to costs, the size of its coefficient is also expected to be higher.

However, results show that in most cases the distance variable is not an important contributor of intra-SADC trade. In the cases were the probability of the distance variable was high, it had a positive sign. The two attributes are inconsistent with expectations. These are strange outcomes. They can be explained in terms of the border variable, which is both highly influential and also consistent with expectation.

The border variable is important in bilateral trade. Although its narrow definition means that the two trading partners have a common border, its implications go way beyond that. An extension of the meaning of border is that distance does not matter that much, as it implies

that countries sharing the border are closer to each other than those that do not share the border. The countries are likely to have other features in common, such as traditions, tastes and preferences, other practices, and also enjoy proximity to each other as markets. Therefore, in this case it is thought that the attributes of *border* may have taken away some of the influence of *distance*. That means, because the border variable is so highly influential, it becomes more important to bilateral trade than distance does.

Table 6.7: Comparisons of contiguous and non-contiguous of average trade value (2000 – 2010) in $ Million and shares by product group.

Trade value and share	Animals	Cereals	Horticulture	Industrial	Oilseeds	Processed	All Products
Total Trade value	198.93	276.73	125.13	557.02	115.32	200.24	1 473.37
Contiguous trade	177.65	254.24	109.22	449.94	94.85	174.44	1 260.34
Contiguous share	89%	92%	87%	81%	82%	87%	86%
Non-Contiguous trade	21.29	22.48	15.92	107.07	20.47	25.81	213.03
Non- Contiguous share	11%	8%	13%	19%	18%	13%	14%

Source: Calculated from Comtrade database, (2013)

In other words, SADC trade is highly influenced by proximity, in this case *border*, such that *distance* does not matter. One can say distance does not matter, or is captured in the proximity element, which is also part of the border attributes. Table 6.7 shows comparison of SADC trade that is taking place between partners that share a border (contiguous trade) and those that do not. There is substantial evidence that a higher percentage of SADC trade takes place between countries sharing a border, than with those that do not. Overall, 86% of SADC trade is between contiguous members, and only 14% is affected by the distance variable. Therefore, the border variable becomes more relevant than the distance variable.

The coefficient of the NTM variable also needs to be explained further, as it has an unexpected sign. The sign of the NTM variable was expected to be negative, on the basis that these NTMs add costs towards trade, and therefore as they increase, intra-SADC trade should decrease. However, the results from all the models show that the sign is positive for the NTM variable, which is inconsistent with theory and our expectations.

The explanation for this sign of NTM variable is in the combination of NTM data and trade data. The explanation of the compilation and use of NTM data was provided in detail in

Chapter 4. It was explained that NTM data which was captured comprises the official NTMs, implying that only those regulations which are enforced were being recorded. So, in other words, only NTMs that needed to be complied with were recorded. As regards the trade data, historical information provided by the COMTRADE database was used. Since estimations were made on the basis of historical trade for the NTMs that needed to be complied with, the compliance of trade within the set regulatory framework were effectively estimated. So, if compliance with NTMs is estimated, the sign of the NTM variable would be positive. This implies that intra-SADC trade increases with the compliance levels of NTMs. This interpretation does not change the role or attributes of NTMs in as far as their effects of increasing trade costs are concerned. The key difference is that, instead of estimating their restrictiveness, their compliance was estimated. The two are basically opposite sides of the same coin.

The estimate of the latent variable requires elaborate explanation, particularly with regard to its magnitude. As it defined earlier at the introduction of the concept, it measures the level at which bilateral trade can take place. So, if trade between two countries is less than the threshold level, then that trade will not take place. Therefore, the higher the threshold level, the less likely trade will take place, particularly with disaggregated product levels.

An extended role of the latent variable is that it can explain trade that is not observed due to NTMs. For example, if there are factors that erode trade, then those factors will increase the threshold level. By definition, those factors are NTMs. So, as the threshold level increases, relatively less trade will take place. As a result, the latent variable has some of the attributes of the NTMs. It is believed that the threshold further explains the observed zero trade that was experienced owing to restrictive NTMs. As the threshold gets higher, zero trade is then observed. And as trade gravitates towards zero, intra-SADC share declines.

6.4.2 Products

The intra-SADC trade results for specific products are explained further in this section. The products that tend to be influenced by these variables and country-specific effects are *industrial, cereals*, *horticultural* and *animals*. The six model which were estimated (three for RT NTMs and three for PM NTMs) showed evidence of the influence of NTMs all *cereals* and on five *industrial* products equations, as well as four for each of *horticultural* and *animal*

products. *Processed* products have results which were not expected prior to estimating these effects.

Cereal and *industrial* products are mostly responsive to a number of variables. However, the NTM variable is the one of interest, in terms of the mixed outcomes. In all the six equations, the NTM variable for the industrial equation is highly influential (at 99%), except for the RT NTM model of the TBT measures. Furthermore, the *industrial* products equation has the highest NTM coefficients compared to all other products, meaning that the impacts are higher for this group of products. As for cereals, the results are explained by the fact that the product groups include staple food items. But the same products are also used for industrial purposes, such as brewing. In addition Appendix B shows that *cereal* products have 100% frequency and coverage ratios for 2000 and 2010. This implies that NTMs were applied on all individual cereal products and imports before and during the implementation of the trade protocol.

To understand some of the possible underlying reasons that might explain why *industrial* products will be more responsive to NTMs, some of the products that belong to these categories will be disaggregated at the HS 2-digit level. These include product groups such as tea, coffee, spices and mate (HS09); sugar and sugar products (HS17); cocoa and cocoa preparation (HS18); beverages, spirits and vinegar (HS22); tobacco and tobacco products (HS24), hides and skins (HS41); leather, saddler and travel goods (HS42); Fur and fur skins (HS43); Wool (HS51); cotton (HS52); and other vegetable textiles (HS13). Production and trade of these products involve mostly large companies, and more often multinationals. Generally, southern African production and trade involves smallholders and medium companies. This means that the compliance levels of multinationals and large companies are high. In addition, they are capable of relocating or switching to other markets if conditions do not suit them anymore.

Besides involvement of multinationals and large companies, products such as tobacco tend to attract regulations for various reasons, i.e. health, business, employment, or protectionism. The sources for such regulatory changes may arise from within the market, i.e. department of health, trade and industry or agriculture. Further sources of change may arise from international institutions, such as the WTO, World Health Organisation (WHO), or International Plant Protection Convention (IPPC). That means that the regulatory framework rarely remains the same for a prolonged period, compared to other products. Therefore,

companies and traders will need to be adaptable and remain flexible in order to deal with such regular changes.

Some of the products under the industrial products group have additional trading agreements. For example, cotton and related products have for many years been affected by multifibre agreements (MFA) and agreements on clothing and textiles (ATC) (Grynberg, 2005). Furthermore in SADC, the rules of origin on clothing and textiles were relaxed to accommodate the LDCs in SADC (Kalaba, 2008). Products, such as sugar, have also been affected by domestic support and export subsidies (WTO, 2005). That means that trade in these products is more distorted than other agricultural products. Article VII of the SADC Trade Protocol deals with sugar and sugar products (Southern African Global Competitiveness Hub, 2009). Again, sugar products will have separate or additional sets of trade rules and regulatory frameworks that other products are not subject to.

These special treatments in the form of separate protocols or agreements for these industrial products set them apart from the rest of the products. That also implies that they have to be adjustable to these changes in regulation, whether initiated from the internal market or international institutions. Therefore, products that are accustomed to such changes and adaptation are likely to be more responsive to changes in trade costs, i.e. NTMs, than other products. Another factor that will render these products more responsive to overall NTMs is the fact that most of these products are closely linked to manufactured products. Then the rules of origin will play a larger role in determining trade of these products (Kalaba, 2008). That explains why there was derogation on clothing and textiles in the implementation of the trade protocol in SADC, to allow countries to improve their industrial and manufacturing capacity.

The two products that have outcomes which may be considered to be surprises are *processed* and *horticulture*. It was initially expected that these products would be as responsive as the *industrial* products owing to their characteristics. For example, *horticultural* products are traded while they are still fresh and therefore perishability is the main concern when trade costs and administrative procedures lead to delays. As a result, trade of those products will be affected. *Processed* products, in contrast to *horticulture*, would have gone through stages of manufacturing and thus attract different types of NTMs from *horticulture* products. The NTMs on processed products that are expected to be more relevant would be labelling

processes, under both the TBT and SPS. Rules of origin, just as in the case of *industrial*, will also have more impact than in other products.

Animal products are affected by regulations from several departments, and therefore to some extend tend to share some of the reasons that affect industrial products. For example, regulations from department of health will play a role in the introduction and application of the NTMs. This will be both in terms of animal health as well as food safety requirements. International institutions and regulatory bodies like WHO, WTO and World Organisation for Animal Health will also play a role in determining some of the NTMs.

However, there is evidence of the responsiveness to the NTMs which indicates that both *animal* and *horticultural* products are second to *industrial* products. *Animal* products are more responsive to NTMs under the PM NTM model than under the RT NTM model. Animal products are responsive in all three types of NTMs under the PM NTM model, and just one (Other NTMs) in the RT NTM model. This implies that intra-SADC trade of these products is highly affected when member states change their NTMs than when they change the trade volumes.

6.4.3 Country Effects

The effects of country contribution were confirmed by the high probability of the variance of the intercept. The estimates indicate that there are differences between the fixed effects of the countries and, therefore, such differences need to be explained. The role of country effects were elaborated in Chapter 2 without necessarily referring to the outcomes of the model results. In a way, country characteristics, such as socio- and macro-economic conditions, trade profiles and agricultural profiles, explain or determine some of the contributions which individual countries make towards intra-regional trade.

The country effects show that South Africa is by far the most influential member of the regional bloc. It has the highest probability and the largest coefficient for all products and in all NTM types. To that extent, South Africa's economic size, trade contribution and diverse agricultural production allows it to be this influential in trade. Furthermore, its role in NTMs implies that it will also have effects when it introduces NTMs. It was shown in Chapter 4 that

it also has introduced more NTMs than any other member. Accordingly, such contributions are reflected in the model outcomes.

Botswana, Mozambique and Zimbabwe can be seen as the second-tier countries in terms of country effects. However, all these countries are very influential in the PM NTM model, compared to the RT NTM. This implies that these countries are more influential of intra-regional trade when they introduce NTMs than when they increase the regional trade share. The same applies to other countries that have less influence than these three countries.

6.4.4 Effects of NTM types

The rationale for separating NTMs and grouping them in the identified categories was to test whether there are different effects between them. The grouping could have been done in many different ways. In this study, it was desired to test whether the NTMs that are founded on WTO agreements are as influential as those that are not sanctioned by the WTO. So, the WTO-sanctioned NTMs were broken down into two groups, which are also called technical NTMs (UNCTAD, 2009). These were SPS and TBT measures. Then, the rest of NTMs were grouped under *Other* NTMs, which are also referred to as Non-technical NTMs under the MAST classification.

The model results do not show strong evidence of a difference between WTO-sanctioned NTMs and the others. In other words, there is no sufficient supporting evidence that SPS and TBT measures are substantially different from other NTMs. Another argument concerning that theory is that, because WTO-sanctioned NTMs must be supported by science, particularly SPS, developing countries will therefore tend to use *other* NTMs. The reason for that is that these countries have limited resources, and therefore the costs of using resources to justify use of the NTMs will discourage their use. Instead, they will use NTMs that do not need to be justified. However, such theories were not confirmed from the results.

They three types of NTMs are influential on six occasions out of possible eighteen (three types of NTMs and six equations or products) under the RT NTM model. In the case of PM NTMs, three types of NTMs are influential on ten occasions. Therefore intra-SADC trade is one and half times more responsive to change in NTMs than change in trade volumes. The reason RT NTM shows relatively low contribution to intra-SADC trade has to do with the

initial share of SADC trade. Intra-SADC share contributes around one-third. That means that when trade volume increases, only one-third goes to SADC and two-thirds goes outside SADC. That is why it will not have much influence on intra-SADC trade because the share will remain the same. Additional explanation can also be provided in the fact that SADC (bilateral) trade in the model is captured in nominal values, i.e. $US1 000. So, the unit of change in the model refers to change in trade values, and not the share of trade.

The PM NTM model shows evidence of the impact of these protective margins for all products and by most countries. This model aimed to respond to the question, *"what happens to intra-SADC trade when a particular member country introduces an NTM"*, hence it is called the protective margin of an NTM. This implies that, as each member introduces an NTM for a particular group of products, it has an influence on intra-regional trade. In this way, NTMs are more influential, however, when there are disparities in regulations between countries.

6.5 CHAPTER SUMMARY

In this chapter an assessment was made of the latent variable gravity model that has been integrated into the Bayesian approach to determine the impact of NTMs on intra-SADC trade. Six equations were estimated for each group of products. In each equation, three types of NTMs were tested as to whether different types of NTMs are influential to intra-SADC trade. Furthermore, the role of additional trade or NTMs was examined by estimating models that capture the impact of additional trade volumes and NTMs.

The results showed that most of the results had the expected signs, with the exception of some cases on distance and NTM variables. The results showed positive signs for the two variables, while the expectations were for a negative sign. It is believed that the sign of the distance variable is explained by the close linkages of the variable with the border variable. SADC trade is higher for countries that share a border, and so is determined by proximity. Accordingly, it is believed that proximity effects also capture the distance attribute.

As for the NTMs having an unexpected sign, it is considered that this is first explained by the NTM and trade data. The NTM data is about official regulations that need to be complied with in order to trade. And the trade data is historical. So, effectively what was estimated was

trade that has complied with the set regulation (NTM), and not the effect of NTMs on trade. In that regard, the sign for NTMs will be the correct one, as increased compliance with NTM requirements will lead to more trade.

As for products, *industrial* products have shown to be more responsive to NTMs compliance. This is explained by the presence of large companies in trade and several special trading arrangements, as well the involvement of multiple agencies in the introduction and utilisation of NTMs. Processed products and horticulture are the second-tier variables in terms of responsiveness towards NTMs.

The two models which were estimated, RT NTM and PM NTM, reveal that intra-SADC trade is responsive to changes in NTMs, rather than increases in nominal trade values. So, the role of countries in adding or reducing NTMs is noticeably important in determining intra-SADC trade. The effects of PM NTMs are more than those of RT NTM models for various NTMs, i.e. WTO sanctioned and other NTMs. As for country effects, South Africa is the most influential, owing its economic size and trade capacity in terms of diverse products, as well as its use of NTMs. Botswana, Mozambique and Zimbabwe are also influential, but less so compared to South Africa. The overall results show that NTMs are most important in determining intra-SADC trade.

The most important way that NTMs influence trade is through the estimated latent variable. This is an estimated effect of the observed zero trade. If the threshold is high, implying that NTMs are restricting trade, then zero trade will be observed. When high percentage of zero trade is observed, then intra-SADC trade is small or declines. However, if the threshold is low, intra-SADC trade increases, as was observed in the case of *industrial* products.

CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

7.1 INTRODUCTION

This study evaluated the role of NTMs on intra-SADC trade of agricultural products. The study was motivated by poor trade performance despite the substantial reduction in tariff barriers, and to provide more information about the overall regulatory measures that affect trade. Ten SADC countries were included in the studies, and were selected on the basis their commitment to implement the trade protocol and trade data availability. Agricultural products were grouped into six main groups, while the NTMs were compiled using the international nomenclature. In the next section, the main highlights of the study are discussed, followed by the overall conclusions. Then in the last section recommendations based on the study as well as some future research are discussed.

7.2 SUMMARY

The estimation of the effects of NTMs on intra-SADC trade started with the realisation that the share of SADC trade has not improved, despite a decade-long period of tariff reduction. As from 2008, more than 85% of SADC trade was free of customs duties, compared to pre-2000 trade. The objective of the SADC trade protocol was to increase that share and aimed to remove NTMs. However, there was no evidence that could be found that NTMs were reduced or maintained at the pre-2000 level. So, the aim of this study was to evaluate the role of NTMs with regard to intra-SADC share. The study was motivated by the fact that intra-regional initiatives and programmes to improve regional integration have not shown any evidence of success.

An SADC NTM database was built in order to provide a repository of official SADC NTMs. In order to quantify NTMs, a database was classified, similarly to the international database, and the MAST nomenclature. Agricultural products at the HS 4-digit level for ten SADC countries were included in this repository. The countries are Botswana, Malawi, Mauritius, Mozambique, Namibia, Swaziland, South Africa, Tanzania, Zambia and Zimbabwe. For the final estimation procedures, agricultural products were categorised into six main groups,

namely animal products, cereals, horticulture, oilseeds, industrial and processed products. The analysis was conducted across all product groups.

The first use of the NTM database was to assess whether SADC NTMs have declined, stayed the same or increased. Inventory methods (frequency index and coverage ratio) of evaluating presence and prevalence of NTMs were used. Results showed that there is evidence of an increase in the use of NTMs. The percentage of products affected by NTMs in 2010 is much higher than in 2000. The same case was observed when evaluating the value of imports affected by NTMs. So, it was established that the use of NTMs in the SADC has been on the rise, while tariffs were being reduced.

Furthermore, it was established that countries belonging to SACU have used NTMs relatively more than other SADC members. This is the case for both the beginning of the period in 2000 and at the end. There are two possible explanations to this pattern. The first one has to do with the diversity of products that are traded within SACU. In general, SACU has a more diverse group of products, and therefore NTMs at a disaggregated product description tend to affect the aggregated level measures. Secondly, SACU as a regional group has set up initiatives for industrialisation. This implies that a comprehensive regulatory framework needed to be undertaken. And in doing so, each country had to revise and consolidate regulatory measures, which consequently added more NTMs over time.

The inventory methods, while they are useful in identifying the use of NTMs, and products affected, are not useful when one wants to ascertain the extent of NTM protection. An econometric model is needed to assess such effects of NTMs. In this study, a gravity model was preferred for estimating such effects. The model needed to be transformed further in order to estimate NTM effects on intra-SADC trade. The transformation was started from a basic gravity model with threshold which was integrated with a Bayesian approach. This was done to capture the trade costs which can be attributed to NTMs when zero trade is observed. The latent variable was used to estimate the preferred trade levels which will then replace zero trade if those levels are above the threshold.

The model was estimated, and results show that distance and border variables (together) are proxies for the same variable that is not observable, i.e. trade costs. Therefore, future studies may need to consider investigating such influence in more detail. The results also showed that

the way historical trade was combined with NTM requirements led to the estimation of the influence of compliance. What was started as an estimation of the effects of NTMs on intra-SADC trade turned out to be an estimation of the effects of NTM compliance on SADC trade. However, the two turned out to be two opposite sides of the same coin.

The overall results confirm that NTMs do contribute to intra-SADC trade. Industrial products are more responsive to NTMs than the other five product groups. South Africa is more influential of intra-SADC trade than all SADC countries, mainly because of its economic power and also its use of NTMs. The response to change in NTM introduction is one and half more than that of a change in trade. That is the case because SADC is already exchanging a large share of its total trade with non-SADC members. Therefore, attention should be given to addressing the way in which NTMs are introduced.

7.3 CONCLUSIONS

This study is the first to assess NTMs on all agricultural products comprehensively in the SADC region. Advanced econometric methods were used to enhance the estimation precision of trade flows in the presence of a high percentage of zero trade. The economic and NTM effects are an improvement on the previously known estimates for the SADC region. Furthermore, the study has compiled and classified data on NTMs within SADC in a way that is consistent with the current nomenclatures. This is also a contribution to data availability on NTMs across the SADC region.

Previous studies on NTMs in the SADC region focused on inventory measures (Mmasi & Ihiga, 2007; World Bank, 2012; Charalambides & Gillson, 2011; Mthembu-Salter, 2007; Imani Development, 2007; SAIIA, 2007). These measures are useful in identifying the presence of NTMs and share of trade affected by those NTMs. However, they do not deal with NTMs that are affecting zero trade, nor highlight high levels of compliance. This study has provided an additional dimension for each product which can easily be examined across a range of NTMs within a country or groups of countries. The same can be done for NTMs, i.e. matching each one against the products it affects.

The econometric methods which were used to estimate effects of NTMs have shown an additional approach for handling zero trade. Furthermore, it enables additional explanation for

why the zero trade is observed. Some studies have left out zero trade, which always introduces selection bias. Other studies used methods which are not theoretically sound, such as converting zero to a very small numbers. In doing so, a useful component of the information gets lost. As has been explained in this thesis, if an NTM is largely successful, it would restrict trade, or effectively lead to zero-trade observations. So, the insufficient handling of zero observation will either lead to loss of this information or biased estimates.

The adaptation of gravity equation into the Bayesian threshold model helped to avoid loss of information. The evaluation of the observed zero trade and estimating what it could have been gave some insights and patterns of zero trade. This was done by using the observed data of the model parameters to calculate posterior distributions (Tan, Tian & Ng, 2010). Then, new observations are used which are derived from the original data to estimate what that zero trade could have been, given some country-specific effects.

The key finding from the study is that NTMs are noticeably influential in determining intra-SADC trade in agricultural product groups, but mainly for industrial products. The positive relationship between NTMs and intra-SADC trade is an indication that compliance with NTMs will result in increased trade. The latent variable which indicates the level of preferred trade is also significant, implying that if that threshold is not attained, true zero values of trade will be observed. So, the latent variable also has some attributes of the effects of NTMs on zero trade. The threshold levels are lowest for industrial products, which simply mean that trade costs, as captured by NTMs, do not have to be high in order for trade to take place.

The gross domestic product is an important factor in trade. It is, therefore, not surprising that it is significant and has a positive effect on trade. Many studies have also shown that this is useful in determining trade. This goes together with language variable, which is a proxy for the understanding of the regulatory issues, and complying with them. This suggests that, at the core of growth in regional trade, is the issue of compliance and that compliance is embodied in the language variable.

The border variable, which was entered as a proxy of transport costs, showed to be significant, but distance was not highly influential in many products. This is due to the fact of the pattern of SADC trade which is higher with border-bound partners than otherwise. The influence of distance seems to be inseparable from the border variable, which is a dummy,

and thus does not have many details beyond the information whether countries share a border or not. This also presents a limitation to this study, as this relationship between border and distance may reveal further details, particularly with respect to SADC trade patterns, or developing countries in general.

One of the major findings from the study is that intra-SADC trade is influenced more when NTMs are introduced compared to when an additional unit of trade value is added. However, the introduction of an additional NTM unit also refers to when that unit is a shift away from the existing NTM regime. So, when a new NTM is introduced by a member of regional bloc, it is viewed as diversifying or moving away from the rest of the members' NTMs regime. So, what member states would prefer to have, in order to improve intra-regional trade, is harmonisation.

Addressing restrictive NTMs will be most important in dealing with constraints on intra-SADC trade, particularly those that lead to zero trade. The results of PM NTM and RT NTM effects show that addressing NTMs will contribute more to intra-SADC trade than merely increasing trade alone. So, increasing SADC trade in value terms is a necessary condition for achieving regional trade objectives. The required conditions for attaining regional trade goals lie in addressing the escalating NTMs, while growing the value of trade.

Overall, the objectives of the study have been attained. The SADC NTM database has been established, and used to test subsequent objectives. The NTMs in SADC have been increasing over the period despite the commitment to eliminate them. As for impact of NTMs on products, it is apparent that cereal and industrial products are mostly affected by NTMs. And that, WTO-sanctioned NTMs do not seem to have a different impact from other NTMs, with the exception of the TBTs in one model out of four.

7.4 RECOMMENDATIONS

The recommendations of this dissertation are subdivided into two parts. The first part deals with the recommendations pertaining to the study, based on the results of this study. It deals with policy and institutional aspects. The second part of the recommendations considers areas of future research. This is based on some of the issues that this study did not cover and others that will improve NTM understanding and analysis.

7.4.1 Recommendations pertaining to the study

It has been shown in the dissertation that the number of NTMs is not necessarily an indicator of restrictiveness. However, high restrictive levels are related to the diversity in NTMs within the product groups. Thus, harmonisation of policies, standard and regulatory measures towards the same benchmark can help reduce some of these trade costs. If countries aim to comply with same standards within various categories of NTMs throughout the region, then the restrictiveness may not be as high compared with when each country has its own different standards.

Regional institutions, mainly regional secretariats need to be strengthened and empowered to deal with some of the violations of both regional and WTO rules. The institutions have no favour or fear to enforce such rules. In addition, there is a need to review the commitments when the agreements are signed. SADC in particular should consider implementing commitments with regards to Article XI of the trade protocol. This is one indication of regional institution displaying weak enforcement powers and thus fails to facilitate and implement some of the set commitments.

Reforms are necessary at the regional institution that will go beyond just implementing the previous commitments. There is a need for new approaches towards future agreements and negotiations. The concern with the current state of agreements is that NTMs have added a cloud of unpredictability and uncertainty about the presence and application of regulatory measures. Therefore future agreements need to consider NTMs, or some parts that address these measures as priority issues for negotiations. Regarding the concluded agreements, the latter phases of implementation usually require some form of reviews. During such reviews, a consideration on reducing the NTMs should be contemplated.

Another recommendation concerns the macro-economic fundamentals of the countries, as indicated by the importance of GDP in intra-regional trade. Economic performance is important in determining trade and so it will be advantageous if countries were to limit the use of ad hoc policies and rather move towards harmonising policies, and not just NTM regulations. This would allow market signals to determine prices, which will subsequently provide incentives where opportunities exist. It is also important to develop and consolidate

independent institutions which will manage trade, so that they follow the explicit directives, but will still respect the market conditions. The current role of regional secretariats seems to be lagging behind what could be done in terms of regulatory frameworks and enforcement.

The national policy and government can move ahead of the regional targets by aiming to comply with the highest standards within the region, particularly in the case of an export-oriented sector or products. Trade negotiations tend to be slow and protracted, especially on controversial and contentious NTMs. So the approach of moving ahead of regional group will have two advantages. First, by attaining highest level of compliance means that it is possible to comply with almost all standards of all countries in the region. Secondly, when then region moves towards a common standard, the highest standard is likely to be adopted rather than a lower one. Therefore a country can position itself better for current and future gains from trade that seem to be limited by NTMs.

7.4.2 Recommendations pertaining to future work

In this dissertation, the NTMs were estimated as a group. This is despite the fact that these measures are diverse, and do vary even within the same group. Given the levels of heterogeneity of NTMs, there is a need to look at various impacts of NTMs separately. NTMs must be estimated when finely defined rather than as an aggregated group. It is possible that such approaches may separate NTMs that are trade enhancing, from trade impediments.

Regulatory measures are generally introduced at a product level. However, products were grouped to in order to attain the objectives of this study. Future studies that focus on single or few products may also show some other aspects of NTMs on affected products in a different light. Such studies will also be very valuable in moving research and understanding of NTMs forward.

To overcome the limitation of separating border attributes from that of distance, further studies need to be done in this area, particularly in developing countries which trade with only a few partners. Other aspects of improvement in research in this area would be to assess impacts of NTMs at detailed product levels, as well as looking at individual NTMs for their

impacts on trade. Such studies would need to consider more than one regional integration group. This will make it possible to understand the main driving forces for such inconsistencies.

Lastly, studies that look at the welfare effects of NTMs will be very helpful in explaining the effects of NTMs from a different viewpoint. This dissertation has not looked at the effects of NTMs beyond trade flows. Additional knowledge can be gained by examining the welfare implications on consumers, producers and governments as results of these measures. These effects may also be used to compare with the corresponding effects resulting from the use of a tariff.

REFERENCES

Abidoye, B. O. (2010). *Bayesian Inference in Modeling Recreation Demand: Graduate Theses and Dissertation Paper 11497.* Ames: Iowa State University.

Abidoye, B. O., Herriges, J. A., & Tobias, J. L. (2012). Controlling for Observed and Unobserved Site Characteristics in RUM Models of Recreation Demand. *American Journal Agricultural Economics, 94 (5):*, 1070 - 1093.

Abidoye, B. O., Herriges, J. A., & Tobias, J. L. (2012). Controlling for Observe and Unobserved Site Characteristics in RUM Models of Recreation Demand. *American Journal of Agricultural Economics, 94 (5)*, 1070 - 1093.

Aguilar, L. (1993, january/February). NAFTA: A Review of Issues. *Economic Perspectives 7*, pp. 12 - 20.

Alleyne, M. (2005).SADC: Regional and Global Context of Integration in Southern African Region. Gaborone.

Anderson, J. E., & van Wincoop, E. (2003). Gravity with gravitas: a solution to the border puzzle. *American Economic Review, 93*, 170-192.

Andriamananjara, S., Dean, J. M., Feinberg, R., Ludema, R., Ferrantino, M. J., & Tsigas, M. (2004). *The effects of non-tariff measures on prices, trade, and welfare: CGE implementation of policy-based price comparisons.* Washington, DC: United States International Trade Commission.

Appleyard, D. R., & Field, A. J. (1998). *International Economics.* New York: Irwin/McGraw-Hill.

Bacchetta, M., Richtering, J., & Santana, R. (2012). How much light do WTO notifications shed on NTMs? In O. Cadot, & M. Malouche (Eds.), *Non-Tariff Measures: A Fresh Look at Trade Policy's New Frontier.* London/Washington, DC: Centre for Economic Policy Research/World Bank.

Badri, N., Aguiar, A., & McDougall, R. (2012). *Global Trade, Assistance, and Production: The GTAP 8 Data Base.* Purdue: Center for Global Trade Analysis.

Baldwin, E. R. (1991). Measuring non-tariff trade policies. In J. De Melo, & A. Sapir (Eds.), *Trade Theory and Economic Reform.* Oxford: Basil Blackwell.

Baldwin, R. (1989). *Measuring Non-tariff Trade Policies.* Cambridge, Massachusetts: NBER.

Baldwin, R. E. (1970). *Nontariff Distortions of International Trade.* Washington DC: Brookings Institution.

Basu, S. R., Kawahara, H., & Dumesnil, F. (2012). *Evolution of Non-Tariff Measures: Emerging Cases from Selected Developing Countries.* New York: United Nations Publication.

Bergstrand, J. H. (1985). The Gravity Equation in International Trade: Some Microeconomic Foundation and Empirical Evidence. *Review of Economics and Statistics, 67*(August), 474-481.

Bergstrand, J. H. (1989). The Generalised Gravity Equation, Monopolistic Competition and the Factor-Proportions Theory in International trade. *He Review of Economics and Statistics, 71*(1), 143–153.

Bhagwati, J., & Srinivisan, T. N. (1975). *Foreign Trade Regimes and Economic Development.* New York: NBER.

Bora, B., Kuwahara, A., & Laid, S. (2002). *Quantification of Non Tariff Measures. Policy Issues in International Trade and Commodities.* Study Series No 18 UNCTAD/ITCG/Tab/19.

Cadot, O., & Gourdon, J. (2012). *Assessing the price-raising effect of non-tariff measures in Africa.* CEPII Working Paper 2012 - 16 , August 2012 , CEPII, Paris.

Cadot, O., & Malouche, M. (Eds.). (2012). *Non-Tariff Measures: A fresh look at trade policy's new frontier.* Washington, DC and London: World Bank and Centre for Economic Policy Research, The World Bank.

Calvin, L., Krissoff, B., & Foster, W. E. (2008). Measuring the Costs and Trade Effects of Phytosanitary Protocols. A US-Japan example. *Review of Agricultural Economics.30:*, 120 - 135.

Carrere, C., & De Melo, J. (2011). *The Doha Round and Market Access for LDCs: Scenarios for the EU and US market.* Working papers, halshs-00554311, HAL.

Chaney, T. (2008). Distorted Gravity: the intensive and extensive margins of international trade. *American Economic Review 98*, 1707 - 21.

Charalambides, N., & Gillson, N. (2011). Addressing Non-Tariff Barriers on Regional Trade in Southern Africa. In O. Cadot, & M. Malouche (Eds.), *Non-tariff measures: A fresh look at trade policy's new frontier.* Washington, DC/London: The World Bank/CEPR.

Charalambides, N., & Ngwenya, K. (2011). *Achieving Balanced Industrial Development Within a Regional Setting: Challenges and Pitfalls.* Gaborone, Botswana: Imani Development.

Chauvin, S., & Gaulier, G. (2002). Prospects for Increasing Trade among SADC Countries. *Trade and Industrial Policy Strategies (TIPS) 2002 Annual Forum.* Muldersdrift, Johannesburg: TIPS Publications.

Cheng, I. H., & Wall, H. J. (2005, January). Controlling for heterogeneity in gravity models of trade and integration. *Review, Federal Reserve Bank of St. Louis*, pp. 49-63.

Chilonda, P., & Musaba, E. (2010). *Agricultural Growth Treands and Outlook for Southern Africa.* Pretoria.

Congdon, P. D. (2010). *Applied Bayesian Hierarchical Methods.* London: Taylor and Francis.

Croome. (1996). *Guide to the Uruguay Round Agreements.* Geneva: Kluwer law International Publication.

de Frahan, H., & Vancauteren, M. (2006). Harmonisation of Food Regulations and Trade in the Single Market: Evidence from Disaggregated Data. *European Review of Agricultural Economics,33(3)*, 337 - 60.

Dean, J., Feinberg, R., & Ferrantino, M. (2005). *Estimating the Tariff Equivalent of NTMs.* World Scientific Ltd.

Deardorff, A. V., & Stern, R. M. (1998). *Measurement of Nontariff Barriers.* Ann Arbor: University of Michigan Press.

Demaria, F., Rau, M.-L., & Schlueter, S. (2011). *NTMs and Gravity Type Models: State of the Art and Analysis of Literature.* Brussels: European Union.

Disdier, A. C., & Marette, S. (2010). The Combination of Gravity and Welafre Approaches for evaluating Nontariff Measures. *American Journal of Agricultural Economics, vol.92(3)*, 713 - 726.

Disdier, A. C., & Marette, S. (2010). The Combination of Gravity and Welfare and Welfare Approaches for Evaluating Non Tariff Measures . *American Journal of Agricultural Economics, vol.92(3)*, 713 - 726.

Disdier, A. C., Fontagn´e, L. E., & Mimouni, M. (2007). *The Impact of Regulations on Agricultural Trade: Evidence from the SPS and TBT Agreements.* CEPII, Working Paper No 2007-04. Paris.

Donnelly, W. A., & Manifold, D. (2005). *A Compilation of Reported Non-Tariff Measures: Description of the Information.* Washington, DC: US International Trade Commission, Office of Economics.

Eaton, J., & Kortum, S. (2002). Technology, Geography and Trade. *Econometrica 70*, 1741 - 79.

Eaton, J., & Tamura, A. (1994). Bilateralism and regionalism in Japanese and US trade and direct foreign investment. *Journal of the Japanese and International Economies, 8*, 478 -510.

Ecker, O., & Breisinger, C. (2012). *Food Security System: A new Conceptual Framework.* Washington DC: International Food Policy Research Institute (IFPRI) Publications.

Egger, P. (2002). *An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials.* Oxford: 297-312.

Egger, P., & Larch, M. (2008). Interdependent Preferential Trade Agreement Memberships: an Empirical Analysis. *Journal of International Economics, 76*, 384 - 99.

Estevadeordal, A., Freund, C., & Ornelas, E. (2008). Does Regionalism Affect trade Liberalisation Towards Non Members? *Quarterly Journal of Economics 123*, 1531 - 1575.

Ethier, W. J. (2007). The theory of Trade Policy and Trade Agreements: A Critique. *European Journal of Political Economy, Elsevier, vol 52 (2)*, 605 - 623.

Evenett, S. J., & Hutchinson, W. K. (2002). The Gravity Equation in International Economics: Theory and Evidence. *Scottish Journal of Political Economy, 49*(5), 489-493.

Feenstra, R. C. (2003). A Homothetic Utility Function for Monopoistic Competition Models without Constant Price Elasticity. *Economics Letters*, 79 - 86.

Ferrantino, M. J. (2006). *Quantifying the Trade and Economic Effects of Non Tariff measures.* Paris: OECD publications.

Ferrantino, M. J. (2012). *Using Supply Chain Analysis to Examine the Costs of Non-Tariff Measures (NTMs) and the Benefits of Trade Facilitation.* Geneva: WTO Publications.

Frankel, A. (1997). *Regional Trading Blocs in the World of Economic System.* Washington, D.C.: Institute of International Economics.

Freund, C., & Ornelas, E. (2010). *Regional Trade Agreements; Working Paper Series.* Washington DC: World Bank.

Fugazza, M., & Maur, J.-C. (2008). Non-tariff barriers in CGE models: how useful for policy? *Journal of Policy Modeling, 30*(3), 475–490.

Gardner, R. N. (1956). *Sterling-Dollar Diplomacy.* Oxford: Clarendon Press.

Gebrihiwet, Y., Ngqangweni, S., & Kirsten, J. (2007). Quantifying the Trade Effects of Sanitary and Phytosanitary Regulations of OECD Countries on South African Food Exports. *Agrekon, 46*, 23 - 39.

Geweke, J. (1992). Evaluating teh Accuracy of Sampling-Based Approach to the Calculation of Posterior Moments. In J. M. Bernado, J. O. Berger, A. P. Dawid, & A. F. Smith, *Bayesian Statistics* (pp. 169 - 193). New York: Oxford University Press.

Gillson, I. (2011). *Non-Tariff Barriers to Sub-Saharan African Trade in Food Staples: Opening Regional Markets to Promote Food Security and Price Stabilization.* Washington: The World Bank.

Gladwell, M. (2008). *Outliers.* London: Penguin Books.

Gourdon, J., & Nicita, A. (2012). Non-Tariff Measures: Evidence from Recent Data Collection. In O. Cadot, & M. Malouche (Eds.), *Non-Tariff Measures—A Fresh Look at Trade Policy's New Frontier.* London/Washington, DC: Centre for Economic Policy Re.

Grossman, G. M., & Helpman, E. (1995). The politics of Free Trade Agreements. *American Economic Review vol 85 (4)*, 667 - 90.

Grynberg, R. (2005). *Rules of Origin: Textiles and Clothing Sector.* London: TJI International.

Grynberg, R. (2011). *The Price of Poultry and Beef.* Gaborone, Botswana: Botswana Institute of Development Policy Analysis (BIDPA).

Gujarati, D. N. (1995). *Basic Econometrics, Student Edition of Textbook.* New York: McGraw Hill Higher Education Publishers.

Guo, S. C. (2010). *Statistical Analysis and Data Mining.* John Wiley and Sons.

Haq, Z., Meilke, K., & Cranfield, J. (2011). *The Gravity Model and the Problem of Zeros in Agrifood Trade.* Ontario: Canadian Agricultural Trade Policy and Competitiveness Research Network.

Harrigan, J. (1993). OECD Imports and Trade Barriers in 1983. *Journal of International Economics*, 95-111.

Head, K., & Mayer, T. (2014). Gravity Equations: Workhorse, Toolkit and Cookbook. In G. Gopinath, E. Helpman, & K. Rofoff, *Handbook of International Economics, Vol 4* (pp. 131 - 195). Atlanta: Elsevier, Inc.

Helmers, C., & Pasteel, J. M. (2005). *Assessing Bilateral Trade Potential at the Commodity Level: An Operational Approach.* Geneva, Switzerland: Market Analysis Section (MAS), International Trade Center.

Helpman, E., Melitz, M., & Rubinstein, Y. (2008). Trading partners and trade volumes. *Quarterly Journal of Economics, 123*, 441 - 87.

Henson, S. (2004). *Standards and Trade.* Guelph: University of Guelph.

Hillberry, H. (2002). Aggregation bias, compositional change and border effects. *The Canadian Journal of Economics, 35*, 517-530.

IFAD. (2007). *Gender and Water. Securing water for Rural Livelihoods: The multiple-use systems approach.* Rome: IFAD.

IFPRI. (2012a). *2012 Global Food Policy Report.* Washington, DC: IFPRI Publications.

IFPRI. (2012b). *2012 Global Hunger Index: The Challenge for Hunger: Ensuring Sustainable Food Security Under Land, Water and Energy Stresses.* Washington, DC: IFPRI Publishers.

Imani Development. (2007). *2007 Survey of Non Tariff Barriers to Trade, July 2007.* Johannesburg, South Africa.

ITC. (2012). *Malawi: Company Perspective. An ITC Series on Non-Tariff Measures.* Geneva: International Trade Centre.

ITC. (2013). *Data Sources and Limitations.* Geneva: ITC Publications.

Jackson, R., & Sorensen, G. (1999). *Introduction to International Relations.* Oxford: Oxford University Press.

Jayasinghe, R., Beghin, C., & Moschini, G. (2010). Determinant of World Demand for U.S. corn seeds: the role of trade costs. *American Journal of Agricultural Economics, 92*, 999-1010.

Kalaba, M. (2008). *Exploring COMESA-EAC and SADC Trilateral Free Frade Area:An Approach to Rules of Origin.* Pretoria: Trade and Induatrial Policy Strategies, Working Papers.

Kalaba, M., & Kirsten, J. (2012). Estimating the Quantity Effects of Non Tariff Measures and sADC Meat and Milk Trade. *Second International Conference of International Trade and Investment : Financial Crisis and Trade and Investment in Developing Countries.* Le Maurice: University of Mauritius.

Kee, H. L., Nicita, A., & Ollareaga, M. (2004). *Ad Valorem Equivalents of Non-Tariff Barriers.* Washington, DC: World Bank.

Kee, H. L., Nicita, A., & Ollareaga, M. (2009). Estimating Trade Restrictiveness Indices. *The Economic Journal, 119*, 172-199.

Khandelwal, P. (2004). *COMESA and SADC: Prospects and Challenges for Regional Trade Integration.* IMF Working Paper No. 04/227 (December 2004), Washington, DC.

Kirk, R. (2010). *Addressing Trade Restrictive Non Tariff Measures on Goods in the East African Community.* Washington DC: World Bank.

Koop, G., & Poirier, D. J. (2004). Bayesian variants of some classical semiparametric regression techniques. *Journal of Econometrics, 123*, 259-282.

Koop, G., Poirier, D. J., & Tobias, J. L. (2007). *Bayesian Econometric Methods.* Cambridge: Cambridge University Press.

Leamer, E. E. (1990). *The Structure and Effects of Tariffs and Nontariff Barriers in 1983.* Los Angeles: University of California.

Levchenko, A. (2007). Institutional Quality and International Trade. *Review of Economic Studies, 74;3*, 791 - 819.

Levy, P. I. (1997). A Political Economy Analysis of Free Trade ASgreements. *The American Economic Review. Vol 87. No 4*, 506 - 519.

Leysens, A. J. (2000). The Political Economy of SADC: Challenges and Problems. *Society, Politics and Economics in Africa.*

Linders, M., & de Groot, H. (2006). *Estimation of Gravity Equation in the Presence of Zero Trade Flow.* Amsterdam: Tinberg Institute Discussion Paper TI 2006-072/3.

Liu, L., & Yue, C. (2009). Non -Tariff Barriers to Trade Caused by SPS Measures and Customs Procedures with Product Quality Changes. *Journal of Agricultural and Resource Economics; 34*, 196 - 212.

Lloyd, P. (1996). The Changing Nature of RTAs. In B. Bora, & C. Findlay (Eds.), *Regional Integration and the Asia-Pacific.* Melbourne: Oxford University Press.

Martinez, A., Mora, J., & Signoret, J. E. (2009). *The Core NTMs Database: A Compilation of Reported Non-Tariff Measures.* Washington, DC: US International Trade Commission, Office of Economics.

McCalla. (1969). Protectionism in the International Agricultural Trade, 1850-1968. *Agricultural History, 43*, 329-43.

McCallum, T. (1995). National Borders Matter: Canada-US Regional Trade Partners. *American Review, 85*, 615-623.

Melitz, M. J. (2003). The Impact of Trade on Intra-industry Reallocations and Aggregated Industry Productivity. . *Econometrica, 71 (6)*, 1695 - 1725.

Mmasi, J., & Ihiga, S. (2007). *A Survey Of Non-Tariff Barriers That Affect Tanzanian Imports And Exports Within EAC, SADC and COMESA Countries.* Arusha.

Mmasi, J., & Ihiga, S. (2007). *A Survey Of Non-Tariff Barriers That Affect Tanzanian Imports And Exports Within EAC, SADC and COMESA Countries.* Arusha.

Mooslechner, P. (2013). If Fiscal Union is Possible, Why Not Economic ? *3rd bAnnual NBP Conference on the Future of the European Economy.* Warsaw.

Mthembu-Salter, G. (2007). *The cost of non-tariff barriers to business along the north-south corridor (South Africa-Zimbabwe) via Beit Bridge – a preliminary study.* Johannesburg, South Africa: South African Institute of International Affairs (SAIIA).

Nakajima, J. (2012). *Bayesian Analysis of Latent Threshold Models:Graduate Thesis and Dissertation.* Durham: Duke University.

Nhara, A. (2006). *SADC and COMESA Integration: Separating Myth from Reality.* Harare, Zimbabwe: Trades Centre.

Nicita, A. (2011). *What Information about NTMs do we have and what are we Missing?* Paper presented at the EAAE Conference in Zurich. September 2011.

Nicita, A., & Gourdon, J. (2013). *Preliminary analysis on the newly collected data on Non-Tariff Measures.* New York: United Nations Publication.

Novy, D. (2013). International Trade without CES:Estimating Translog Gravity. *Journal of International Economics, Vol 89, Issue 2*, 271 - 282.

Obsfeld, M., & Rogoff, T. (2000). The Six major Puzzles in Macroeconomics: Is there Common Cause? *NBR Macroeconomics Annual*.

OECD. (2005). *Analysis of Non-Tariff Barriers of Concern to Developing Countries.* OECD Trade Policy Papers, No. 16, OECD Publishing.

Oguledo, V. I., & Macphee, C. R. (1994). Gravity Models: A Reformulation and an Application to Discriminatory Trade Arrangements. *Applied Economics, 26*, 107-120.

Oosthuizen, G. H. (2006). *The southern African Development Community: The organisation, its policies and prospects.* Johannesburg: Acumen Publishing Solutions.

Ornelas, E. (2005). Trade-creating Free Trade Areas and teh Undermining of Multilateralism. 49. *European Economic Review*, 1717 - 1735.

Otsuki, T., Wilson, J., & Sewadeh, M. (2001). What Price Precaution?European Harmonisation of Aflatoxin Regulations and Groundnut Exports. *European Review of Agricultural Economics, 28:*, 263 - 283.

Ottavio, G., Tabuchi, T., & Thisse, J. (2002). Agglomeration and Trade Revisited. *International Economic Review, Vol 43*, 409 - 435.

Pacific Economic Coopeartion Coucil. (2000). *Non-tariff measures in goods and services trade.* Singapore: PECC Secretariat.

Patroba, H., & Nene, M. (2013). *Is SACU Ready for Monetary Union.* Johannesburg: South Africa Instituute of International Affairs (SAIIA).

PECC. (2000). *Non-tariff measures in goods and services.* Singapore: PECC.

Penson, J. B., Capps, O., Rosson, P. C., & Woodward, R. T. (2010). *Introduction to Agricultural Economics.* Boston: Pearson Prentice Hall.

Raballand, G. (2003). Determinants of Negative Impact of being Landlocked on Trade: An Empirical Invetigation through the Central Asian Case. *Comparative Economic Studies, 45*, 520 - 36.

Ranjan, P., & Tobias, J. L. (2007). Bayesian Inference for the Gravity Model. *Journal of Applied Econometrics, 22*, 817-838.

Roningen, V., & Yeats, A. (1976). Nontariff Distortion of International Trade: Some Preliminary Empirical Evidence. *Weltwirtschaftliches Archive, 22*(4), 613-625.

SACU. (2004). *The 2002 Southern African Customs Union (SACU) Agreement.* Windhoek, Namibia.

SADC. (2000). *Treaty of the Southern African Development Community.* Gaborone, Botswana.

SADC. (2003). Annexe of the trade protocol. Gaborone, Botswana.

SADC. (2004). *SADC protocol on trade.* Gaborone, Botswana.

SADC. (2006). *Regional Indicative Strategic Development Plan (RISDP).* Gaborone: SADC Publications.

SADC. (2008). *SADC Free Trade Aarea.* Gaborone, Botswana.

SADC. (2009). *Southern African Development Community Free trade Area Brochure.* Gaborone, Botswana.

SADC. (2012, July). Food Security Early Warning System: Food Security Update. *Monthly*.

SADC. (2013, July). Food Security Early Warning System. *Monthly*.

SADC Secretariat. (2007). *SADC Achievements to date.* Gaborone, Botswana.

SAIIA. (2007). *Non-tariff barriers in Southern Africa - towards a Measurement Approach.* Johannesburg, South Africa.

Salvatore, D. (2011). *International Economics: Trade and Finance* (10 ed.). Singapore: John Wiley and Sons.

SATH. (2011). *Technical Report: 2011 Audit of Implementation of the SADC Protocol on Trade.* USAID Southern African Trade Hub. August 2011. Gaborone, Botswana.

SATH. (2012). *Trade Hub Presents Sixth Audit of the Implementation of the SADC Protocol on Trade.* Gaborone, Botswana.

Schlueter, S. W., Wieck, C., & Heckelei, T. (2009). Regulatory Policies in Meat Trade: Is there Evidence for Least Trade-Distorting Sanitary Regulations? . *American Journal of Agricultural Economics, 9 (51)*, 1484 - 1490.

Schoeman, M. (2004). *From SADCC to SADC and Beyond: The Politics of Economic Integration.* Pretoria, South Africa.

Southern African Global Competitiveness Hub. (2007). *Audit of the Implementation of the SADC Protocol on Trade.* Gaborone, Botswana.

Southern African Global Competitiveness Hub. (2009). *Guide to the SADC Protocol on Trade.* Gaborone.

Stevens, R. D., & Jabara, C. L. (1988). *Agricultural Development Principles: Economic Theory and Empirical Evidence.* Baltimore: The Johns Hopkins University Press.

Tan, M. T., Tian, G.-L., & Ng, K. W. (2010). *Bayesian Missing Data Problems.* New York: Taylor and Francis Publishers.

Tinbergen, J. (1962). *Shaping the World Economy. Suggestion for an International Economic Policy.* New York: The Twentieth Century Fund.

TMSA. (2011). *TradeMark Southern Africa (TMSA), Briefing Information, October 2011.* Pretoria, South Africa.

TMSA. (2012). *TradeMark Southern Africa (TMSA), Briefing Information, October 2012.* Pretoria, South Africa.

UN COMTRDE. (2013). *Trade Statistics accessed via World Integrated Trade Solutions (WITS).* New York: UN Comtrade.

UNCOMTRADE. (2011). *International Merchandise Trade Statistics.* New York: United Nations Statistics Division.

UNCOMTRADE. (2012). *Trade Statistics accessed via World Integrated Trade Solutions (WITS).* New York: UNComtrade, United Nations, USA.

UNCTAD. (2009). *Updated classification of Non Tariff Measures.* Report to the Secretary-General of UNCTAD, December 2009.

UNCTAD. (2010). *Non-Tariff Measures: Evidence from Selected Developing Countries and Future Research Agenda.* United Nations Conference on Trade and Development.

UNCTAD. (2012). *UNCTAD Hand book of Statistics, 2013.* Handbook of Statistics, Geneva, Switzerland.

United Nations. (2010). *Millenium Development Goals 2010 Report.* New York City: United Nations.

United Nations Statistics Division. (2012). *Economic and Statistical Classifications.*

USITC. (2008). *Global Beef Trade: Effects of Animal Health, Sanitary, Food Safety, and Other Measures on U.S. Beef Exports.* Publication 4033, September, Washington, DC.

USITC. (2009). *India: Effects of Tariffs and Nontariff Measures on U.S. Agricultural Exports.* Publication 4107, November, Washington, DC.

van Grasstek, C. (2013). *The History and Future of the World Trade Organisation.* Geneva: WTO Publications.

Viner, J. (1950). *The Customs Union Issue.* New York: Carnegie Endowment for International Peace.

Wilson, J. S., Mann, C. L., & Otsuki, T. (2003). *A New Approach to Quantifying Impact.* Washington DC: World Bank.

Wilson, J., Mann, C., & Otsuki, T. (2005). Assessing the potential benefit of trade facilitation: a global perspective. In P. Dee, & M. Ferrantino (Eds.), *Quantitative Methods for Assessing the Effects of Non-Tariff Measures and Trade Facilitation.* Singapore: World Scientific Ltd. for APEC.

Winchester, W. (2008). Is there a Dirty Little Secret? Non Tariff Barriers and the Gains from Trade. *Journal of POlicy Modeling 31 (6)*, 819 - 834.

Wolfe, R. (2003). Regulatory Transparency, Developing Countries and the World Trade Organisation (WTO). *World Trade Review, 2*(2, July 2003), 157-82.

World Bank. (2010). *Country Classification.* Washington, DC: World Bank.

World Bank. (2012). *World Bank Indicators.* World Bank Data catalogue, Washington DC.

World Bank. (2013). *World Development Indicators.* Washington, DC: World Bank.

WTO. (1994). *General Agreement on Tariffs and Trade: WTO Analytical Index.* Geneva: WTO Publications.

WTO. (2005). *European Communities - Export Subsidies on Sugar.* Geneva: World Trade Organisation.

WTO. (2010). *World Tariffs Profile 2006–2010.* Geneva, Switzerland: World Trade Organisation.

WTO. (2012). *A Practical Guide to Trade Policy Analysis.* Geneva: WTO Publications.

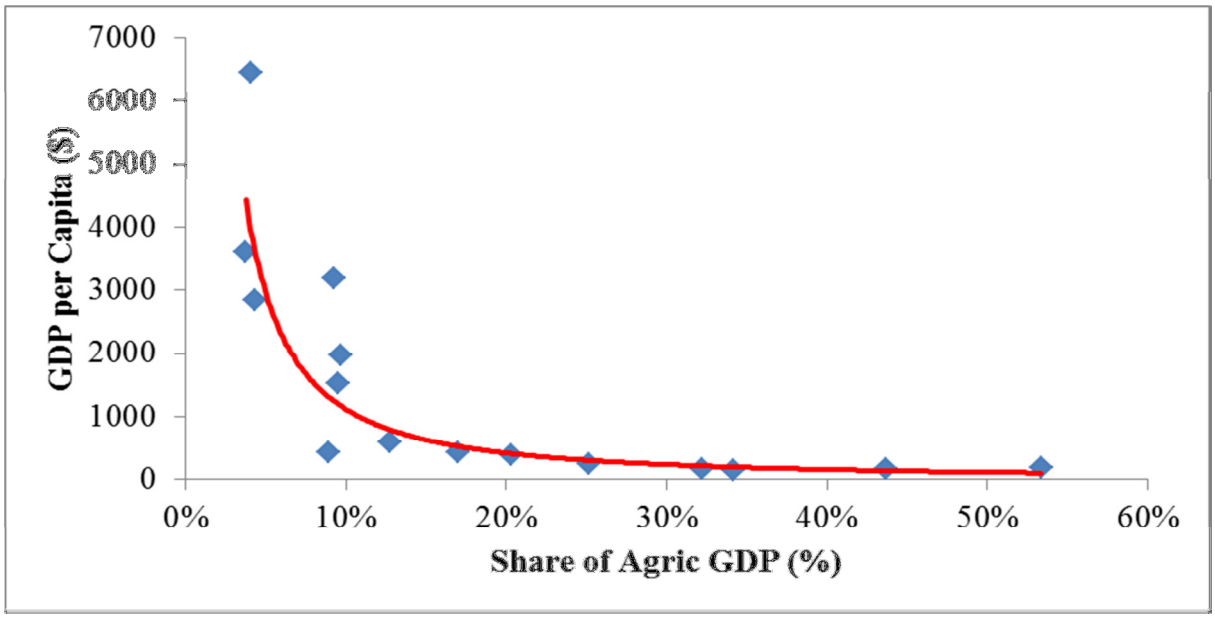
WTO. (2013). *WTO Integrated Trade Databe (IDB).* Geneva: WTO Publications.

Yeats, A. J. (1991). *Can pre-shipment inspection offset non-competitive pricing of developing countries' imports? The evidence from Madagascar.* World Bank.

APPENDIX A

SADC GDP AND PER CAPITA NEXUS

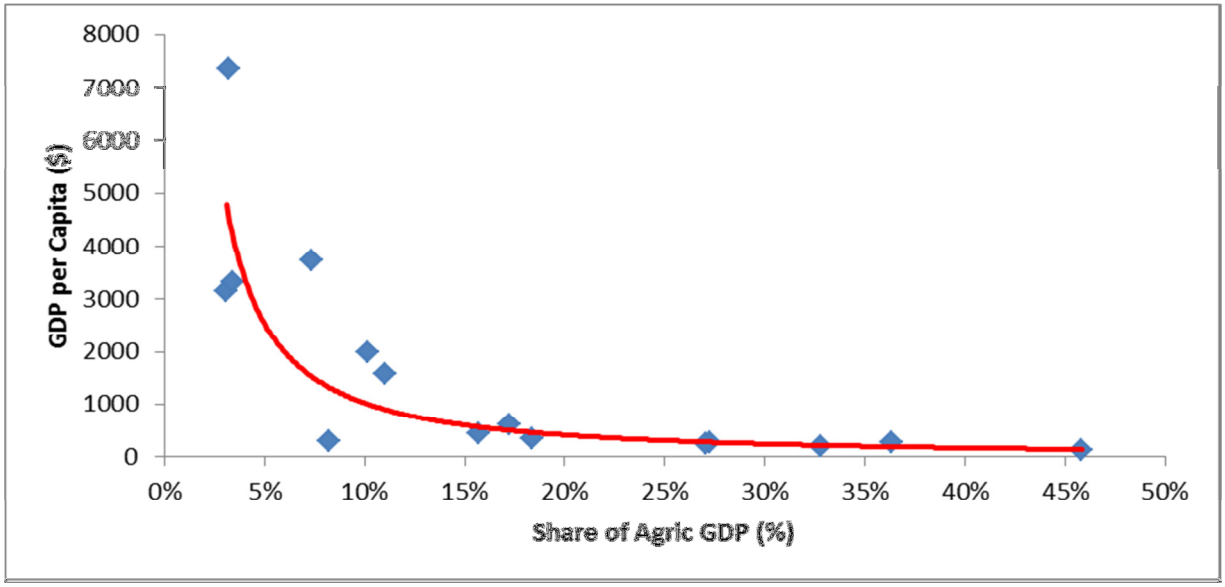
Figure A.1: SADC country agriculture share of GDP -GDP per Capita nexus, 1992 - 1995



Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

(World Bank, 2013)

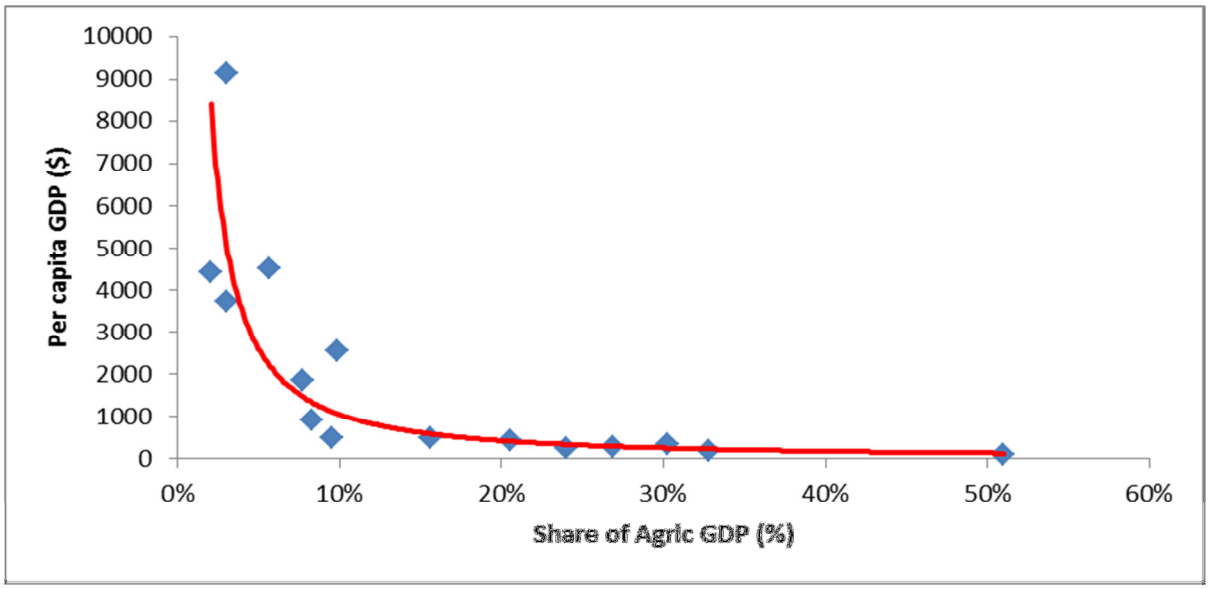
Figure A.2: SADC country agriculture share of GDP -GDP per Capita nexus, 1995 - 2000



Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

(World Bank, 2013)

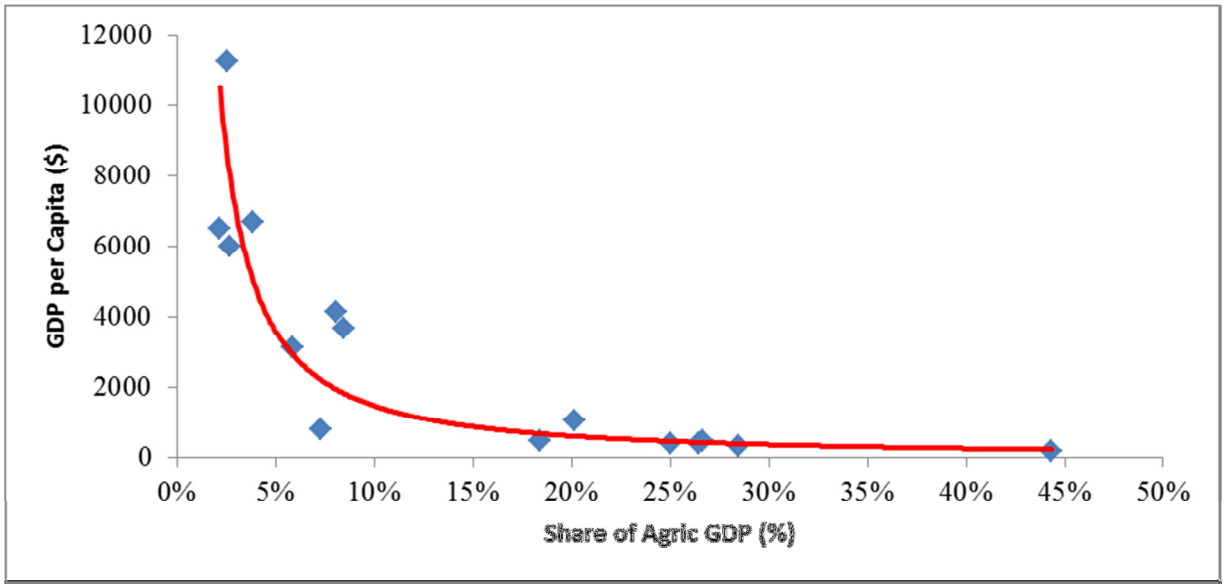
Figure A.3: SADC country agriculture share of GDP -GDP per Capita nexus, 2001 - 2005



Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

(World Bank, 2013)

Figure A.4: SADC country agriculture share of GDP -GDP per Capita nexus, 2006 - 2010



Source: Author's calculations based World Bank Development Indicators (World Bank, 2013)

(World Bank, 2013)

APPENDIX B

SADC FREQUENCY INDEX AND COVERAGE RATIO

Table B.1: SADC Frequency Index (FI) and Coverage Ratio (CR) for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Live animals	100	100	100	100
2	Meat products	100	100	100	100
3	Dairy products	100	100	100	100
4	Live trees, other plant; bulb, root; cutflowers	100	100	100	100
5	Vegetables and certain roots and tubers	100	100	100	100
6	Fruits	100	100	100	100
7	Coffee, tea, matï and spices	67	100	100	100
8	Cereals	100	100	100	100
9	Milling Products	44	100	62	100
10	Oilseeds	82	100	96	100
11	Other vegetable saps& extracts	100	100	100	100
12	Vegetable plaiting materials	25	100	63	100
13	Animal and vegetables fats & oils	100	100	100	100
14	Meat preparations	100	100	100	100
15	Sugars and sugar products	100	100	100	100
16	Cocoa and cocoa preparations	17	100	0	100
17	Cereal preparations, flour, starch; pastry cooks'	80	100	75	100
18	Preparations of vegetable, fruit, nuts or others	100	100	100	100
19	Miscellaneous edible preparations	100	100	100	100
20	Beverages, spirits and vinegar	100	100	100	100
21	Residues & waste from the food industries	100	100	100	100
22	Tobacco and tobacco substitutes	100	100	100	100
23	Cotton	100	100	100	100
24	Wool and animal hair	91	91	100	100
25	Hides and skins	20	63	56	96
26	Other products of animal origin	9	9	14	54
27	Leather products	17	17	18	19
28	Furskins and artificial fur	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.2: Botswana FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Meat products	100.00	100.00	100.00	100.00
2	Cereals	25.00	100.00	6.06	100.00
3	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
4	Animal and vegetables fats & oils	86.67	78.57	98.56	97.33
5	Coffee, tea, matï and spices.	50.00	57.14	96.53	91.17
6	Dairy products	80.00	62.50	43.98	88.60
7	Live trees, other plant; bulb, root; cutflowers	33.33	33.33	51.92	61.60
8	Milling Products	-	42.86	-	58.16
9	Residues & waste from the food industries	-	25.00	-	47.88
10	Cotton	-	10.00	-	21.72
11	Sugars and sugar products	33.33	33.33	6.59	11.85
12	Fruits	18.18	15.38	9.13	9.56
13	Vegetables and certain roots and tubers.	20.00	21.43	49.29	9.09
14	Oilseeds	33.33	14.29	0.21	2.61
15	Cereal preparations, flour, starch/milk; pastry cooks'	20.00	-	0.15	0.00
16	Live animals	-	-	-	-
17	Other products of animal origin	-	-	-	-
18	Other vegetable saps& extracts	-	-	-	-
19	Meat preparations	-	-	-	-
20	Cocoa and cocoa preparations.	-	-	-	-
21	Preparations of vegetable, fruit, nuts or others	-	-	-	-
22	Beverages, spirits and vinegar.	-	-	-	-
23	Tobacco and tobacco substitutes	-	-	-	-
24	Hides and skins	-	-	-	-
25	Leather products	-	-	-	-
26	Furskins and artificial fur	-	-	-	-
27	Wool and animal hair	-	-	-	-
28	Vegetable plaiting materials				

Source: Calculated from compiled SADC NTM database

Table B.3: Malawi FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Meat products	100.00	100.00	100.00	100.00
2	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
3	Cereals	25.00	100.00	6.06	100.00
4	Animal and vegetables fats & oils	86.67	78.57	98.56	97.33
5	Coffee, tea, matï and spices.	50.00	57.14	96.53	91.17
6	Dairy products	80.00	62.50	43.98	88.60
7	Live trees, other plant; bulb, root; cutflowers	33.33	33.33	51.92	61.60
8	Milling Products	-	42.86	-	58.16
9	Residues & waste from the food industries	-	25.00	-	47.88
10	Cotton	-	10.00	-	21.72
11	Sugars and sugar products	33.33	33.33	6.59	11.85
12	Fruits	18.18	15.38	9.13	9.56
13	Vegetables and certain roots and tubers.	20.00	21.43	49.29	9.09
14	Oilseeds	33.33	14.29	0.21	2.61
15	Cereal preparations, flour, starch/milk; pastry cooks'	20.00	-	0.15	0.00
16	Live animals	-	-	-	-
17	Other products of animal origin	-	-	-	-
18	Other vegetable saps& extracts	-	-	-	-
19	Vegetable plaiting materials	-	-	-	-
20	Meat preparations	-	-	-	-
21	Cocoa and cocoa preparations.	-	-	-	-
22	Preparations of vegetable, fruit, nuts or others	-	-	-	-
23	Beverages, spirits and vinegar.	-	-	-	-
24	Tobacco and tobacco substitutes	-	-	-	-
25	Hides and skins	-	-	-	-
26	Leather products	-	-	-	-
27	Furskins and artificial fur	-	-	-	-
28	Wool and animal hair	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.4: Mozambique FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Meat products	100.00	100.00	100.00	100.00
2	Cereals	25.00	100.00	6.06	100.00
3	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
4	Animal and vegetables fats & oils	86.67	78.57	98.56	97.33
5	Coffee, tea, matï and spices.	50.00	57.14	96.53	91.17
6	Dairy products	80.00	62.50	43.98	88.60
7	Live trees, other plant; bulb, root; cutflowers	33.33	33.33	51.92	61.60
8	Milling Products	-	42.86	-	58.16
9	Residues & waste from the food industries	-	25.00	-	47.88
10	Cotton	-	10.00	-	21.72
11	Sugars and sugar products	33.33	33.33	6.59	11.85
12	Fruits	18.18	15.38	9.13	9.56
13	Vegetables and certain roots and tubers.	20.00	21.43	49.29	9.09
14	Oilseeds	33.33	14.29	0.21	2.61
15	Cereal preparations, flour, starch/milk; pastrycooks'	20.00	-	0.15	0.00
16	Live animals	-	-	-	-
17	Other products of animal origin	-	-	-	-
18	Other vegetable saps& extracts	-	-	-	-
19	Meat preparations	-	-	-	-
20	Cocoa and cocoa preparations.	-	-	-	-
21	Preparations of vegetable, fruit, nuts or others	-	-	-	-
22	Beverages, spirits and vinegar.	-	-	-	-
23	Tobacco and tobacco substitutes	-	-	-	-
24	Hides and skins	-	-	-	-
25	Leather products	-	-	-	-
26	Furskins and artificial fur	-	-	-	-
27	Wool and animal hair	-	-	-	-
28	Vegetable plaiting materials				

Source: Calculated from compiled SADC NTM database

Table B.5: Mauritius FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Meat products	100.00	100.00	100.00	100.00
2	Cereals	25.00	100.00	6.06	100.00
3	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
4	Animal and vegetables fats & oils	86.67	78.57	98.56	97.33
5	Coffee, tea, matï and spices.	50.00	57.14	96.53	91.17
6	Dairy products	80.00	62.50	43.98	88.60
7	Live trees, other plant; bulb, root; cutflowers	33.33	33.33	51.92	61.60
8	Milling Products	-	42.86	-	58.16
9	Residues & waste from the food industries	-	25.00	-	47.88
10	Cotton	-	10.00	-	21.72
11	Sugars and sugar products	33.33	33.33	6.59	11.85
12	Fruits	18.18	15.38	9.13	9.56
13	Vegetables and certain roots and tubers.	20.00	21.43	49.29	9.09
14	Oilseeds	33.33	14.29	0.21	2.61
15	Cereal preparations, flour, starch/milk; pastry cooks'	20.00	-	0.15	0.00
16	Live animals	-	-	-	-
17	Other products of animal origin	-	-	-	-
18	Other vegetable saps& extracts	-	-	-	-
19	Meat preparations	-	-	-	-
20	Cocoa and cocoa preparations.	-	-	-	-
21	Preparations of vegetable, fruit, nuts or other	-	-	-	-
22	Beverages, spirits and vinegar.	-	-	-	-
23	Tobacco and tobacco substitutes	-	-	-	-
24	Hides and skins	-	-	-	-
25	Leather products	-	-	-	-
26	Furskins and artificial fur	-	-	-	-
27	Wool and animal hair	-	-	-	-
28	Vegetable plaiting materials				

Source: Calculated from compiled SADC NTM database

Table B.6: Namibia FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Live animals	100.00	100.00	100.00	100.00
2	Meat products	100.00	100.00	100.00	100.00
3	Dairy products	100.00	100.00	100.00	100.00
4	Vegetables and certain roots and tubers.	100.00	100.00	100.00	100.00
5	Fruits	100.00	100.00	100.00	100.00
6	Other vegetable saps& extracts	100.00	100.00	100.00	100.00
7	Animal and vegetables fats & oils	100.00	100.00	100.00	100.00
8	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
9	Tobacco and tobacco substitutes	100.00	100.00	100.00	100.00
10	Cotton	100.00	100.00	100.00	100.00
11	Wool and animal hair	83.33	88.89	92.43	98.83
12	Cereals	75.00	71.43	95.84	98.06
13	Hides and skins	-	71.43	-	97.62
14	Live trees, other plant; bulb, root; cutflowers	75.00	75.00	97.45	97.20
15	Sugars and sugar products	50.00	50.00	87.75	71.69
16	Milling Products	33.33	55.56	72.99	56.98
17	Coffee, tea, matï and spices.	50.00	42.86	70.50	51.92
18	Beverages, spirits and vinegar.	50.00	50.00	33.00	46.94
19	Cereal preparations, flour, starch/milk; pastry cooks'	50.00	60.00	34.33	45.26
20	Meat preparations	25.00	25.00	32.85	27.98
21	Other products of animal origin	14.29	14.29	27.80	24.71
22	Vegetable plaiting materials	33.33	50.00	36.63	24.02
23	Leather products	16.67	25.00	27.69	18.91
24	Oilseeds	12.50	11.11	14.01	12.87
25	Preparations of vegetable, fruit, nuts or others	12.50	12.50	9.30	7.74
26	Cocoa and cocoa preparations.	-	-	-	-
27	Residues & waste from the food industries	-	-	-	-
28	Furskins and artificial fur	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.7: South Africa FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Meat products	100.00	100.00	100.00	100.00
2	Dairy products	100.00	100.00	100.00	100.00
3	Vegetables and certain roots and tubers.	100.00	100.00	100.00	100.00
4	Fruits	100.00	100.00	100.00	100.00
5	Coffee, tea, matï and spices.	50.00	100.00	94.68	100.00
6	Cereals	100.00	100.00	100.00	100.00
7	Milling Products	22.22	100.00	32.82	100.00
8	Oilseeds	28.57	100.00	83.43	100.00
9	Animal and vegetables fats & oils	80.00	100.00	98.83	100.00
10	Cocoa and cocoa preparations.	-	100.00	-	100.00
11	Cereal preparations, flour, starch/milk; pastry cooks'	-	100.00	0.01	100.00
12	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
13	Beverages, spirits and vinegar.	100.00	100.00	100.00	100.00
14	Tobacco and tobacco substitutes	-	100.00	-	100.00
15	Cotton	91.67	90.91	99.83	100.00
16	Live trees, other plant; bulb, root; cutflowers	33.33	50.00	93.31	95.21
17	Residues & waste from the food industries	50.00	42.86	61.12	84.92
18	Vegetable plaiting materials	-		-	50.65
19	Hides and skins	33.33	40.00	43.52	42.76
20	Sugars and sugar products	25.00	25.00	11.24	29.46
21	Live animals	16.67	33.33	0.82	8.71
22	Meat preparations	-	50.00	-	7.85
23	Other products of animal origin	-	-	-	-
24	Other vegetable saps& extracts	-		-	-
25	Preparations of vegetable, fruit, nuts or others	-	-	-	-
26	Leather products	-	-	-	-
27	Furskins and artificial fur	-	-	-	-
28	Wool and animal hair	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.8: Swaziland FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Live animals	100.00	100.00	100.00	100.00
2	Meat products	100.00	100.00	100.00	100.00
3	Dairy products	100.00	100.00	100.00	100.00
4	Vegetables and certain roots and tubers.	100.00	100.00	100.00	100.00
5	Fruits	100.00	100.00	100.00	100.00
6	Cocoa and cocoa preparations.	-	100.00	-	100.00
7	Cereal preparations, flour, starch/milk; pastry cooks'	60.00	100.00	58.25	100.00
8	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
9	Beverages, spirits and vinegar.	100.00	100.00	100.00	100.00
10	Tobacco and tobacco substitutes	100.00	100.00	100.00	100.00
11	Cereals	71.43	75.00	99.70	99.81
12	Coffee, tea, matï and spices.	50.00	50.00	98.22	98.60
13	Residues & waste from the food industries	-	50.00	-	86.45
14	Milling Products	44.44	55.56	56.77	79.08
15	Animal and vegetables fats & oils	73.68	70.00	62.58	76.21
16	Hides and skins	20.00	33.33	7.80	52.71
17	Sugars and sugar products	25.00	25.00	38.82	49.04
18	Cotton	25.00	25.00	1.24	19.08
19	Meat preparations	50.00	50.00	13.78	13.24
20	Oilseeds	25.00	20.00	21.01	11.68
21	Live trees, other plant; bulb, root; cutflowers	25.00	25.00	3.15	3.51
22	Other products of animal origin	12.50	12.50	26.54	2.12
23	Preparations of vegetable, fruit, nuts or others	12.50	12.50	0.36	0.44
24	Other vegetable saps& extracts	-	-	-	-
25	Vegetable plaiting materials	-	-	-	-
26	Leather products	-	-	-	-
27	Furskins and artificial fur	-	-	-	-
28	Wool and animal hair	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.9: Tanzania FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Live animals	100.00	100.00	100.00	100.00
2	Meat products	100.00	100.00	100.00	100.00
3	Vegetables and certain roots and tubers.	100.00	100.00	100.00	100.00
4	Fruits	100.00	100.00	100.00	100.00
5	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
6	Beverages, spirits and vinegar.	100.00	100.00	100.00	100.00
7	Tobacco and tobacco substitutes				100.00
8	Animal and vegetables fats & oils	66.67	90.00	67.62	99.11
9	Live trees, other plant; bulb, root; cutflowers	0	100.00		98.94
10	Hides and skins	-	100.00	-	97.92
11	Residues & waste from the food industries	-	50.00	-	97.62
12	Cereals	-	60.00	-	96.87
13	Preparations of vegetable, fruit, nuts or others	-	28.57	-	90.58
14	Dairy products	-	50.00	-	76.25
15	Coffee, tea, matï and spices.	25.00	66.67	56.81	68.72
16	Other products of animal origin		50.00	-	67.78
17	Cotton	-	50.00	-	63.88
18	Cereal preparations, flour, starch/milk; pastry cooks'	-	50.00	-	63.68
19	Milling Products	-	57.14	-	55.03
20	Meat preparations	100.00	33.33	99.26	17.36
21	Sugars and sugar products	-	66.67	-	2.94
22	Oilseeds	-	16.67	-	0.02
23	Other vegetable saps& extracts	-		-	-
24	Vegetable plaiting materials		-		-
25	Cocoa and cocoa preparations.	-	-	-	-
26	Leather products	-	-	-	-
27	Furskins and artificial fur			-	-
28	Wool and animal hair	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.10: Zambia FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Live animals	-	100.00	-	100.00
2	Meat products	-	100.00	-	100.00
3	Dairy products	100.00	100.00	100.00	100.00
4	Fruits	100.00	100.00	100.00	100.00
5	Cereals	50.00	100.00	99.11	100.00
6	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
7	Beverages, spirits and vinegar.	-	100.00	-	100.00
8	Cotton	-	100.00	-	100.00
9	Oilseeds	-	75.00	-	99.32
10	Residues & waste from the food industries	-	60.00	-	99.17
11	Coffee, tea, matï and spices.	83.33	55.56	99.82	99.17
12	Live trees, other plant; bulb, root; cutflowers	33.33	75.00	99.04	86.66
13	Animal and vegetables fats & oils	76.47	77.78	82.38	81.99
14	Milling Products	-	50.00	-	76.08
15	Vegetables and certain roots and tubers.	15.38	15.38	51.44	48.05
16	Sugars and sugar products	-	25.00	-	41.60
17	Cereal preparations, flour, starch/milk; pastry cooks'	-	40.00	0.02	24.22
18	Hides and skins	-	-	-	15.43
19	Meat preparations	-	25.00	-	15.08
20	Preparations of vegetable, fruit, nuts or others	-	12.50	-	9.96
21	Other products of animal origin	-	-	-	-
22	Other vegetable saps& extracts	-	-	-	-
23	Vegetable plaiting materials	-		-	-
24	Cocoa and cocoa preparations.	-	-	-	-
25	Tobacco and tobacco substitutes	-	-	-	-
26	Leather products	-	-	-	-
27	Furskins and artificial fur		-	-	-
28	Wool and animal hair	-	-	-	-

Source: Calculated from compiled SADC NTM database

Table B.11: Zimbabwe FI and CR for 2000 and 2010 (%)

Rank	HS2 Description	FI 2000	FI 2010	CR 2000	CR 2010
1	Meat products	85.71	100.00	99.15	100.00
2	Fruits	-	100.00	-	100.00
3	Cereals	100.00	100.00	100.00	100.00
4	Sugars and sugar products	100.00	100.00	100.00	100.00
5	Miscellaneous edible preparations.	100.00	100.00	100.00	100.00
6	Beverages, spirits and vinegar.	-	100.00	-	100.00
7	Cotton	-	100.00	-	100.00
8	Dairy products	87.50	100.00	99.91	100.00
9	Coffee, tea, matï and spices.	42.86	37.50	90.44	92.39
10	Animal and vegetables fats & oils	68.42	72.22	95.42	88.60
11	Residues & waste from the food industries	25.00	40.00	18.25	46.52
12	Oilseeds	20.00	10.00	23.63	33.01
13	Live trees, other plant; bulb, root; cutflowers	-	25.00	-	21.76
14	Live animals	-	16.67	-	7.32
15	Milling Products	-	44.44	-	3.82
16	Vegetables and certain roots and tubers.	-	7.14	-	1.46
17	Cereal preparations, flour, starch/milk; pastry cooks'	20.00	20.00	0.22	0.25
18	Other products of animal origin	-	-	-	-
19	Other vegetable saps& extracts	-	-	-	-
20	Vegetable plaiting materials	-	-	-	-
21	Meat preparations	-	-	-	-
22	Cocoa and cocoa preparations.	-	-	-	-
23	Preparations of vegetable, fruit, nuts or others	-	-	-	-
24	Tobacco and tobacco substitutes	-	-	-	-
25	Hides and skins	-	-	-	-
26	Leather products	-	-	-	-
27	Furskins and artificial fur	-	-	-	-
28	Wool and animal hair	-	-	-	-

Source: Calculated from compiled SADC NTM database

APPENDIX C

Table C.1: Number of NTMs imposed by SADC countries in the year 2000 by NTM-Digit 1 level

NTM/Country	BWA	MOZ	MUS	MWI	NAM	SWZ	TZA	ZAF	ZMB	ZWE
A	95	28	5	45	100	13	46	94	13	9
B	61	11	4	0	0	96	2	96	1	23
C	0	0	0	0	0	0	0	0	0	0
D	10	0	1	6	98	0	9	27	1	10
E	4	0	0	0	89	78	15	105	34	3
F	0	0	2	20	0	62	25	2	3	16
G	0	0	0	0	0	0	0	0	0	0
H	4	0	0	0	0	35	0	24	0	0
I	0	0	0	0	0	0	0	0	0	0
J	0	0	0	0	0	0	0	0	2	0
K	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0
N	0	0	10	0	0	0	0	0	0	0
O	39	39	39	39	39	39	39	39	39	39
P	7	56	0	55	19	57	28	34	5	28
Total	**220**	**134**	**61**	**165**	**345**	**380**	**164**	**421**	**98**	**128**

Source: SADC NTM database, 2012

*For information on NTM Code description, see Table 3.1.

Table C.2: Number of NTMs imposed by SADC countries in the year 2010 by NTM-Digit 1 level

NTM/Country	BWA	MOZ	MUS	MWI	NAM	SWZ	TZA	ZAF	ZMB	ZWE
A	178	50	97	105	100	57	151	106	298	49
B	131	65	65	19	54	122	6	200	6	49
C	0	26	4	0	0	0	4	22	0	0
D	21	41	40	19	119	64	13	30	7	10
E	85	208	45	22	107	78	19	130	51	48
F	0	12	9	22	0	62	31	2	36	49
G	0	0	0	0	0	0	0	0	0	0
H	4	0	9	0	5	35	0	29	0	0
I	0	0	0	0	0	0	0	0	0	0
J	0	0	0	0	0	0	0	0	2	0
K	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0
N	0	0	0	0	0	0	0	0	0	0
O	42	42	42	42	42	42	42	42	42	42
P	46	100	36	59	59	57	49	35	76	96
Total	**507**	**544**	**61**	**288**	**486**	**517**	**164**	**596**	**518**	**343**

Source: SADC NTM database, 2012

*For information on NTM Code description, see Table 3.1.