THE IMPACT OF NON-TARIFF MEASURES ON MEAT TRADE BETWEEN SOUTHERN AFRICAN CUSTOMS UNION (SACU) AND ZAMBIA

by

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DECLARATION

I, Phaswana Pfarelo Edwin, declare that the thesis, which I hereby submit for the degree MSc. (Agric) Agricultural Economics at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other institution.

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ABSTRACT

THE IMPACT OF NON-TARIFF MEASURES ON MEAT TRADE BETWEEN SOUTHERN AFRICAN CUSTOMS UNION (SACU) COUNTRIES AND ZAMBIA

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The Southern African Development Community (SADC) displayed notable success in pushing for trade liberalisation through tariff reductions. This was achieved following the signing of the SADC protocol on trade in 1996. The implementation of the protocol commenced in 2000. About 85 % of intra-SADC trade was free of duty in 2008 and the Southern African Development Community Free Trade Area (SADC-FTA) was launched. Maximum tariff reductions were achieved in 2012. The main aim for SADC tariff reductions under the trade protocol was to improve intra-SADC trade. However, this is not what happened, since the relationship between tariffs and trade was not inverse as assumed. The response of intra-SADC agricultural trade to tariff liberalisation was disappointing.

This study investigated why there has been lack of trade improvement, even though tariff liberalisation has been achieved in SADC. The study, however, is limited to a focus on the meat trade between SACU countries and Zambia. The trading partners were selected for the study since they all displayed substantial progress in implementing their tariff liberalisation commitments under the SADC protocol on trade. The meat trade was chosen for this study due to the importance of livestock to the people of these countries. Prior assessments of trade statistics revealed that the meat trade between SACU countries and Zambia has remained very low, notwithstanding tariff liberalisation. As a result, the main objective of the study was to investigate why there has been little improvement in the meat trade between these countries following tariff liberalisation. It is documented in the trade literature that the continuous decline in tariffs prompted the use of non-tariff measures (NTMs) in regulating trade. This study investigated if NTMs contributed to low levels of meat

trade between the trading partners. In particular, the study examined the impact of NTMs on the meat trade between SACU countries and Zambia over the period 2001 to 2013. The study also examined the impact of GDP per capita and meat production volumes.

The gravity model was preferred for this study, based on the model's outstanding achievements when explaining bilateral trade relationships. Due to the prevalence of zero trade observations, the study used the Heckman sample selection model to estimate the gravity equation. The estimation model was chosen due to its exceptional capability in dealing with zero trade observations as well as sample selection bias. The results confirmed the observation that the relationship between tariffs and trade in meat is not inverse, as expected. It found a statistically insignificant relationship, further confirming the fact that tariff liberalisation had not influenced improvement in meat trade between the trading partners. The study found a statistically significant, negative effect of NTMs on meat trade. As a result, the study concluded that NTMs contributed to low meat trade between SACU countries and Zambia. The results found a positive and statistically significant relationship between GDP per capita and meat trade, and a negative and statistically significant relationship between meat production volumes and trade.

Key words: Tariff liberalization, meat trade, NTMs, GDP per capita and meat production volumes.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

AAHC   Aquatic Animal Health Code

AOA   Agreement on Agriculture

COMESA   The Common Market for Eastern and Southern Africa

FANRPAN   Food Agriculture and Natural Resources Policy Analysis Network

FAO   Food and Agriculture Organisation

FTA   Free Trade Area

GDP   Gross Domestic Product

IPPC   The international Plant Protection Convention

ITC   International Trade Centre

NTBs   Non-Tariff Barriers

NTMs   Non-Tariff Measures

OECD   Organisation for Economic Co-operation and Development

OLS   Ordinary Least Squares

RESET   Regression Error Specification Test

RTA   Regional Trade Agreements

SACU   Southern African Customs Union

SADC   Southern African Development Community

SPS   Sanitary and Phytosanitary measures

TAHC   Terrestrial Animal Health Code

TBT   Technical Barriers to Trade

UNCTAD   United Nations Conference on Trade and Development

WHO   World Health Organisation

WITS   World Integrated Trade Solution

WTO   World Trade Organisation

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Many countries started the process of liberalising trade in the period after World War II. Countries implemented various forms of trade liberalisation, including tariff reductions and eliminations. Substantial liberalisation has been experienced since the early 1980s. Developing countries also commenced with trade liberalisation during this period. This process intensified during the 1990s, and tariff levels and other barriers to trade declined significantly in most of the countries, worldwide (Terborgh, 2003; Lee, 2005).

In agricultural trade, the signing of the Agreement on Agriculture (AOA) was one of the earlier milestones in endeavouring to resolve the problem of high levels of agricultural trade protection. The AOA formed part of the Uruguay Round of multilateral trade negotiations over the period 1986 to 1994. It came into force in 1995 and covered various trade liberalisation measures, including tariff reductions (Fielke, 1995; Beierle, 2002).

Further to the AOA, countries have engaged in the creation of various trade associations and agreements as a way to further improve market access (Grant and Lambert, 2008). This was evidenced by the rising trend of Regional Trade Agreements (RTAs) since the early 1990s (Fadeyi, 2013). The same trend has also been experienced in Africa (Meyer, Fenyes, Breitenbach and Idsardi, 2010).

The Southern African Development Community (SADC) is one of the RTAs in Africa which has displayed a notable success, through tariff reductions, in pushing for trade liberalisation. It has a total of 15 member countries which are Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe (Kalenga, 2012). Of the 15 member counties, five countries, namely, South Africa, Botswana, Lesotho, Namibia and Swaziland are also members of the Southern African Customs Union (SACU) (Kirk and Stern, 2003).

After signing the SADC protocol on trade in 1996 and commencing with implementation in 2000, SADC successfully achieved its Free Trade Area (FTA) in 2008 when tariffs on 85 % of intra-SADC trade were reduced to zero in 2008. Maximum tariff reductions were achieved in 2012 (Sandrey, 2013). The SADC protocol on trade aimed, among other things, to improve trade between SADC member states (Kalenga, 2012).

According to Kalenga (2012), the Southern African Customs Union (SACU) countries were the leading SADC members in implementing their tariff liberalisation commitments under the SADC protocol on trade. They completed their liberalisation commitments in 2008. The other countries which displayed notable progress in tariff liberalisation were Zambia, Tanzania and Mauritius. Zambia completed its tariff phase down in December 2011. The other member countries, such as Zimbabwe, lagged behind with their commitments and in some cases applied for, and were granted, derogation from the protocol (Kalenga, 2012).

It is indicated in the literature that trade liberalisation often leads to improved trade. The empirical findings by Terborgh (2003), using historical trade and tariff data for trading partners, showed that there is indeed an inverse relationship between trade and tariffs. This is also consistent with theoretical trade literature which hypothesises a negative relationship between trade and tariffs. Ackah and Morrissey (2005) contend that trade liberalisation should expose economies to international trade and lead to an increase in trade volumes.

In the SADC region, however, the study by Kalaba and Kirsten (2012) indicates that the response of intra-SADC trade-to-trade liberalisation has displayed a disappointing trend. They further indicated that although intra-SADC agricultural trade had improved slightly in the earlier years after the members commenced with implementation of the SADC trade protocol. Intra-SADC agricultural trade declined from above 20 % in 2000 to below 15 % in 2008. This is the opposite of what is expected when trading partners reduce trade protection in the form tariffs.

1.2 BACKGROUND OF THE STUDY

SACU countries and Zambia were selected as the trading partners for scrutiny in this study. SACU countries were selected since they were the leading SADC countries in

the process of implementing their tariff reduction commitments under the SADC trade protocol on trade. Zambia was chosen since it also displayed sufficient progress in implementing its tariff reduction commitments under the protocol. The meat trade was chosen for this study due to the role and importance of livestock in SACU countries and Zambia.

In Zambia, livestock farming plays a very important role at household level, as a greater part of the Zambian rural population depends on livestock for survival (Sinkala, Simuunza, Muma, Pfeiffer, Kasanga and Mweene, 2014). The contribution of livestock to household incomes in Zambia can be as high as 45 % (Lubungu and Mofya-Mukuka, 2012).

In South Africa, livestock farming is practised throughout the country and it contributes both in economic and social terms. It contributes substantially to food security and sustainability, especially in the rural areas (Department of Agriculture, 2006). FANRPAN (2011) reported that in Swaziland livestock is a livelihood asset of great importance to the people of the country. They derive several benefits such as income, food, and as a form of investment. In Namibia, a World Bank (2012) policy note outlines the point that the livestock sector plays an important role in both growth and job creation. The sector contributes largely to private employment in the country. Furthermore, the sector is also important due to its contribution to livelihoods and food security of the people of the country.

Botswana's livestock sector, especially the beef industry, is a substantial contributor to the GDP of the country. However, the agriculture sector's overall contribution to GDP has declined over the years (Seanama Conservation Consultancy, 2012). In Lesotho, the livestock sector plays an important role for both economic and social reasons (SPEAR (Pty) Ltd and BFAP, 2014). A research report by Freeman, Kaitibie, Moyo and Perry (2008) has found that livestock farming is one of the most important livelihood activities to the people of Lesotho.

The discussion above confirms the importance of the livestock sector to the people of both SACU countries and Zambia. This implies that any improvement to the sector would help improve the role the sector plays in the lives of people of these countries. If trade in the products of this sector, such as meat, can improve, it will present an

opportunity for increased income earnings. As a result, the livelihoods of the people of these countries will improve.

1.3 PROBLEM STATEMENT

The relationship between tariffs and trade has proven to be inverse (Terborgh, 2003). However, in the SADC when tariffs were reduced, this was not accompanied by increasing trade. The response of intra-SADC trade to tariff liberalisation displayed a disappointing trend. Even though intra-SADC agricultural trade had improved slightly in the earlier years after the members commenced with the implementation of their tariff liberalisation commitments under the SADC trade protocol, it declined from above 20 % in 2000 to below 15 % in 2008 (Kalaba and Kirsten, 2012).

If the lack of improvement in intra-SADC trade continues, it would mean that the governments of SADC countries cannot capture the welfare benefits associated with trade liberalisation. These include the benefits for consumers such as increased availability of food, lowered and wider domestic food prices, and extended consumer choice. These benefits would encourage increased food consumption and also improve food security. Benefits for producers include access to larger markets, improved resource allocation, and reduction in production costs. For developing countries, increased trade would result in improved foreign exchange earnings. This would result in increased availability of funding for other development-related investments. All these benefits, combined, would result in overall improvement of livelihoods in the region (OECD, 2005; OECD, 2009).

Focusing on the response of trade in selected products among individual SADC member states, one also arrives at the same conclusion, that trade response to tariff reductions has been very poor. Meat trade volumes between SACU countries and Zambia show a lack of improvement in trade following the reduction in tariffs (ITC Trade Map, 2015). As discussed, SACU countries were the leading SADC countries in implementing their tariff liberalisation commitments under the SADC trade protocol, while Zambia also displayed sufficient progress in implementing its tariff liberalisation commitments (Kalenga, 2012). However, the meat trade between these trading partners failed to improve correspondingly.

The trade statistics from ITC Trade Map (2015) show that the export of meat from Zambia to the SACU was very low throughout the period 2001 to 2013. Relative to Zambia's meat exports to the world, Zambia's meat exports to the SACU were very low, and remained below 15 % per cent of its total meat exports to the world. Furthermore, it has been very unstable over the period. Likewise, the statistics show that SACU's meat exports to Zambia remained very low throughout the period 2001 to 2013. It further shows that, when compared with SACU's total exports to the world, SACU's meat exports to Zambia remained, relatively, very low (See figure 1.1 below).
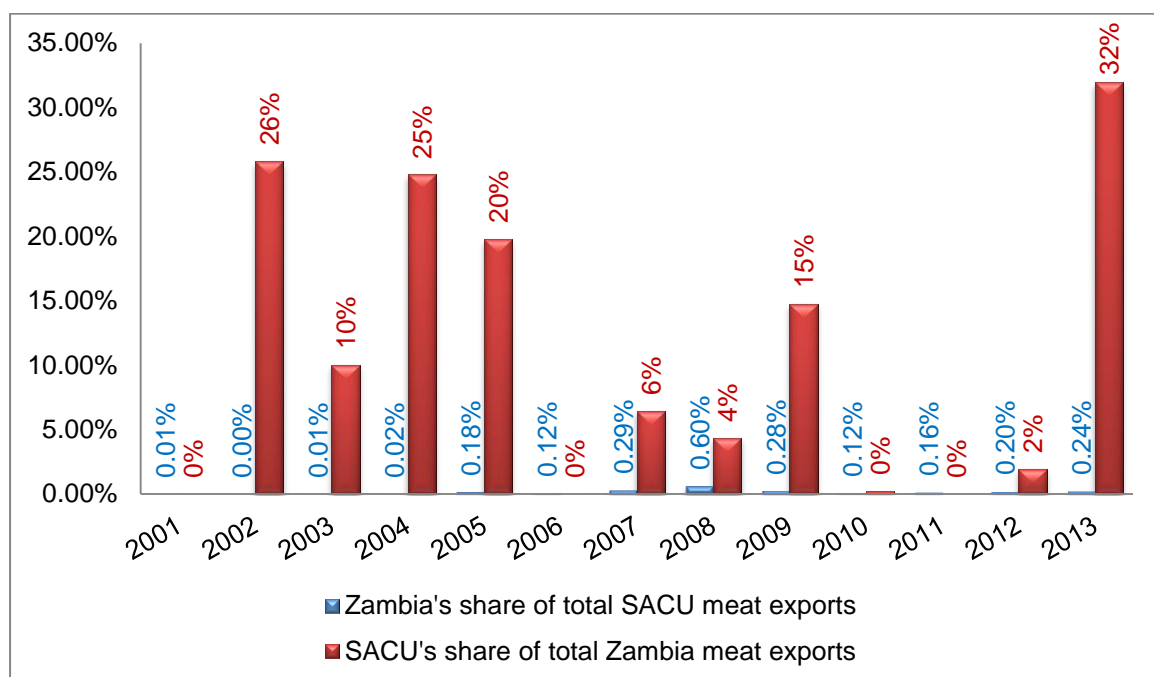
Figure 1.1: Meat trade between SACU and Zambia

Source: Author's diagram with statistics from ITC Trade map, 2015

Although tariff reductions and elimination are expected to result in improved trade, the discussion above may suggest that this has not happened in the case of intra-SADC trade, and specifically meat trade between SACU countries and Zambia. This SADC trade–tariff relation is problematic given that SADC countries are not able to derive the full benefits from efforts of tariff liberalization, and needs to be understood in detail, as well as its effects on future trade. As a result, it is imperative to explore other factors with the potential to restrict meat trade between SACU and Zambia.

It is documented in the trade literature that the continuous decline in tariffs has prompted the use of non-tariff measures (NTMs) in regulating trade (FAO, 2006; Kalaba and Kirsten, 2012; Kirk, 2010; UNCTAD, 2013). NTMs are defined in UNCTAD (2013) as being all policy-related trade costs, other than tariffs, incurred by producers from the initial point of production to the point where the product reaches the consumers. These measures have become the main focus in trade protection and are seen as significantly affecting trade in products of agricultural origin (FAO, 2006; UNCTAD, 2013).

1.4 OBJECTIVES OF THE STUDY

The main objective of the study is to investigate why there has been a lack of improvement in meat trade between SACU countries and Zambia after tariff liberalisation. As discussed above, the decline in tariffs has resulted in the rise to prominence of NTMs in regulating trade. As a result, the study aims to address the following specific objectives:

- To examine the impact of NTMs on meat trade between SACU and Zambia.
- To examine the impact of GDP per capita on meat trade between SACU countries and Zambia.
- To examine the impact of meat production volumes on meat trade between SACU and Zambia.

1.5 HYPOTHESES OF THE STUDY

In the SADC region, where the SACU countries and Zambia are located, there is evidence that NTMs are heavily used in regulating trade. The study by Kalaba and Kirsten (2012) found that there is heavy usage of NTMs in regulating intra-SADC agricultural trade, including regulating trade in meat and dairy products in the region. Therefore, the researcher is of the view that NTMs are the main reason why there is a lack of improvement in the meat trade between the SACU and Zambia. It is against this background that this study examines the impact of NTMs on the meat trade between SACU countries and Zambia.

The impact of NTMs on trade varies on a case-by-case basis. Some researchers have found a negative relationship between NTMs and trade, while others have

found the opposite. As a result, this study will test the following hypotheses in line with the specific objectives:

- NTMs negatively contributed to the low levels of meat trade between SACU countries and Zambia.
- GDP per capita positively affects meat trade between SACU countries and Zambia.
- Meat production volumes negatively affect meat trade between SACU countries and Zambia.

1.6 RESEARCH METHODOLOGY

The study uses the gravity model in examining the impact of NTMs, GDP per capita, and meat production volumes on the meat trade between the SACU and Zambia. The gravity model has been used by many researchers in explaining bilateral trade flows. It has become an integral part of trade literature (Linders and De Groot, 2006). According to Kareem (2013), the gravity model is preferred by many researchers due to its extraordinary accomplishments in predicting trade flows.

According to Bicker (2009), a gravity model specifies that trade flow from one country to another depends on: (i) the supply conditions in the exporting country; (ii) the demand conditions in the importing country; and (iii) several other factors which may either encourage or discourage such trade flow. The original expression of the gravity model in international trade, as specified by Tinbergen in 1962, can be expressed in the following form (Kareem, 2013):

$$X_{ij} = \beta_0 (Y_i)^{\beta_1} (Y_j)^{\beta_2} (D_{ij})^{\beta_3} \mu_{ij} \qquad (1.1)$$

where X_{ij} represents the value of imports of country i from country j; Y_i and Y_j are GDPs of trading partners; and D_{ij} represents bilateral distance. μ_{ij} is the error term which captures the effect of any other factors with the potential to affect bilateral trade Xij, other that the factors mentioned above. In line with Biker (2009), the GDP of the exporting country would represent the supply conditions in the country of origin, while that of the importer would represent the demand conditions in the importing country. The other factors which may either encourage or discourage trade are captured by the distance variable and the error term.

7

The gravity model is used for this study due to its ability to examine the relationship between trade and the factors with the potential to affect trade. The model has already been used by many researchers to analyse the impact of several factors which may either encourage or discourage trade, such as tariffs, other trade costs, and NTMs. In this sense, the model requires very little adjustments to suite the current study.

In order to examine the impact of NTMs, GDP per capita, and meat production volumes on the meat trade between the SACU and Zambia, the current study estimates the following gravity equation:

$$lnM_{ijt} = \gamma_0 + \gamma_1 lnGDPPC_{it} + \gamma_2 lnMPV_{jt} + \gamma_3 lnISTrade_t + \gamma_4 \ln(1 + Tar_{ijt}) + \gamma_5 NTM_{ijt} + \gamma_6 lnDist_{ij} + \gamma_7 ADJ_{ij} + \varepsilon_{ijt}$$

(1.2)

where:

lnM_{ijt} is meat import volumes by country i from j in year t;

$GDPPC_{it}$ is the GDP per capita for the importing country i at time t;

MPV_{jt} is meat production volumes of country j at time t;

ISTrade is the intra-SACU meat trade volume for a specific SACU country at time t

Tar_{ijt} represents the tariff applied by country i on imports from country j and time t;

$Dist_{ij}$ is the distance between countries i and j;

NTM_{ijt} is the NTM dummy variable;

ADJ_{ij} is the common border dummy variable; and

ε_{ijt} is the error term.

The factors which are of special interest for this study, as shown in the objectives above, are NTMs captured by the NTM dummy variable, GDP per Capita and meat production volumes. In assessing the impact of NTMs, this study will rely on the NTM dummy variable coefficient. If the coefficient has a positive sign, it would mean that NTMs are positively related to meat trade. As a result, the study will reject the hypothesis that NTMs negatively affect meat trade between SACU and Zambia. If

the sign is negative, we will fail to reject the hypothesis of the study and conclude that, indeed, NTMs contributed to low meat trade between these trading partners.

Likewise, in order to assess the impact of GDP per capita and meat production volumes, the study will rely on the coefficients of these variables. For either of the two, if the coefficients have expected positive signs, it would mean that the factors are positively related to meat trade. As a result, the study will fail to reject the hypothesis that these factors have a positive relationship with meat trade between SACU and Zambia. If the sign is negative, we will reject the hypothesis and conclude that these factors also contributed to the low meat trade volumes between SACU and Zambia.

This study uses panel data. Panel data offer several advantages: larger data sets with more variability and less collinearity among the variables, more reliable estimates due to additional and more informative data, the ability to control for individual heterogeneity, and the ability to detect and estimate effects that cannot be detected using pure cross-sections or pure time-series data (Hsiao, 1986).

The SACU countries included in the analysis are South Africa, Botswana, Namibia and Swaziland. Lesotho is, however, not part of the analysis due to data unavailability. This study focuses on the meat trade data between SACU countries and Zambia over the period 2001 to 2013. The study period was chosen to track meat trade performance during the period when SACU countries and Zambia were expected to have commenced and completed their tariff reduction commitments under the SADC protocol on trade. The study, however, extends the study period by a year beyond this point in order to capture any impact that tariff reductions in the last year, 2012, might have had on trade performance in the following year, 2013.

Data for the dependent variable, *meat trade* (M_{ijt}) between SACU and Zambia and intra-SACU meat trade ($ISTrade_t$) was obtained from the ITC trade map. The dataset was supplemented by data from the World Integrated Trade Solution (WITS, 2015). In terms of the Harmonized Classification (HS) Code, meat is classifiable under Chapter 2 and the data was collected at heading (HS4 digit) level.

Data on meat production volumes (MPV_{jt}) was sourced from the FAO statistics database and is expressed in kilograms. The data on GDP per capita ($GDPPC_{it}$) for

the countries was sourced from the World Bank Development Indicators database and is expressed in real terms as US$ dollars. Data on tariffs (Tar_{itj}) was obtained from the Department of Trade and Industry, and data on distance ($Dist_{ij}$) was obtained from the website www.indo.com/distance. Data on the Common border (ADJ_{ij}) was obtained from the World Atlas.

Data for the variable NTM (NTM_{ijt}) was obtained from the database developed by Kalaba (2014). The data was updated to ensure that it covers the whole period of study, based on whether there was a notice of withdrawal of applied NTMs or the introduction of new NTM beyond the period covered by the database. If there was no notice of either of the two possible intentions, it is concluded that the status quo in the previous year remains.

1.7 JUSTIFICATION OF THE STUDY

Successful tariff liberalisation is expected to result in improved trade between trading partners (Terborgh, 2003; Ackah and Morrissey). If trade does not improve accordingly, it means that any welfare gains which might come with successful tariff reductions cannot be reaped. These gains will continue to be lost if nothing is done to try to improve trade. This is the case with the meat trade between SACU and Zambia (OECD, 2005; OECD, 2009).

If nothing is done, these trading partners will continue to lose the benefits which should be associated with their efforts of successfully reducing tariffs. The people of SACU and Zambia will not benefit from the increased availability of food, lowered and wider domestic food prices, and extended consumer choices. Meat producers will not gain from larger markets, improved resource allocation, and reductions in production costs (OECD, 2009).

By examining the factors with the potential to affect the meat trade, this study will provide clarity as to which factors had negatively or positively affected trade. In terms of NTMs, specifically, the study will clarify whether they should be prioritised in trying to improve the meat trade between the SACU and Zambia.

In this sense, policy makers in SACU countries and Zambia will benefit from the study. The study will inform them as to whether they should prioritise NTMs when

drafting policies aimed at improving meat trade between these countries, or explore other factors with the potential to encourage or discourage trade. Should they be successful and trade improve, the overall livelihood of the people in these countries would improve through the increased availability of food, lowered food prices, larger market size, and reduction in meat production costs.

1.8 ORGANISATION OF THE STUDY

The rest of this report is outlined as follows. Chapter 2 presents an overview of the selected trading partners; Chapter 3 presents a review of the relevant research work done by other researchers and organisations, together with other information deemed relevant to this study; Chapter 4 presents a discussion on the empirical approach used to assess the specific objectives, and the results thereof are presented in Chapter 5. Chapter 6 presents the summary, conclusions and recommendations.

CHAPTER 2: OVERVIEW OF THE TRADING PARTNERS

2.1. INTRODUCTION

This chapter provides an overview of the trading partners in terms of the factors deemed relevant to this study. This is done to gain an understanding of the dynamics in these factors since they can, in one way or another, have an impact on the level of meat trade between the two trading partners, SACU and Zambia. These factors are GDP; population size; and meat production trends. The participation of the trading partners in the global meat trade will also be discussed, coupled with an overview of various legislative provisions, for individual countries, which might have a bearing in the regulation of trade in meat. The work on legislative provisions is done to understand if the use of NTMs by the trading partners can be linked to their respective legislative frameworks.

2.2 SOUTHERN AFRICAN CUSTOMS UNION

The SACU dates as far back as 1910. Namibia is the last SACU member to join the union, doing so when it became independent in 1990. The close economic relations of SACU countries existed even before the formation of the union owing to their geographic locations, adjacent to each other. South Africa is the leading country in terms of economic size. The other four member states are heavily dependent on South Africa for a considerable portion of their trade, investment, employment, etc. Lesotho is the smallest country in terms of economic size (Kirk and Stern, 2003).

2.2.1 Gross Domestic Product (GDP)

Table 2.1 below presents the annual real GDP growth rates of the five SACU countries in the period 2001 to 2013. It is clear from the table that all the SACU countries experienced volatile annual GDP growth rates throughout the period. However, positive GDP growth rates have been reported for most part of the period under consideration. South Africa reported the highest annual GDP growth rate of 5.60% in 2006. In 2009, South Africa reported a negative growth rate of -1.54%. Botswana also reported a negative GDP growth rate of -7.65% in the same year. This is period around the global economic recession. However, Botswana recorded

very high annual GDP growth rates in the period post 2009 reaching the highest at 11.34% in 2013.

Table 2.1 SACU countries' annual GDP growth rates, 2001-2013 (%)

Years	South Africa	Botswana	Lesotho	Namibia	Swaziland
2001	2.74	0.25	3.56	1.18	1.05
2002	3.67	6.07	0.72	4.79	4.38
2003	2.95	4.63	4.56	4.24	3.88
2004	4.55	2.71	1.69	12.27	3.62
2005	5.28	4.56	3.47	2.53	6.00
2006	5.60	8.36	4.23	7.07	5.99
2007	5.36	8.28	4.83	6.62	4.44
2008	3.19	6.25	6.74	2.65	0.82
2009	-1.54	-7.65	2.15	0.30	1.57
2010	3.04	8.56	6.07	6.04	3.79
2011	3.28	6.05	6.90	5.09	2.25
2012	2.21	4.46	6.00	5.06	4.72
2013	2.49	11.34	1.84	5.61	6.42

Source: World Bank development indicators (2014)

Lesotho reported positive annual GDP growth rates throughout the period 2001 to 2013. The lowest annual GDP growth rate reported in Lesotho was 0.72% in 2002 while the highest was 6.90% reported in 2011. Likewise, both Namibia and Swaziland reported positive growth rates throughout the period 2001 to 2013. Namibia's highest growth rate was 12.27% reported in 2004 and the lowest was 0.30% reported in 2009. In Swaziland, the highest annual GDP growth rate was reported in 2013 at 6.42% while the lowest was 0.82% in 2008.

2.2.2 Population

Table 1.2: SACU countries' population numbers

Years	South Africa	Botswana	Lesotho	Namibia	Swaziland
2001	44 909 738	1 762 531	1 871 489	1 931 005	1 074 765
2002	45 546 345	1 786 672	1 885 488	1 957 749	1 082 195
2003	46 127 031	1 810 438	1 898 778	1 980 531	1 087 949
2004	46 727 694	1 835 750	1 912 042	2 002 745	1 094 775
2005	47 349 013	1 864 003	1 925 844	2 027 026	1 104 642
2006	47 991 699	1 895 671	1 940 345	2 053 915	1 118 204
2007	48 656 506	1 930 431	1 955 656	2 083 174	1 134 853
2008	49 344 228	1 967 866	1 972 194	2 115 703	1 153 750
2009	50 055 701	2 007 212	1 990 413	2 152 357	1 173 529
2010	50 791 808	2 047 831	2 010 586	2 193 643	1 193 148
2011	51 553 479	2 089 706	2 032 950	2 240 161	1 212 458
2012	52 341 695	2 132 822	2 057 331	2 291 645	1 231 694
2013	53 157 490	2 176 510	2 083 061	2 346 592	1 250 641

Source: World Bank development indicators (2014)

All the five SACU countries have experienced increases in population size, over time. South Africa experienced the highest increase in population numbers over the period 2001 to 2013, increasing by a net of over 8 million people. Population size increased by a net of less than 500 000 people in each of the other SACU countries in the same period. These increases in population numbers mean that the market sizes in these countries have increased. This could be expected to encourage more meat trade since the expansion of the market size would create more demand for meat.

2.2.3 Meat regulations, production and trade

This section presents a discussion on selected items of legislation passed by SACU countries relating to the trade in meat. These items of legislation provide the basis upon which any regulations aimed at regulating trade should be developed. This section also surveys the trends for meat production and trade over the period 2001 to 2013.

2.2.3.1 South Africa

This subsection presents a discussion on selected items of South African legislation related to meat production and trade. South Africa, like any other country, would be expected to have legislation aimed at controlling its domestic industries and sectors. In terms of meat production, this subsection presents meat production trends in terms of four meat categories, namely beef, mutton, pork and chicken. Trade is presented in terms of both overall meat trade and trade in the four meat trade categories referred to above.

2.2.3.1.1 Legislation related to meat production and trade

There are a number of items of legislation dealing with issues of meat trade in South Africa and the responsibility for administering this legislation rests with several role players or authorities. These regulations are in place to ensure that safe meat is sold within the boundaries of South Africa, and that locally produced meat and meat products conform to the regulations of meat imports in other countries in the case of meat produced for export. The importation of meat into South Africa is assessed in accordance with this legislation, as well as the relevant international standards (Department of Health, 2004).

The Agricultural Products Standards Act, 119 of 1990, regulates product quality standards for the domestic and the export markets. This Act regulates the classification and marking of meat intended to be sold in the South African market. Among other things, the Act ensures that meat that is sold in the South African market complies with the sales requirements in terms of correct classification, marking, meat treatment, and description (Department of Health, 2004).

The Meat Safety Act (Act 40 of 2000) deals with several issues related to meat processing, including meat safety and hygiene standards. The Act also regulates the import and export of unprocessed meat into and out of the borders of South Africa. The Health Act (Act 63 of 1977), through the general regulations promulgated in terms of the Public Health Act, 1919 (G.N. No. R. 180 of 10 February 1967), regulates issues in relation to the transport of meat and meat products (Department of Health, 2004).

The legislation discussed above is mainly aimed at restricting the entry into the South African market of products which are deemed to be unsafe for the country's consumers. That is, any meat and/or meat products destined for the South African market will be denied access to the South African market if it is found to pose risk to the domestic consumers. Although this legislation has been enacted to protect consumers, the impact on trade can be restrictive. This is so because if countries targeting the South African market fail to meet the required standards or measures developed based on the legislation, their products will not be permitted to enter the South African market.

2.2.3.1.2 Meat production trends
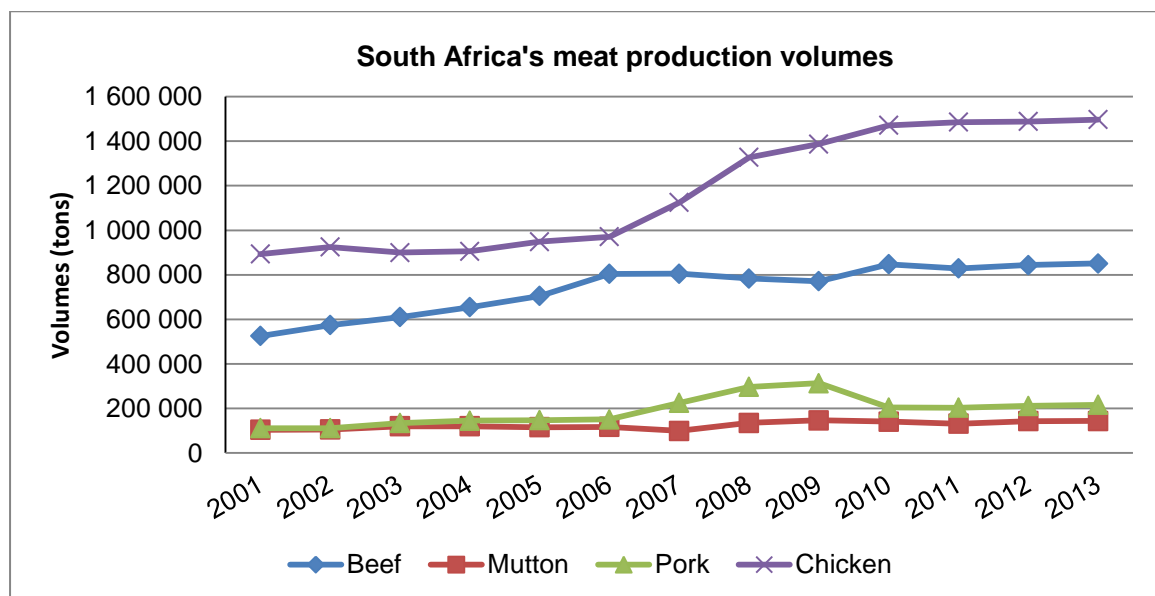
Figure 2.1: South Africa's meat production volumes (tons), 2001 to 2013

Source: Author's diagram with statistics from FAO (2015)

Generally, meat production volumes in South Africa increased over the period 2001 to 2013. Figure 2.1 above shows that the highest meat production volume was experienced in chicken meat. Chicken meat production remained relatively stable between 2001 and 2006, and started picking from 2007 onwards. Overall, chicken meat volumes increased from 893 000 tons in 2001 to approximately 1.5 million tons in 2013. Beef production increased from 525 000 tons in 2001 to 851 000 tons in 2013, although production showed a slight decline between 2006 and 2009. The

lowest volumes of meat produced were experienced for mutton and pork, with volumes below 400 000 tons over the period.

2.2.3.1.3 Trade in meat

South Africa's meat trade

Figure 2.2: South Africa's meat trade in tons, 2001 to 2013

Source: Author's diagram with statistics from ITC trade map (2015)

In terms of meat trade, Figure 2.2 above shows that South Africa was a net importer of meat throughout the period 2001 to 2013. Import volumes increased from approximately 144 000 tons in 2001 to 389 000 tons in 2006, before declining to 296 000 tons in 2008. However, import volumes increased again to 497 000 tons in 2013. The highest volume of meat imports was experienced in 2012, at 521 000 tons. Meat export volumes declined over the period 2001 to 2006, falling from 26 000 tons to 12 000 tons. The highest volume of meat volumes exported by South Africa was 168 000 tons in 2011.

Table 2.3: South Africa's meat trade by categories (tons)

Years	Beef		Mutton		Chicken		Pork	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2001	13 222	9 820	39 238	168	63 722	7 213	10 262	636
2002	13 278	11 454	20 034	179	80 473	8 873	11 675	1 187
2003	19 037	6 936	18 053	379	125 433	4 391	21 786	639
2004	24 098	7 022	22 894	146	154 054	3 429	26 674	642
2005	29 289	2 907	29 074	490	189 134	1 564	32 655	991
2006	26 856	4 395	40 727	252	259 242	1 871	26 564	757
2007	29 062	3 115	36 906	437	236 631	1 926	29 718	974
2008	17 033	4 194	33 199	471	189 339	2 713	24 366	3 105
2009	26 529	5 398	18 476	736	205 200	12 415	33 037	2 437
2010	36 883	16 143	26 766	4 280	239 631	61 817	35 158	7 262
2011	48 099	51 312	23 994	10 416	325 168	82 704	41 329	20 115
2012	53 906	16 608	21 477	1 166	369 971	63 708	39 470	5 968
2013	54 564	19 316	18 865	1 364	354 317	51 607	31 726	7 155

Source: ITC Trade Map, (2016)

Table 2.3 above disaggregates trade statistics in terms of the major livestock meat categories – beef, mutton, chicken and pork. In terms of imports, the table shows that South Africa's highest imports of meat were for poultry, at approximately 2.8 million tons over the period 2001 to 2013, followed by beef at about 392 000 tons, pork at about 365 000 tons, and mutton at about 350 000 tons. The same picture applies for exports, where poultry had the highest export quantities, followed by beef, pork and mutton, in that order. The table also shows that South Africa was a net importer of meat in all the meat categories in all the years, except for beef in 2011, when the country was a net exporter of meat.

Since South Africa was a net importer of meat throughout the period 2001 to 2013, as shown in Figure 2.2 and Table 2.3, it would be expected that this should have presented an opportunity to potential international exporters of meat, including Zambia, to sell into the South African market. However, with regard to Zambia, trade statistics from the ITC Trade Map reflect otherwise. It shows that Zambia's exports of meat to South Africa and to SACU did not improve over that period.

2.2.3.2 Botswana

This subsection presents a discussion on Botswana's legislation related to meat production and trade. The subsection also presents an analysis of meat production and trade trends over the period 2001 to 2013. Production and trade volumes are presented in terms of the four meat categories, namely beef, mutton, pork and chicken.

2.2.3.2.1 Legislation related to meat production and trade

The Botswana Meat Commission Act, Law 22 of 1965, makes provision, among other things, for the establishment of the Botswana Meat Commission. It terms of trade, the Act prohibits the export of cattle and edible cattle products by any person other than the Commission, unless the exporter is in possession of the permit. The Act also addresses the licensing of the export slaughter houses, in conjunction with the Control of the Livestock Industry Act (FAOLEX, 2016a).

The Control of Livestock Industry Act, Proclamation 67 of 1941, makes provision for the export of meat from Botswana. The Act provides that any meat for export should be transported directly from the export slaughter house and that the director of veterinary services should have first given permission for such meat to be exported. It prohibits the slaughtering of livestock for export by any person or business if not done at the export slaughter house. It also makes provisions on the construction of export slaughter houses (FAOLEX, 2016b).

The Diseases of Animals Act, 9 of 1977 (as amended), makes provision for the prevention and control of diseases in animals in Botswana. This is done by regulating the trade and movement of animals, and providing for the quarantine of animals in certain circumstances. The Act stipulates that no person is allowed to import or export animals or products thereof into or from Botswana with the capability of carrying animal diseases, without the requisite permission. Under this Act, the country also has strict border controls which include quarantine and testing of suspected animals and the products thereof (FAOLEX, 2016c).

The Livestock and Meat Industries Act makes provision for the slaughter of animals for human consumption, the control and operation of abattoirs, meat processing plants, cutting premises, canning plants, and the marketing, grading and inspection

19

of meat. It covers issues relating to meat inspection, hygiene standards, testing of livestock products for residues or contaminating substances, meat quality standards, grades and marking, meat handling, storage and transportation, and livestock products export levies (FAOLEX, 2016d).

These items of legislation are mainly directed at ensuring that consumers are supplied with safe meat and meat products. Furthermore, the legislation is also aimed at ensuring the prevention and elimination of animal diseases which can be spread by the trade in products of animal origin. Although the intentions of these legislative instruments are legitimate, their impact on trade, when implemented through measures developed based on the legislation, can be protective and hence negatively impact on trade.

2.2.3.2.2 Meat production trends

Figure 2.3: Botswana's meat production volumes (tons), 2001 to 2013

Source: Author's diagram with statistics from FAO (2015)

Figure 2.3 above shows that the highest volumes of meat produced in Botswana over the period 2001 to 2013 were reported for beef, followed by chicken, mutton and pork, in that order. Beef production increased slightly between 2001 and 2007, from 33 750 tons to 35 000 tons, and further increased to 47 000 tons in 2013. Chicken meat production volumes declined from 9 360 tons in 2001 to 7 200 tons in

2013. Meat production volumes for pork and mutton remained very low throughout the period 2001 to 2013.

2.2.3.2.3 Trade in meat
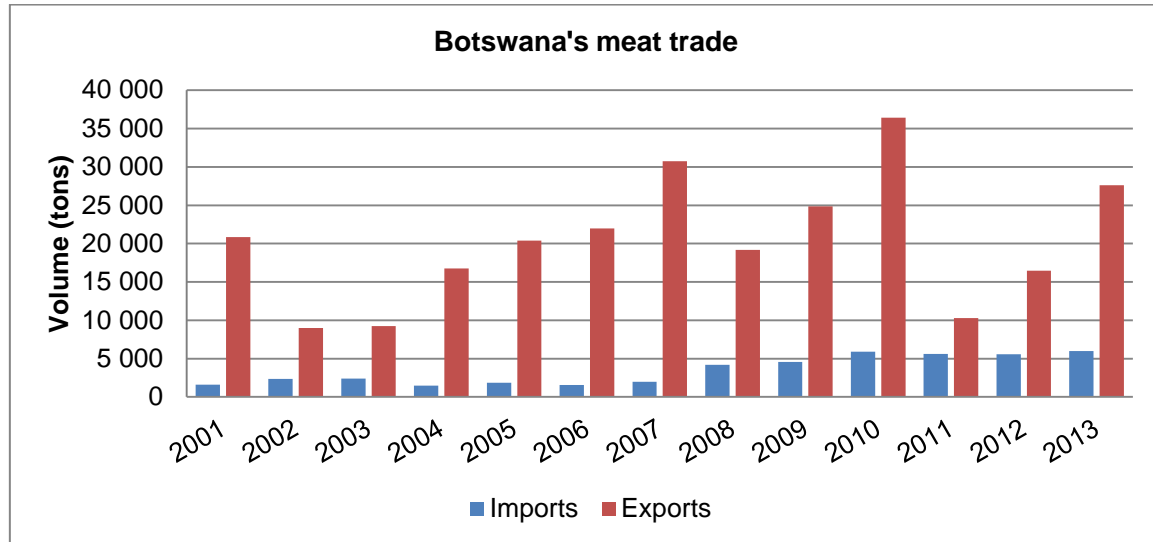
Figure 2.4: Botswana's meat trade in tons, 2001 to 2013

Source: ITC trade map (2015)

Figure 2.4 above shows that Botswana was a net meat exporter over the period 2001 to 2013. There have been notable fluctuations in meat exports from Botswana. Meat exports increased from 20 857 tons in 2001 to 30 765 tons in 2007, and further increased to 36 416 tons in 2010, before declining to 27 598 tons in 2013. Import volumes remained very low throughout the period 2001 to 2013. Import volumes increased slightly from 1 594 tons in 2001 to 1 988 tons in 2007, and further increased to 6 005 tons in 2013.

Table 2.4 Botswana's meat trade by categories (tons)

Years	Beef		Mutton		Poultry		Pork	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2001	261	20 738	796	0	123	0	157	24
2002	662	8 534	845	0	254	0	317	45
2003	159	8 988	570	4	332	0	312	2
2004	203	15 936	314	0	246	0	530	99
2005	171	20 012	491	53	108	1	853	182
2006	482	20 947	435	4	231	0	178	39
2007	166	30 512	244	1	496	0	338	91
2008	265	18 574	593	0	2 309	22	676	1
2009	411	24 864	335	0	2 759	1	820	3
2010	429	36 315	253	0	4 246	8	549	86
2011	354	10 176	224	0	3 633	25	716	88
2012	466	16 428	178	0	3 648	2	768	28
2013	991	27 497	246	0	3 036	1	914	56

Source: ITC Trade Map, 2016

Table 2.4 above shows that most of the meat imports by Botswana over the period 2001 to 2013 were for poultry, followed by pork, mutton and beef, in that order. The highest meat exports were reported for beef, followed by pork. In terms of mutton and poultry, exports were very low throughout the period, with even zero export values being recorded for most of the years. Although both Figure 2.4 and Table 2.4 show that Botswana was a net exporter of meat over the period 2001 to 2013, Table 2.4 provides more clarity to that effect. The table shows that Botswana was only a net exporter of beef, and a net importer for all the other meat categories.

2.2.3.3 Lesotho

This subsection presents a discussion on Lesotho's legislation related to meat production and trade. The subsection also presents an analysis of meat production and trade trends over the period 2001 to 2013. Production and trade volumes are presented in terms of the four meat categories, namely beef, mutton, pork and chicken.

2.2.3.3.1 Legislations related to meat production and trade

Lesotho has several items of legislation and regulations dealing with livestock and livestock products trade. The Lesotho Export and Import Control Act, No 16 of 1984 as amended, regulates the import and export of the products into and from Lesotho. Under this Act, all importers are required to register with the Ministry of Trade and Industry, Cooperatives and Marketing in order to be allowed to import. With respect to exporters, the Act sets out the procedures for registration to be allowed to export. Furthermore, there are no duties or levies applied to exports (WTO, 2009).

The Agriculture Marketing Act, 26 of 1967, regulates the import and export of agricultural produce into and from Lesotho. The Act requires that an import or export permit should obtained by any person desiring to import or export agricultural produce. There are several provisions which deal with the SPS measures for livestock and livestock products. These include the Importation of Livestock Products Proclamation, 57 (1952), the Stock Diseases Proclamation (Amendment), and the Stock Diseases Regulations of 1973 (WTO, 2009).

The Stock Diseases (Amendment) Act of 1984 deals with issues of livestock diseases by preventing the introduction and spread of diseases among livestock in the Kingdom of Lesotho. The Act prevents the introduction of diseases from outside the borders of Lesotho by regulating the importation of livestock and the movement of livestock within the borders of Lesotho. It also ensures better disease management by making provisions for the notification of disease outbreaks in Lesotho (WTO, 2009).
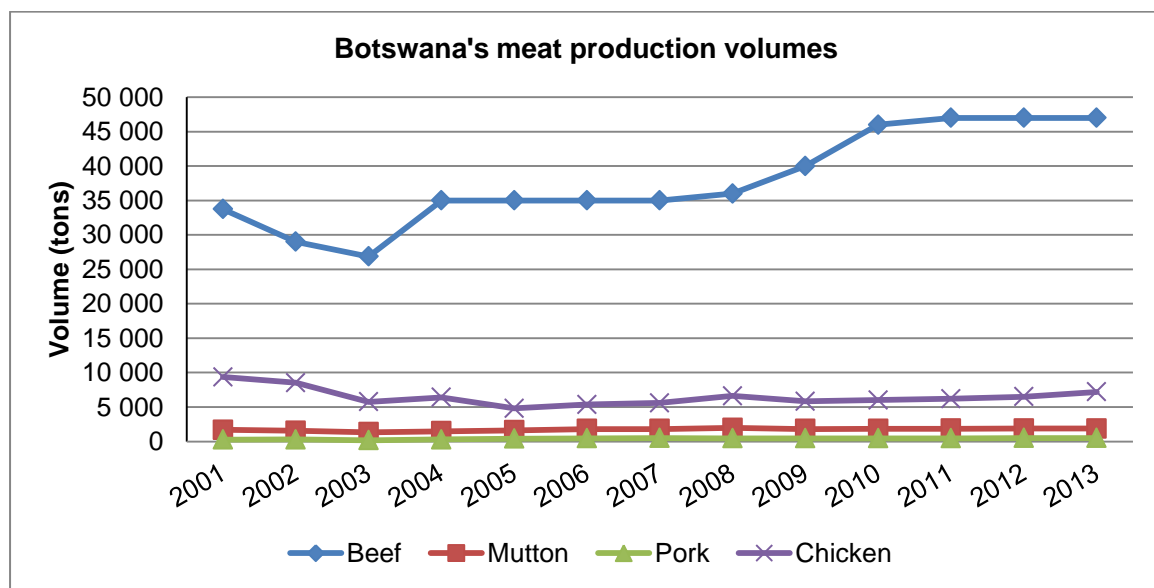
2.2.3.3.2 Meat production trends
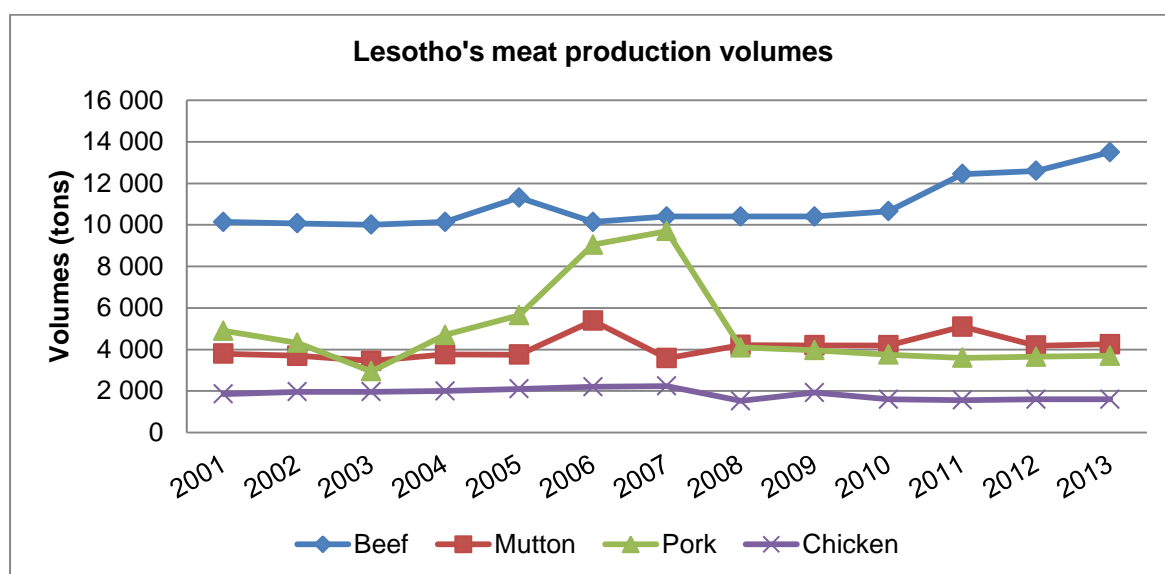
Figure 2.5: Lesotho's meat production volumes (tons), 2001 to 2013

Source: Author's diagram with statistics from FAO (2015)

Figure 2.5 above shows meat production volumes in Lesotho. Pork production declined from 4 900 tons in 2001 to 2 950 tons in 2003. Pork production increased from 2 950 tons in 2003, and reached its peak in 2007, at 9 706 tons. However, it declined significantly to 4 100 tons in 2008 and further declined to 3 700 tons in 2013. The lowest meat production volumes were realised in chicken. Chicken production volumes displayed a stable trend throughout the period, only declining slightly from 1 852 tons in 2001 to 1 600 in 2013.

2.2.3.3.3 Trade in meat

Table 2.5: Lesotho meat trade (tons), 2001 to 2013

Year	Exports (tons)	Imports (tons)
2001	-	-
2002	-	-
2003	14	6 839
2004	-	-
2005	-	-
2006	-	-
2007	-	-
2008	13	10 942
2009	1	16 223
2010	10	2 384
2011	8	19 340
2012	0	16 500
2013	-	-

Source: ITC Trade map (2015)

As can be gleaned from Table 2.5 above, Lesotho was a net importer of meat over the period 2001 to 2013. There were no trade volumes recorded for the years 2001, 2002, 2004, 2005, 2006 and 2007. Meat export volumes remained very low, with the highest volume of meat exports of 13 tons in 2008. Meat import volumes increased from 6 839 tons in 2003 to 10 942 tons in 2008, and further increased to 16 500 tons in 2012. The highest volume of meat imported was 19 340 tons in 2011.

2.2.3.4 Namibia

This subsection presents a discussion on Namibia's legislation related to meat production and trade. The subsection also presents an analysis of meat production and trade trends over the period 2001 to 2013. Production and trade volumes are presented in terms of the four meat categories, namely beef, mutton, pork and chicken.

2.2.3.4.1 Legislations related to meat production and trade

The regulation of the meat industry in Namibia is anchored by the Meat Industry Act, No 12 of 1981, as amended by the Meat Industry (Amendment) Act (No. 21 of 1992) and the Animal Health Act, No 1 of 2011. The Meat Industry Act (Act No 12 of 1981) provides for the establishment of the Namibia Meat Board, which is responsible for the control of all the features of the meat industry. It terms of trade, the Meat Industry Act gives powers to the Meat Board to take any measures aimed at regulating the trade in livestock, meat and meat products. The Act also grants powers to the Meat Board to regulate the import and export of meat and meat products, as well as proscribing the sale of these products where they do not meet the packaging, labelling and quality requirements (FAOLEX, 2016e).

The Animal Health Act (Act No 1 of 2011) makes provision for measures related to diseases prevention and control, and places restrictions on the trade of animals, animal products and restricted material. It also provides for animal movement control and traceability. The Act stipulates that no imports of animals or animal products can be made into Namibia unless the importer is in possession of the required permit, and that the imports must be in accordance with conditions in the permit. The Act also stipulates that no one should import any animals or animal products if the person knows or believes that such is infected. This Act prohibits the export of animals or animal products from Namibia without a health certificate issued by the Chief Veterinary Officer (FAOLEX, 2016f).

In terms of disease prevention and control, the Animal Health Act stipulates that, if the owner of animals knows or has reason to suspect that the animals are infected with a disease, he/she should take relevant actions to prevent the spread of disease. These actions include notifying the veterinary official, isolating the infected animals, and providing appropriate treatment for the infected animals. The Act further grants powers to the veterinary officer to seize the infected animals and animal products, and if warranted, destroy or depose of such. The same treatment should be provided for any other animal which may have been in contact with the infected animals or with any premises housing the infected animals (FAOLEX, 2016f).

The legislation is mainly aimed at restricting the trade in animals and animal products without permission from the authorities. The Animal Health Act clearly states that any trade without permission from the Chief Veterinary Officer is prohibited. If the process to obtain such permission is cumbersome or not transparent, it might negatively affect the trade in products subject to the permission. Furthermore, if the Chief Veterinary Officer is not convinced that such trade will not result in the spread of animal diseases, the permission will not be granted and hence prevent trade from taking place (FAOLEX, 2016f).

2.2.3.4.2 Meat production trends
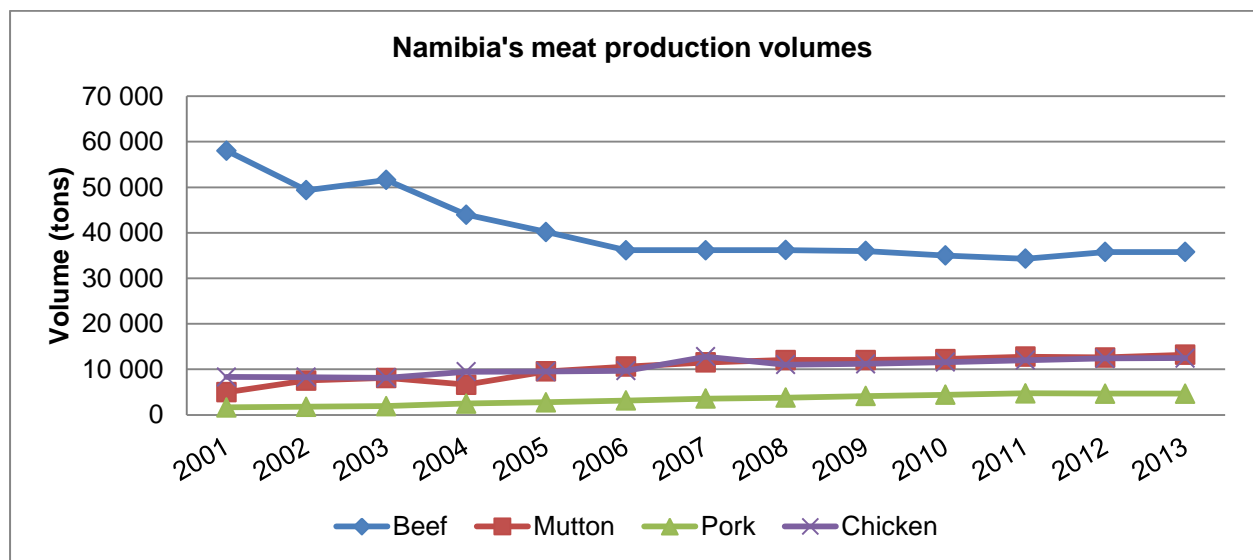
Figure 2.6: Namibia's meat production volumes (tons), 2001 to 2013

Source: Author's diagram with statistics from FAO (2015)

Figure 2.6 above shows that the highest volumes of meat produced in Namibia over the period 2001 to 2013 were reported for beef. However, beef production volumes displayed a declining trend throughout the period. Meat volumes declined from 58 035 tons in 2001 to 36 164 tons in 2007, and further declined to 35 800 tons in 2013. Meat production volumes for mutton, pork and chicken displayed increasing trends. Mutton increased from 4 984 to 13 200 tons; chicken increased from 8 320 to 12 480 tons; and pork increased from 1 650 to 4 675 tons in 2013.

2.2.3.4.3 Trade in meat
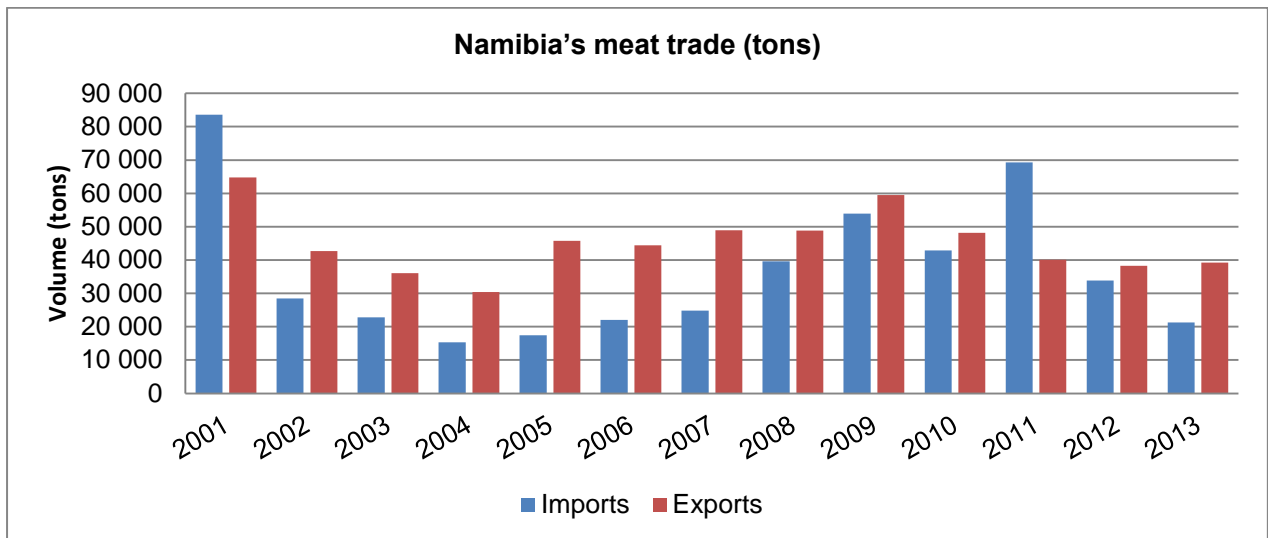
Figure 2.7: Namibia's meat trade in tons, 2001 to 2013

Source: Author's diagram with statistics from ITC trade map (2015)

Namibia was a net exporter of meat over the period 2001 to 2013. The country was a net importer of meat only in 2001 and 2011. Meat imports fell from 83 607 tons in 2001 to 24 809 tons in 2007, before increasing to 69 320 tons in 2011. However, meat imports declined again to 21 243 tons in 2013. Meat exports declined from 64782 tons in 2001 to 48 937 tons in 2007, and further declined to 39 190 tons in 2013. This might be mainly attributed to the declines in production volumes, especially for beef, over the period as shown in Figure 2.6 above.

Table 2.6: Namibia's meat trade by categories

Years	Beef		Mutton		Chicken		Pork	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2001	1 508	57 327	3 888	6 602	15 022	27	11 700	214
2002	1 118	35 211	2 144	6 266	3 890	178	4 517	265
2003	862	25 481	1 670	7 198	1 927	311	4 411	27
2004	663	21 603	165	7 919	7 094	623	3 208	345
2005	1 033	25 736	182	16 800	8 616	2 067	2 972	933
2006	2 305	23 234	257	14 661	10 765	3 298	2 496	1 572
2007	2 974	28 682	274	16 113	10 643	1 654	2 799	296
2008	3 380	27 018	128	14 851	26 936	4 203	3 103	399
2009	3 782	31 664	58	20 606	35 479	6 130	5 176	152
2010	1 834	29 140	70	17 448	34 021	569	4 201	183
2011	659	24 010	65	15 041	38 786	247	27 375	84
2012	455	20 314	60	14 245	30 149	2 335	2 314	195
2013	675	20 176	52	16 102	16 982	1 508	2 746	198

Source: ITC Trade Map (2016)

Table 2.6 above shows that Namibia was a net exporter of beef and mutton, while it was a net importer of chicken and pork for all the years, over the period 2001 to 2013. Highest import volumes were recorded for poultry, followed by pork, beef and mutton, in that order. Most imports of mutton declined significantly over the period, from over 3 000 tons in 2001 to below 100 tons in 2013. In terms of exports, the highest volumes were reported for beef, followed by mutton, poultry and pork, in that order.

2.2.3.5 Swaziland

This subsection presents a discussion on Swaziland's legislation related to meat production and trade. The subsection also presents an analysis of meat production and trade trends over the period 2001 to 2013. Production and trade volumes are presented in terms of the four meat categories, namely beef, mutton, pork and chicken.

2.2.3.5.1 Legislations related to meat production and trade

The Animal Health Act, No 7 of 1965, regulates the entire local and cross-border livestock and livestock product movement in Swaziland. The Act makes provision for regulations on animal disease control, which include close monitoring and quick reporting of animal diseases, imposition of immediate provisional quarantine measures, notification procedures, and controls over the importation of animals and animal products (WTO, 2015a).

The Veterinary Public Health Act, 17/2013, regulates the import and export of raw and processed foods of animal origin in order to secure sustainable food safety to high levels of consumer protection. The Act makes provision for the official control of slaughter facilities and food establishments, and for quality control of locally produced foods of animal origin for local consumption and export, and imported products (WTO, 2015a).

The Veterinary Public Health Act also makes provision for the certification of both imports and exports of foods of animal origin. At a port of entry, all the imported animal products are inspected by veterinary officials to check if they meet all the import requirements and conditions. The inspection to check whether the animal food products meet the hygiene and other food safety standards is done by the Meat Hygiene Services (WTO, 2015a). The Livestock Identification Act, 13/2001, makes provision for the identification and traceability of livestock, including cattle and small ruminants (Swaziland Government, 2016).

2.2.3.5.2 Meat production trends
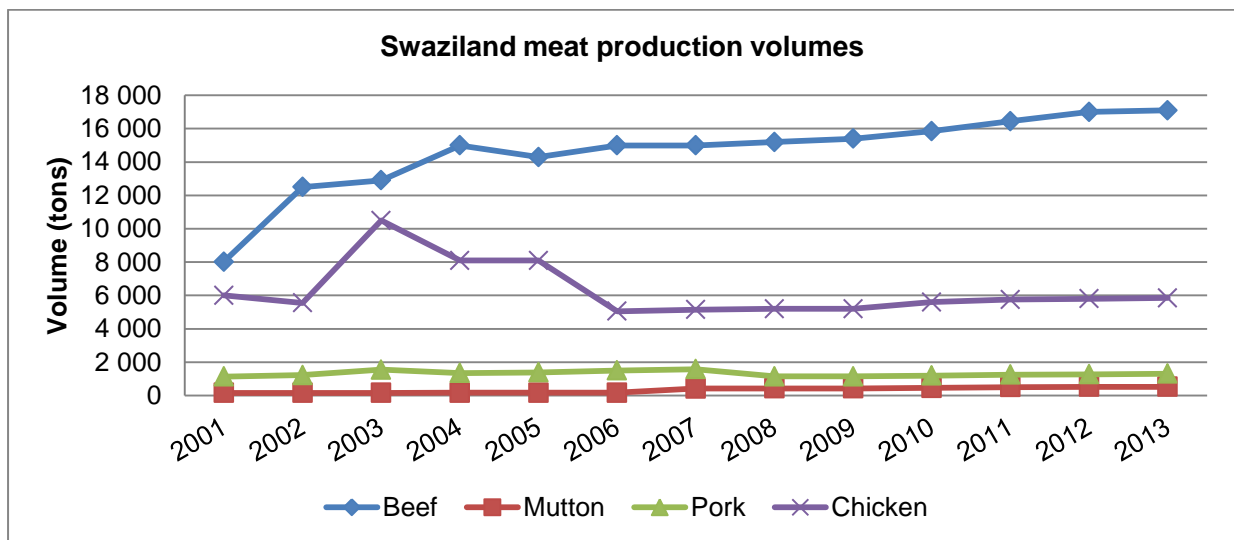
Figure 2.8: Swaziland meat production volumes (tons), 2001 to 2013

Source: Author's diagram with statistics from FAO (2015)

Swaziland's meat production volumes recorded in Figure 2.8 above show that beef production volumes displayed an increasing trend over the period 2001 to 2013. Beef production increased from 8 018 tons in 2001 to 15 000 tons in 2007, and further increased to 17 100 tons in 2013. Chicken production increased from 6 000 tons in 2001 to 10 500 tons in 2003, and declined sharply to 5 050 tons in 2006. Pork increased from 1 133 tons in 2001 to 1 310 tons in 2013, and mutton increased from 162 tons in 2001 to 526 tons in 2013.

2.2.3.5.3 Trade in meat
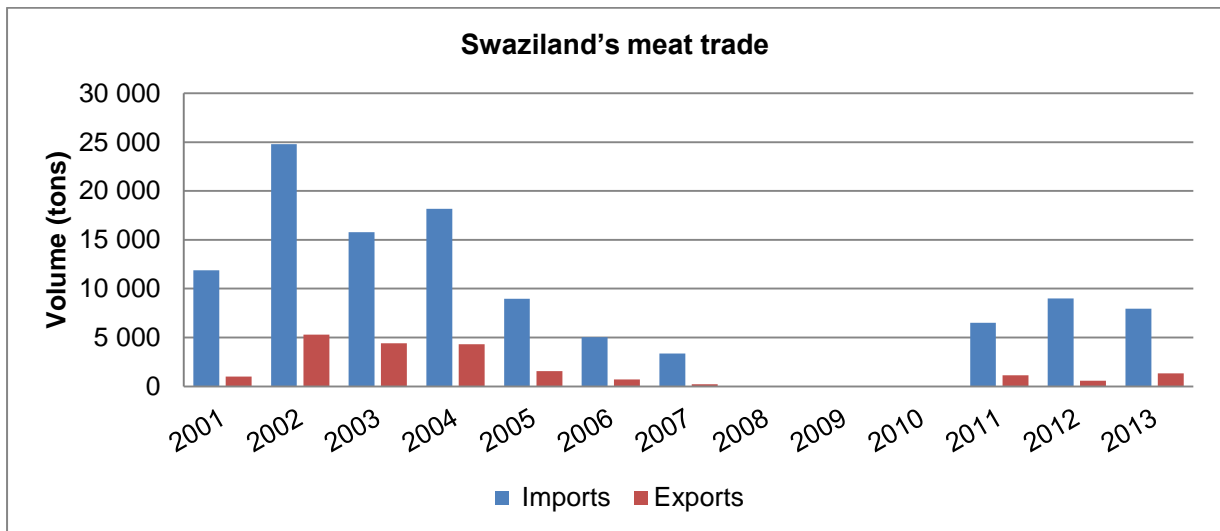
Figure 2.9: Swaziland's meat trade in tons, 2001 to 2013

Source: Authors diagram with statistics from ITC trade map (2015)

Figure 2.9 above shows that Swaziland was a net importer of meat over the period 2001 to 2013. No trade volumes were recorded over the period 2008 to 2010. Import volumes fell from 24 810 tons in 2002 to 3 363 tons in 2007. Over the period 2011 to 2013, imports increased from 6 516 tons to 7 948 tons. Exports displayed a similar trend as imports, declining from 5 305 tons in 2002 to 217 tons in 2007. Over the period 2011 to 2013, imports also increased from 1 120 tons to 1 326 tons.

Table 2.7: Swaziland meat trade by categories (tons)

Years	Beef		Mutton		Poultry		Pork	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2001	7 515	418	1 176	34	459	247	2 177	172
2002	20 258	1 099	1 953	78	203	543	707	3 188
2003	11 865	1 897	103	24	388	506	221	1 461
2004	13 666	3 838	76	13	3 299	306	699	124
2005	7 864	1 440	117	3	180	93	224	9
2006	4 313	417	45	2	158	232	72	31
2007	2 749	110	63	0	105	0	83	3
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0
2011	5 186	870	62	7	0	3	1 196	166
2012	6 870	487	194	5	629	2	565	54
2013	4 679	1 241	277	1	1 005	12	903	53

Source: ITC Trade Map (2015)

Swaziland was a net importer of the four major meat categories over the period 2001 to 2013. As can be gleaned from Table 2.7 above, the Kingdom was a net importer of beef and mutton for all the years, except for the years 2008, 2009 and 2010 when no trade was reported for both imports and exports. The Kingdom was a net exporter of chicken meat in 2002, 2003, 2006 and 2011, whereas it was a net exporter of pork in 2002 and 2003. Beef has the highest traded meat volumes for both imports and exports followed by pork, chicken and mutton.

2.3 ZAMBIA

This section presents a discussion on selected Zambian legislation dealing with trade in meat. These items of legislation form the basis upon which any regulations aimed at regulating trade should be developed. The section also looks at the trends for meat production and the trade thereof over the period 2001 to 2013. Production and trade volumes are presented in terms of the four meat categories, namely beef, mutton, pork and chicken.

2.3.1 Gross Domestic Product and population

Table 2.8: Zambia's annual GDP growth rates (%) and population, 2001-2013

Year	Annual GDP growth rates (%)	Population
2001	5.32	10 861 238
2002	4.51	11 139,978
2003	6.94	11 426 006
2004	7.03	11 725 635
2005	7.24	12 043 591
2006	7.90	12 381 509
2007	8.35	12 738 676
2008	7.77	13 114 579
2009	9.22	13,507,849
2010	10.30	13 917 439
2011	5.56	14 343 526
2012	7.60	14 786 581
2013	5.06	15 246 086

Source: World Bank development indicators (2014)

As can be seen from Table 2.8 above, Zambia reported positive annual GDP growth rates throughout the period 2001 to 2013. The highest annual GDP growth rate was reported in 2010 at 10.30% and lowest was reported in 2002 at 4.51%. Population size increased by 1 877 438 people between 2001 and 2007, and by 2 131 507 people between 2008 and 2013. Overall, population increased by 4 384 848 people over the period 2001 to 2013.

2.3.2 Legislation related to meat production and trade

The Zambian Animal Health Act, 27 of 2010, makes provision, among other things, for the prevention and control of animal diseases, and regulates the trade in animals and animal products. In terms of the imports of animal and animal products, the Act provides for the requisite permission in the form of an import permit, issued by the Director for Veterinary Services. The Act makes provision for the Minister to provide for the prohibition, restriction and regulation of the importation of any animal and animal products (FAOLEX, 2016g).

It prohibits the export of animals and animal products from Zambia by any person not in possession of an export permit issued by the Director of Veterinary Services. The Act also permits the Minister to prohibit the export of animal and animal products to any stipulated countries, except and until all the export regulations are met in such cases. In introducing any export restrictions on animals and animal products, the Act requires the Minister to take into account the international treaties, agreements and regulations applicable in the importing countries. Furthermore, the Act allows the Minister to institute any regulations to prescribe fees to be levied on such products destined for the export market (FAOLEX, 2016g).

In order to ensure the control and spread of animal diseases, the Act allows for the prohibition and regulation of the entry of animal and animal products from areas outside Zambia where animals diseases exist or are suspected to exist. The Act also allows for the regulation of the movement and sale of animals and animals products within the borders of Zambia from parts of the country where diseases exist or are suspected to exist. Meat inspection is also conducted to check for food safety and assurance (FAOLEX, 2016g).

This Act is mainly aimed at controlling the spread of animal diseases within the borders of Zambia. It makes provision for prohibiting any trade in animal and animal products, whether by import or export by any person or individual without the permission of the Director of Veterinary Services. This implies that unless the permission is granted upon satisfying the requirements of the granting authority, no trade in animal or animal products may take place. This will likely negatively affect the volumes of meat traded by Zambia internationally. Although the aim is to protect the domestic industry from invasion by animal diseases and also to prevent the export of infected animal products, the impact on trade will be negative.

2.3.3. Meat production trends
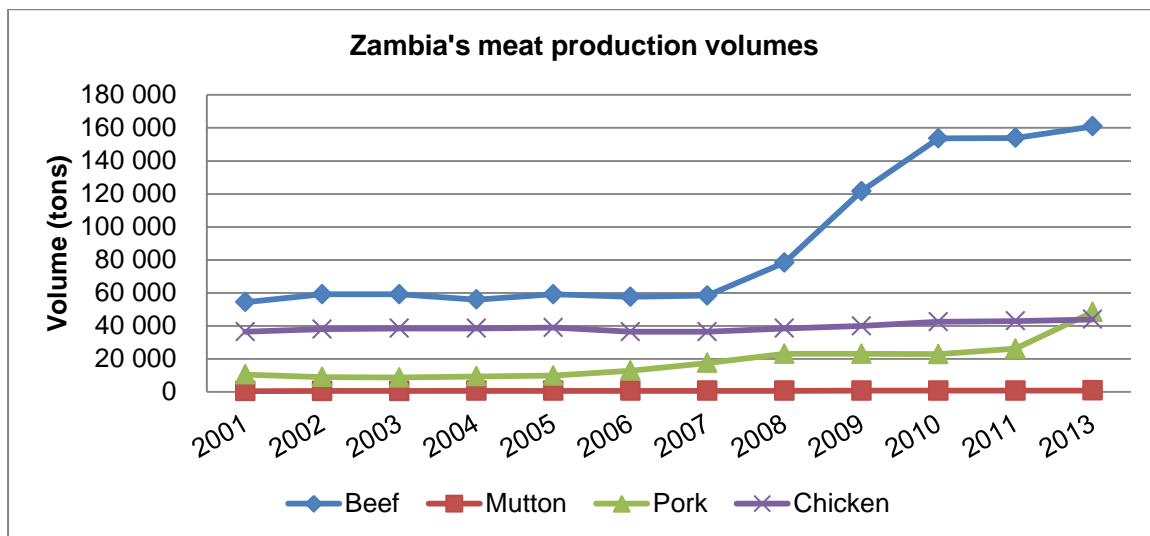
Figure 2.10: Zambia's meat production volumes (tons), 2001 to 2013

Source: Author's diagram with statistics from FAO (2015)

Figure 2.10 above shows that there have been increasing trends for beef, chicken and pork production volumes in Zambia. Beef production increased from 54 400 tons in 2001 to 58 400 tons in 2007, and further increased to 160 899 tons in 2013. This can be mainly attributed to a large and growing market for beef and beef products due to increased urban population and improvement in income conditions in the urban areas over the period 2004 to 2010 (Hichaambwa, 2012). Chicken production increased from 36 500 tons in 2001 to 44 000 tons in 2013, and pork production increased from 10 560 tons in 2001 to 48 400 tons in 2013. Mutton production remained relatively low throughout the period, increasing slightly from 546 tons in 2001 to 861 tons in 2013.

2.3.4. Trade in meat
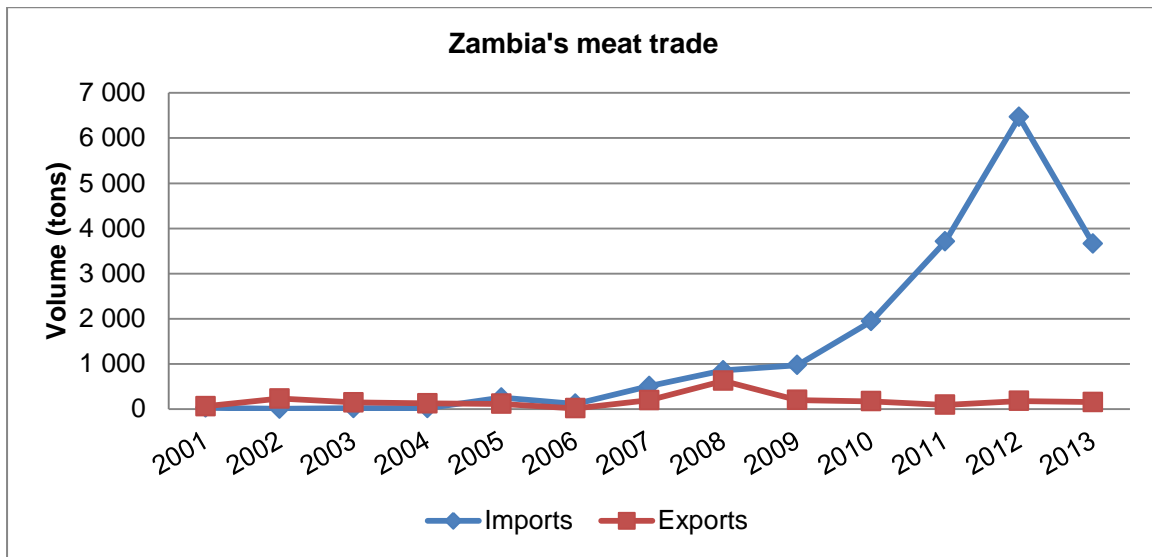
Figure 2.11: Zambia's meat trade in tons, 2001 to 2013

Source: Author's diagram with statistics from ITC trade map (2015)

Zambia was a net importer of meat over the period 2001 to 2013. Figure 2.11 above shows that Zambia was a net exporter of meat between 2001 and 2005; however, from 2006 to 2013 the trend changed and the country became a net importer. Imports increased sharply from 117 tons 2006 to 6 467 tons in 2012, and declined to 3 658 tons in 2013. Export volumes remained very low throughout the period, increasing from 63 tons in 2001 to 156 000 tons in 2013.

Table 2.9: Zambia's meat trade by categories (tons)

Years	Beef		Mutton		Chicken		Pork	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2001	0	38	1	0	24	12	2	0
2002	0	85	0	0	0	52	3	0
2003	13	13	0	3	0	2	4	3
2004	2	27	0	0	0	0	5	50
2005	117	97	0	0	112	0	1	18
2006	108	10	0	0	0	0	0	14
2007	414	45	0	1	0	1	97	6
2008	641	198	2	5	0	249	180	136
2009	845	107	0	22	0	21	104	27
2010	1 340	48	2	3	558	7	14	96
2011	2 554	1	0	0	967	50	80	27
2012	3 608	97	4	2	1 606	34	1 045	18
2013	1 446	60	18	2	1 522	15	361	48

Source: ITC Trade Map, 2016

Table 2.9 above shows that Zambia has experienced increases in import volumes of beef and pork over the years. The same can be said for chicken, although there were zero trade volumes for most the years over the period 2001 to 2013. In terms of exports, Zambia has displayed very low export volumes for all the meat categories over the period. There was very little trade, import and export, which has taken place for mutton over the years.

2.4 CONCLUSION

This chapter provided an overview of the trading partners in terms of their GDP, population sizes, meat production trends, and their participation in global meat trade. All the SACU countries and Zambia reported positive annual GDP growth rates over the period 2001 to 2013 except for South Africa and Botswana in 2009. South Africa reported the highest annual GDP growth rate of 5.60% in 2006. Botswana recorded highest annual GDP growth rates of 11.34% in 2013. Lesotho, Namibia and Swaziland reported positive annual GDP growth rates throughout the period 2001 to

2013. The highest annual GDP growth rates were 12.27% in 2004, 6.90% in 2011, and 6.42% in 2013 for Namibia, Lesotho and Swaziland, respectively.

In terms of population numbers, all the five SACU countries experienced increases in population over the period 2001 to 2013. South Africa experienced the highest increase in population numbers, of over 8 million people, while each of the other SACU countries experienced population size increases by a net of less than 500 000 people in the same period. In percentage terms, Botswana registered the highest population growth of 23% followed by Namibia with 22%, South Africa with 18%, Swaziland with 16% and Lesotho with 11%. Zambia's population size increased by 4 384 848 people over the same period which translates to 40% increase in population size. The increases in population numbers by all the trading partners mean that the market sizes have also increased. This is expected to encourage greater meat trade since the expansion of the market size would create more demand for meat.

An overview of the legislative frameworks with a bearing on meat trade was also presented for the individual countries. The work on legislative provisions was done to understand if the use of NTMs by the trading partners can be linked to their respective legislative frameworks. All the individual countries included in the study have legislative provisions directly aimed at regulating the trade in animal and animal products. The aims behind all these legislative pieces include ensuring that consumers are provided with safe and high quality meat, and controlling any spread of animal diseases. The legislative measures stipulate that these aims should be achieved by preventing the entry into their markets of products deemed to be posing risks to achieving the targeted aims.

Although the aims behind all this legislation are legitimate, it would be expected that the NTMs developed in order to achieve the targeted aims would be of protectionist intent. As a result, one can conclude that this legislation serves as a basis on which NTMs imposed by these countries on trade in meat are developed. Furthermore, since these NTMs are likely to be of protectionist intent, it would also be expected that such NTMs would negatively affect trade in meat.

All the countries in the study displayed a general increase in meat production volumes in the period under consideration. There are, however, specific cases where

countries experienced declines in meat production volumes for specific meat categories over the period. In terms of trade in meat, all the countries are actively participating in the global market for meat trade. However, Lesotho's meat trade information was lacking for most part of the period under review.

CHAPTER 3: LITERATURE REVIEW

3.1 INTRODUCTION

This chapter presents a review of the research work relevant to this study. The chapter describes discussions on tariff liberalisation and trade, welfare gains from improved trade, factors with the potential to affect trade, and the gravity model in international trade. The chapter also presents an extensive discussion on NTMs. In particular, the chapter discusses various definitions and classification of NTMs, the regulation of NTMs, their impact on trade, and their incidences in the SADC region. The last section of this chapter presents a review of the gravity model in international trade.

3.2 THE RELATIONSHIP BETWEEN TARIFF LIBERALIZATION AND TRADE

Tariff liberalisation is anticipated to positively influence trade. Empirical findings by Terborgh (2003), using historical trade and tariff data for the trading partners, showed that there is indeed an inverse relationship between trade and tariffs. This is also consistent with theoretical trade literature which postulates a negative relationship between trade and tariffs. Wu and Zeng (2008) also point out that trade liberalisation leads to improved trade performance and Ackah and Morrissey (2005) argue that trade liberalisation should expose economies to international trade, and as a result, increase trade volumes.

In contrast, Kowalski (2005) outlines the point that if tariffs are not liberalised, they negatively affect trade for both the countries that impose them and their trading partners. According to Kowalski, tariffs shield domestically produced products from international completion by creating a wedge between domestic and world prices, which favours locally produced products. Furthermore, irregular tariff structures distort production and consumption incentives, and in turn prevent countries from capturing gains associated with more open trade (Kowalski, 2005).

There are several gains, in addition to increased trade volumes, which trading partners can derive from a trade environment in which tariffs have been liberalised. Improved market access improves product availability, and in turn extends consumer choice. This will result in lowered food prices and result in increased food

consumption. Moreover, it will assist in ensuring food security. This will also be the same for the southern African region (OECD, 2009).

Increased trade is also expected to encourage the more efficient use of resources and increased competitiveness. Furthermore, increased trade implies that the domestic producer's target market size will increase through improved market access to markets beyond its domestic borders. Increased production volumes result in a decline in production costs due to improved competitiveness (Ackah and Morrissey, 2005). In developing countries, higher export earnings will imply that more funding will be available for development-related activities (OECD, 2003).

According to Kowalski (2005), there is a growing consensus supporting the argument that there are substantial gains to be had, more so for developing countries, which would accrue through the removing of tariffs. Estimates by OECD (2003) show that full tariff liberalisation, combined with other trade costs reducing mechanisms, would result in greater welfare gains of 1.37 % and 0.37 % as a share of developing and developed countries' GDPs, respectively. Overall, over half of the benefits go to developing countries. It is further postulated that over half of the developing country welfare gains come from tariff liberalisation in just three sectors, namely motor vehicles and parts, textiles and clothing, and processed agricultural products.

This section outlined the relationship between tariff liberalisation and trade. The discussion clearly outlines the point that the reduction and elimination of tariffs are expected to result in improved trade. The discussion also shows that the expected improved trade attributable to tariff reductions and elimination also comes with several welfare gains. These gains include increased product varieties, lower product prices for consumers, and improved resource allocation and subsequent reduction in costs of production for companies. However, these gains are lost if trade does not improve subsequent to successful tariffs reduction and elimination.

3.3 FACTORS WITH THE POTENTIAL TO AFFECT TRADE

There are several factors with the potential to affect trade, other than tariffs. These factors include GDPs of the trading countries, population sizes, distance, and NTMs. This section presents a discussion on the relationship between these factors and trade. The first subsection discusses the first four factors, and the second section

discusses the fifth factor, NTMs. A detailed discussion on NTMs is provided since they are the core of this study, as indicated in the problem statement, objectives and hypothesis of the study.

3.3.1 GDP, population and distance

The GDP of an importing country is an indication of the country's ability to absorb the imported goods, while the exporting country's GDP is an indication of productive capacity, and it measures the size of the economy in terms of the available goods. Countries with high incomes tend to trade more, and as result, both the importer's and the exporter's GDP are anticipated to positively influence trade (Tinbergen, 1962; Harris and Matyas, 1998; Jafari, Ismail and Kouhestani, 2011).

The exporting country's population size helps to describe the production possibility frontiers, whereas the population size in the target or importing country serves as an indicator for the market demand. A large population size in an exporting country is associated with high chances of finding more and cheaper labour for production, and hence increased production for export. On the other hand, a larger population size in an importing country is associated with high demand. This means that both the exporting and importing countries' population numbers are expected to have a positive influence on bilateral trade (Harris and Matyas, 1998).

However, the population size in an exporting country is also an indication of the size of the domestic market. A large population size in an exporting country means that there will be more demand for domestically manufactured products. This means that more local products will be consumed locally, and this can result in very little produce being available for the export market (Jafari et al., 2011). This argument suggests that the exporting country's population size has the potential to negatively affect trade flows, which is in contrast with the population–trade relationship noted by Harris and Matyas (1998) referred to above. As a result, one can conclude that the exporter's population size has an ambiguous impact on trade flows, i.e. it can be either positive or negative.

Distance is used as a proxy for transport costs between two countries, and longer distances are associated with higher transportation costs. Trading partners situated far apart from each other incur high costs when engaged in bilateral trade. This

erodes any possible gains from such trade and discourages trade. As a result, distance has an inverse relationship with trade flows, i.e. trade is expected to be greater between trading partners adjacent to each other, and vice versa. Additionally, countries which share a common border are expected to trade more with each other (Cyrus, 2002).

The discussion above shows the relationships between various factors and trade. The GDPs have a positive relationship with trade. The importing country's population size is also positively related to trade. The exporter's population size relationship with trade can be ambiguous. It can affect trade either positively or negatively. Distance, a proxy of transportation cost, is negatively related to trade.

3.3.2 Non-tariff measures

NTMs measures comprise one of the factors with the potential to affect trade. This subsection presents a discussion on NTMs. It presents NTM definition and classification, regulation of NTMs both at international and regional levels, impact of NTMs on trade, and NTM incidences in SADC. Particular reference will be made to Sanitary and Phytosanitary measures (SPS) and Technical Barriers to Trade (TBT) since they are the NTM categories which have the most bearing on food and agricultural trade, especially trade in meat and meat products.

3.3.2.1 Definition and classification of NTMs

A number of researchers and authors have proposed different, and sometimes similar, definitions of NTMs. Baldwin (1970) referred to NTMs simply as non-tariff distortions. His view suggested that the existence of non-tariff distortions affected the way in which resources are allocated in the production of internationally traded goods, and as result, affected the potential real world income. He further indicated that such a distortion cannot be approximated without undertaking various computations.

Other researchers have referred to NTMs as Non-Tariff Barriers (NTBs) or measures, other than tariffs, imposed specifically to restrict imports. A good example is the definition by Hillman (1991), cited in Trabelsi (2013) which refers to NTBs as being any device or governmental action which obstructs the entry of imports into a

country. This definition indicates that NTMs are not seen in any way as having any potential to positively affect the entry of imports into a country, but purely as being trade barriers.

Kirk (2010) describes NTMs as comprising regulations, procedures or administrative requirements which are developed to realise genuine domestic policy intents. However, if the implementation of such regulations is done in a way that restricts imports unnecessarily, they can be referred to as NTBs. This suggests that the impact of NTMs on trade is highly dependent on the manner in which they are implemented. In support of this, Disdier and van Tongeren (2010) point out that the impact of NTMs on trade can be intentional, or arise as side effects of reasonable regulatory measures.

UNCTAD (2013) defines NTMs as a collection of all policy-related trade costs, other than tariffs, incurred by producers from production to the point where the product reaches the consumers. These measures have the potential to have an economic effect, and alter traded quantities and/or prices on internationally traded goods. They include all policy-related measures, whether of protectionist intent or not, as long as they have the potential to influence international trade.

In terms of classification, Staiger (2012) suggests that NTMs can be classified into three categories: NTMs imposed on imports, NTMs imposed on exports, and the behind-the-border NTMs such as domestic legislation and regulations. UNCTAD (2013) classifies NTMs based on their scope and/or their design. NTMs are broadly classified according to whether they are imposed on the import or the export side, as import and export measures, respectively. In the next level, import measures are categorised into technical and non-technical measures. In the last level, technical and non-technical measures are classified into 16 chapters, chapters A to P. This classification is demonstrated in Table 3.1 below.

Table 3.1: Classification of NTMs

Import Measures	Technical Measures	**A** -Sanitary and Phytosanitary (SPS) measures
		B -Technical Barriers To Trade
		C -Pre-shipment inspection and other formalities
	Non-Technical Measures	**D** -Contingent trade-protective measures
		E -Non-automatic licensing, quotas, prohibitions and quantity-control measures other than for SPS or TBT reasons
		F -Price-control measures, including additional taxes and charges
		G -Finance measures
		H -Measures affecting competition
		I -Trade-related investment measures
		J -Distribution restrictions
		K -Restrictions on post-sales services
		L -Subsidies (excluding export subsidies under in **P**)
		M -Government procurement restrictions
		N -Intellectual property
		O -Rules of origin
Export Measures		**P** -Export-related measures

Source: UNCTAD (2013)

3.3.2.1.1 Sanitary and Phytosanitary (SPS) measures

As contained in the WTO SPS agreement (WTO, 2015b): SPS measures include all relevant laws, decrees, regulations, requirements and procedures including, inter alia, end product criteria; processes and production methods; testing, inspection, certification and approval procedures; quarantine treatments including relevant requirements associated with the transport of animals or plants, or with the materials necessary for their survival during transport; provisions on relevant statistical

methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements directly related to food safety.

As listed in Annex 1 of the agreement, such measures are applied to achieve the following objectives/goals:

- To protect animal or plant life or health within the territory of the Member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms;

- To protect human or animal life or health within the territory of the Member from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs;

- To protect human life or health within the territory of the Member from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests; or

- To prevent or limit other damage within the territory of the Member from the entry, establishment or spread of pests.

3.3.2.1.2 Technical Barriers to Trade measures

TBT measures are regulations and standards referring to the technical specification of the relevant products and the conformity assessment systems thereof. These regulations and standards target the technical characteristics of products, and do not include explicit bans on imports from specific countries or regions, but rather deal with international standards such as international production standards and national standards on packaging, labelling and marking requirements (Van Tongeren, Beghin and Marette, 2009).

TBTs can be classified into three categories, as follows (WTO, 2014):

- TBTs dealing with technical regulation refer to such regulatory documents which set the product characteristics, production methods and the applicable administrative provisions. These measures may also set regulations dealing with issues such as terminologies, symbols, packaging and labelling

requirements related to production methods and the products thereof. The compliance with these measures is mandatory;

- Standards TBTs which deal with rules, guidelines, and characteristics of products and production methods, compliance with which is not mandatory; and

- Conformity assessment procedures which refer to any procedures used to determine that requirements in technical regulations or standards are fulfilled. These include procedures for sampling, testing and inspection, evaluation, verifications, and assurance of conformity.

3.3.2.2 Regulation of NTMs in meat trade

This subsection discusses the regulation of NTMs, both at international and regional levels. At the international level, the discussion is focused on the regulation of NTMs by the WTO. The well-documented WTO agreements on the application of SPS and TBT measures are discussed. At the regional level, the discussion looks at the provisions under regional trade agreements on the application of NTMs. The regional agreements for the SADC, COMESA and SACU regions are discussed. These are the regional agreements under which the trading partners fall. All SACU countries and Zambia are members of the SADC. Zambia and Swaziland are also members of COMESA.

3.3.2.2.1 The World Trade Organisation Sanitary and Phytosanitary agreement

The WTO SPS Agreement (WTO, 2015b) deals with all SPS measures which can influence international trade. Under this agreement, member countries can apply measures that are necessary to achieve the objectives of protecting human, animal, or plant life or health. The agreement obliges member countries to apply SPS measures only to the extent necessary to achieve these objectives. Furthermore, such measures should not be maintained without sufficient scientific evidence of necessity.

This agreement requires members to ensure that the SPS measures adopted do not discriminate unwarrantedly between areas where identical conditions exist. This also applies if similar conditions prevail between the members adopting the measures

and their trading partners. Furthermore, the agreement stipulates that the SPS measures should not be applied in order to unnecessarily restrict international trade (WTO, 2015b).

Under the SPS agreement's principle of harmonisation, WTO member countries are entitled to develop their own SPS measures, based on international standards, guidelines and recommendations. Such measures are accepted as being essential to achieve legitimate policy objectives. However, countries are allowed to adopt measures with more protection effect than those based on the provisions in the agreement, provided there is scientific justification, or a concern which requires such a level of SPS protection (WTO, 2015b).

The SPS agreement's principle of equivalence requires WTO members to treat as equal the other members' SPS measures, provided it is mutually established that they both provide essential SPS protection in both parties' territories. Furthermore, a member asserting that both parties' measures are equivalent should provide sound access to the other to put its measures to the test. The principle of transparency obliges members to notify and make information available on changes in their measures (WTO, 2015b).

There are three international standard-setting bodies which WTO members should base their SPS measures on. It is also advised that member participate in the activities of these organisations pertaining to issues on SPS measures (WTO, 2015b). The three international standard setting bodies are:

- The International Plant Protection Convention (IPPC) which deals with plant health;

- The World Organisation for Animal Health (OIE) which deals with animal health; and

- The Codex Alimentarius Commission (Codex) which deals with food safety.

Out of the three organisations, only the OIE and the Codex are relevant to the current study. According to Cassidy (2010), the OIE helps WTO member countries to comply with the WTO SPS agreement, in terms of trade in animals and animal products, with several aims which include: the prevention of protectionism by

prohibiting the use of SPS measures as constraints to trade; ensuring that measures for food safety must have a sound scientific basis; and encouraging the use of international standards references for SPS measures.

The OIE has two codes of practice providing for animal health, and the safety of animal products in human consumption and use. These are the Terrestrial Animal Health Code (TAHC) and the Aquatic Animal Health Code (AAHC), both of which are revised on a regular basis. The main concern of these codes is animal health and they aim at minimising the introduction and spread of animal and zoonotic diseases through international trade (Cassidy, 2010).

The Codex is the joint responsibility of the FAO and the World Health Organization (WHO), and its main concern is food safety. The organisation safeguards all issues with regard to food safety, such as the adoption and application of standards and guidelines. In terms of setting standards, the organisation prioritises the health of consumers (Department of Agriculture, Fisheries and Forestry, 2016).

According to Van Tongeren (2004), the other requirements, other than those outlined in the SPS agreement, that regulate food trade under the WTO are in the agreement on TBTs. The agreement regulates issues in connection with labelling, nutrition requirements, packaging and several other relevant issues. The WTO TBT agreement is discussed below.

3.3.2.2.2 The World Trade Organisation Technical Barriers to Trade agreement

The TBT agreement (WTO, 2015c) requires WTO members to ensure that the same treatment with respect to technical regulations is applied to all comparable products manufactured within the country's national borders and those imported from different countries, with no preferential treatment being applicable. The member countries applying the technical regulations should ensure that the regulations adopted do not create unnecessary barriers to international trade. However, if the technical regulations are adopted to fulfil legitimate objectives, such regulations will be justified. As shown in the 2012 World Trade Report (WTO, 2012), the objectives referred to are: "national security requirements; the prevention of deceptive practices; and protection of human health or safety, animal or plant life or health, or the environment".

In cases where the relevant circumstances, or such legitimate objectives which led to the adoption of technical regulations, no longer exist, or if there are other mechanisms with a less trade-impeding impact which could be used, the TBT agreement requires members to suspend or remove such technical regulations (WTO, 2015c).

As with the WTO SPS agreement, this agreement requires that when the need for technical regulations arises, and there are relevant international standards which already exist, member countries should use such standards when developing their own regulations. Furthermore, the agreement encourages WTO members to partake in the activities of the recognised bodies responsible for setting standards, especially on issues deemed relevant to them (WTO, 2015c).

However, if the existing international standards would prove to be less effective in the endeavour to accomplish the legitimate objectives, the agreement allows the member countries to develop their own technical regulations that would help accomplish such objectives. In such cases, the member intending to adopt technical regulations outside the scope of the international standards should provide an opportunity to the members to be affected by the new regulation and to interested parties to make their written submissions, and take such submissions into consideration. In doing so, a member intending to adopt such a regulation should allow access to all relevant documents deemed useful by interested parties for making informed submissions (WTO, 2015c).

The agreement also requires WTO member countries to consider the technical regulations of other member countries as equivalent, even if their regulations differ from their own, on condition that a member is satisfied that such regulations would prove to be effective in fulfilling the objectives of its own regulations (WTO, 2015c).

3.3.2.3 The role of regional bodies in regulating non-tariff measures

This subsection discusses the role of regional bodies in regulating the use of NTMs. The subsection discusses the regional bodies to which the trading partners for this study are signatories which are SADC, COMESA and SACU.

3.3.2.3.1 Southern African Development Community

The SADC member states signed the SADC protocol on trade in Maseru, Lesotho, in 1996. The objectives (1) and (5) of the protocol were targeted at improving intra-regional trade through further trade liberalisation and the establishment of the SADC FTA. This was to be achieved through the removal of intra-regional trade barriers such as import duties, export duties, quantitative import restrictions, quantitative export restrictions and other non-tariff barriers (SADC, 1996).

The trade restrictive NTMs (non-tariff barriers) are also a reason for concern in the SADC region and the region has been, over the years, trying to address the challenges posed by these measures. Article 6 of the SADC Protocol on trade encourages SADC member states to adopt mechanisms to eliminate all existing forms of non-tariff barriers. This article also calls for member states not to implement any new trade-restrictive NTMs

In terms of addressing SPS measures, SADC's approach is based on the provisions in the WTO SPS agreement. Article 16 of the SADC Protocol on trade calls for SADC member states to develop their SPS measures based on international standards, guidelines and recommendations, in order to ensure ease harmonisation of the measures. The article also calls for the principle of equivalence to be applied as in the WTO SPS agreement (SADC, 1996).

With respect to TBT measures, Article 17 of the SADC protocol on trade is also aligned with the WTO TBT agreement. The article calls for the SADC member states to use the international standards as the basis for developing their TBT measures, and the measures which comply with international standards shall be considered as not creating unnecessary barriers to trade. In order to facilitate trade with the SADC community, where member states develop their own standards, they should try by all means to align their standards to the available international standards. The article also encourages Member states to accept other member states' technical regulations as equivalent, even if they differ from theirs, if they prove to be adequate for attaining the objectives targeted by their own regulations (SADC, 1996).

3.3.2.3.2 The Common Market for Eastern and Southern Africa

The proliferation of NTMs has also been observed in the COMESA region. These NTMs negatively affect both intra-COMESA trade volumes and values through the choking of the free flow of goods. These NTMs include the unjustified and improper application of SPS and TBT measures, which is increasingly affecting intra-regional trade in agricultural and food trade. As a result, the region also has provisions directed towards the regulation of NTMs. Article 49 of the COMESA Treaty makes provision for all COMESA member states to embark on the process of removing all existing trade-restrictive NTMs applied on intra-region trade (COMESA Business Council, 2016a).

There are mechanisms in place which are aimed at better regulating the use of NTMs in the region. These mechanisms include: the NTBs Reporting, Monitoring and Eliminating Mechanism which enables stakeholders to report, and monitor the resolution of barriers encountered when conducting trade; the COMESA National Focal Points and National Monitoring Committees which are national mechanisms put in place to facilitate awareness and compliance with the COMESA Treaty and provisions; and the COMESA regional integration agenda aimed at addressing standards conformity, and SPS and TBT measures as an essential aspect in promoting trade in the region (COMESA Business Council, 2016b).

3.3.2.3.3 Southern African Customs Union

Within SACU, Article 18 of the 2002 SACU agreement makes provision for the free movement of domestic goods between the member states. This article also gives the member states the right to impose restriction on trade in line with their national laws and regulations. However, this is allowed for those reasons which are of national importance, such as the protection of the health of humans, animals or plants, and the environment. In addition, Article 25 of the agreement also allows members to restrict the trade of any goods for economic, social and or cultural reasons (SACU, 2015).

Article 28 of the SACU agreement on TBT measures makes provision that member states should apply these measures in accordance with the WTO agreement on TBTs. Furthermore, the member states are required to harmonise their standards

and technical regulations within the SACU. Article 30 of the agreement on SPS measures allows the member states to adopt these measures for the prevention of the spread of animal and plant diseases, parasites and insects. The article requires members to work together in order to facilitate the free flow of goods. The article also allows member to apply SPS measures in line with their national laws and international standards.

The above discussion details the regulation of NTMs, both at international and regional levels. The NTM categories referenced in the discussion are SPS and TBT measures. At the international level, the discussion shows how these are regulated under the WTO agreements. Both the WTO SPS and TBT agreements are aimed at ensuring that SPS and TBT are used for justified reasons which are of national importance. These agreements outline the point that the measures should not be used as unnecessary barriers to trade.

The regional bodies also have provisions to manage the use of NTMs in regulating trade. In terms of SPS and TBT measures, these provisions are clear in that the measures developed should be aligned with the WTO agreements. There are also mechanisms that are put in place in order to ensure that member countries comply with such provisions.

The regulation of NTMs, both at the international and the regional level, is structured to better control the use of NTMs. Although there may other setbacks, such as the failure to comply with the regulations, the regional bodies are working towards ensuring compliance. All these regulations, however, have provisions which allow members to develop regulations at national level to provide better protection to their territories. If these provisions are not better managed, countries will continue to implement much stricter NTMs to restrict entry into their market of specific products.

3.3.2.4 Non-tariff measures incidences in the Southern African Development Community

Kalaba (2012) collected data on NTMs in order to estimate the impact of NTMs on cross-border trade along the Beira corridor, which covers Mozambique, Malawi, Zambia and Zimbabwe. His paper shows that the NTMs used in regulating agricultural trade among these countries had increased from around 400 in the year

2000 to over 1000 in 2010. Most notably, SPS measures increased from below 100 to about 500 over the same period. Furthermore, meat was among the products for which NTMs were heavily used to regulate its trade.

Kalaba and Kirsten (2012) found that there are over 2400 NTMs used to regulate trade of about 250 agricultural products within the SADC region. The top four NTM categories used in the SADC are SPS measures, quantity control measures, export related measures, and TBT measures. The study found that Mozambique was the leading SADC member with the most NTMs applied to agricultural products, followed by Tanzania, South Africa, Mauritius and Zambia, in that order. Malawi was found to be the country with the least NTMs applied to agricultural products in the region. In terms of product categories, fruits, meat, dairy, beverages and cereals comprised the top five products for which the most NTMs are applied in intra-SADC trade.

The study by Kalaba, Kirsten and Sacolo (2016) assessed the NTMs used in regulating SADC agricultural trade. The study compared the number of NTMs used by SADC countries in regulating intra-SADC agricultural trade in the years 2000 and 2010. The study found that in 2000, six SADC countries, namely Malawi, Mauritius, Mozambique, Tanzania, Zambia and Zimbabwe, had fewer than 200 NTMs on agricultural products. Botswana had 220 NTMs, whereas South Africa, Swaziland and Namibia all had over 3000 NTMs. In 2010, however, all the SADC countries were found to have increased the number NTMs with, among others, South Africa, Mozambique, Zambia, Botswana and Tanzania having over 500 NTMs. Dairy, beverages and meat products were found to be among the top products with the highest numbers of NTMs.

The discussion above is aimed at clarifying that NTMs are indeed heavily used in the SADC region, where both the SACU countries and Zambia are members. It would be expected that NTMs are also heavily used in regulating the meat trade between SACU and Zambia. As a result, and in line with the hypothesis of this study, a negative impact of NTMs on meat trade can be expected.

3.3.2.5 The relationship between NTMs and trade

Global trade role players are increasingly being confronted by NTMs when exporting their products to international markets (Fassarella, Souza and Burnquist, 2011).

Meat and meat products are some of the product categories which have seen an increasing number regulatory measures being implemented to regulate their trade (Schlueter, Wieck and Heckelei, 2009). Trade in these products might be subject to a number of market failures, such as diseases, and meat and feed scandals. This has raised awareness for both consumers and producers (Schlueter et al., 2009).

Regulating trade using NTMs can have three possible outcomes, the first two of which are trade restriction and trade enhancing. It is possible that these two outcomes could offset each other, depending on the nature of goods or commodities traded. This happens when there are NTMs with a significant positive impact on trade, and the opposing NTMs with a significant negative impact on trade. As a result, a third possible outcome, no impact at all, is observed (Schlueter et al., 2009).

Economic theory also supports the assertion that NTMs can have diverse impacts on trade. The use of an NTM can result in an increase in variable and/or fixed costs of production on the side of an exporter, which can exert an upward pressure on the pricing of the products, and hence a subsequent fall in demand for that product. On the other hand, the introduction of an NTM – say, a minimum standard requirement, – can be used as a screening criterion to reduce information asymmetries and this can lead to a reduction in transaction costs and downward pressure on product pricing, and in turn raise export quantity for the producers that meet the imposed standard requirement. The resultant effect on trade will depend on the net effect of an NTM on the supply and demand for a particular product (Van den Bosse, 2013).

NTMs, such as SPS and TBT measures, can result in an increase in the marginal cost of production. This is so since extra costs arise when trying to comply with such requirements and this may have a negative impact on trade. Otherwise, these measures may serve as important quality signals and may enhance and increase demand, specifically for those products which meet such standards, by providing useful information to consumers or buyers (Van Tongeren et al., 2009; WTO, 2012).

Similarity in the characteristics of the trading partners in terms of trade regulations also plays a vital role in influencing the response of trade that follows the introduction of an NTM. Exporting countries can vary in terms of their ability to meet the set regulations in the importing market. If an importing country with many potential exporters introduces an NTM, the exporters with regulations identical to those of the

importer are likely going to have an advantage in accessing the market, and hence increasing their export quantities, than the ones with different regulations do (Bratt, 2014).

The impact of SPS and TBT measures on trade can vary in terms of sectors (Moenius, 2004). In agricultural and food trade, these measures can have diverse impacts on trade, but the relationship does not always have to be negative (WTO, 2012). There are a number of studies which support the arguments that NTMs have various impacts on trade. Some studies have found only negative impacts of NTMs on trade; others only positive impacts; and the remainder both negative and positive impacts.

Gebrehiwet, Ngqangweni and Kirsten (2007) used a gravity model to estimate the trade effect on South African food exports of an SPS measure, total aflatoxin levels, which was imposed by five OECD countries (Ireland, Italy, Sweden, Germany and USA). Their study found that stringent SPS measures have the potential to negatively affect trade. The study also found that should these measures be implemented based on international standards, they were going to enhance South African exports, and that South Africa could earn additional export revenue from the OECD countries.

Disdier, Fontagne and Mimouni (2008) studied the impact of NTMs, SPS and TBTs on agricultural trade, using a gravity model approach. Their study found that these measures negatively affect agricultural product exports by developing countries to the OECD countries. At the agricultural subsector level, they also found that NTMs negatively affect trade in meat.

De Frahan and Vancauteren (2006) found a purely trade-enhancing effect of NTMs on trade. In estimating the influence of harmonisation of food regulations in the EU, they found that there was a positive relationship between regulations and trade, over the period 1990 to 2001. The relationship was positive at both aggregate and subsector levels. It is also outlined in Bratt (2014) that similarities in regulations are likely going to have a positive trade relationship between the trading partners.

Several researchers have analysed the impact of NTMs on meat trade in recent years. Kalaba and Kirsten (2012) evaluated the quantity impact of NTMs on intra-

SADC meat trade using the gravity model. The impact of the NTM dummy variable was found to be negative for intra-SADC beef, pork and chicken trade. However, a positive impact was observed for intra-SADC sheep meat (mutton) trade.

Schlueter et al. (2009) used the gravity model approach to study the impact of SPS measures on meat trade. The study assessed the impact of SPS measures using an aggregated regulatory measures variable, and found that SPS measures are positively related to meat trade. The measures were then disaggregated in accordance with the specific issues which they regulate, and then estimated that impact on meat trade.

The results showed that the impact of regulatory measures on meat trade can be ambiguous. SPS measures dealing with disease prevention, tolerant limits for residues and contaminants, and information requirements were found to have a favourable influence on trade, while measures related to production process requirements, as well as handling and distribution of meat after slaughtering, were found to have a negative impact on trade.

Fassarella et al. (2011) evaluated the impact of NTMs adopted by leading importers of Brazil's poultry meat, using the gravity model. The study found that technical and sanitary regulations related to labelling, as well as the presence of prohibitive technical and sanitary measures, are positively related to Brazil's poultry meat exports. The study also found that the measures related to compliance have a negative impact on Brazil's poultry meat exports.

This subsection discussed the impact of NTMs on trade. It also looked specifically at the impact of NTMs on meat trade. The discussion shows that the impact of NTMs on trade can be either positive or negative, and in some cases, NTMs can have no impact at all. This implies that the impact of NTMs cannot be predetermined. This also means that the hypothesis of this study which states that NTMs negatively affect meat trade between SACU and Zambia is testable. The study will either accept or reject the hypothesis.

In order to estimate the impact of all the factors discussed above on trade, the study will adopt the model which can better explain this relationship. There are several methodologies which can be used to estimate the impact of various factors, including

NTMs, on trade. The gravity model is one of these methodologies (UNCTAD, 2013). The gravity model is discussed in the next section.

3.4 ESTIMATION OF BILATERAL TRADE USING THE GRAVITY MODEL

The gravity model is an integral part of international trade literature (Linders and De Groot, 2006). The model has become an important and most-used model in the explanation and prediction of bilateral trade flows. Its exceptional accomplishments in predicting bilateral trade flows have led to it being accepted by many as the main model for analysing patterns of bilateral trade (Kareem, 2013). It has been used to provide an econometric explanation of the impact of various factors and trade policy instruments with the potential to influence trade between countries (Baier and Bergstrand, 2007).

The notion of the gravity model is based on the Newton's Law of Universal Gravity which relates the attraction force between two objects to their combined mass and the distance separating them. It was originally introduced to the analysis of international trade by Tinbergen (1962) (Trabelsi, 2013), Pöyhönen in 1963 and Linneman in 1966 (Linders and De Groot, 2006). The main idea of the model is that trade flows between two countries are determined by the exporter's potential to export and the importer's propensity to import, as well as other factors which might either encourage or discourage trade (Pöyhönen, 1963, cited in Linders and De Groot, 2006).

The gravity model was initially considered as a simple illustration of an empirically stable relationship between the size of the economies, their distance, and the amount of their trade, and this led to it being disputed for a lack of theoretical foundation (Linders and De Groot, 2006). This has led to the model being neglected between the late 1960s and late 1970s (Kareem, 2013). However, the model's extraordinary stability and power to explain bilateral trade relationships necessitated the need for theoretical justification for it (Trabelsi, 2013).

Based on constant elasticity of substitution (CES) assumptions, Anderson was the first to provide a theoretical basis for gravity models in 1979, using a context where goods were differentiated based on their country of origin, and consumers had defined preferences over all differential products (Kalaba and Kirsten, 2012).

Anderson's work (1979) was followed by Bergstrand (1985 and 1989), showing that a gravity model is a direct implication of a model of trade based on monopolistic competition developed by Krugman (1980).

The gravity model works well empirically, as it yields sensible parameter estimates and explains a large variation in bilateral trade (Rose, 2004). It can be used to estimate the impact of trade policies on trade flows with the use of policy instruments such as explanatory or independent variables (WTO, 2012, world trade report). De Almeida, Gomes and da Silva (2012) support the view that the gravity equation has been used by many to examine the influence of tariffs and NTMs on international trade.

Research papers on trade by Lee and Swagel (1997), Deardorff and Stern (2001), and Anderson and van Wincoop (2004) are some of the studies where the model has been used (De Almeida et al., 2012). As already discussed above, the gravity model has been used to compute the impact of NTMs by several researchers, including De Frahan and Vancauteren (2006), Gebrehiwet et al. (2007), Schlueter et al. (2009), Fassarella et al. (2011) and Kalaba and Kirsten (2012).

There are several procedures which can be used to estimate the gravity equation. However, estimating the gravity equations using Ordinary Least Squares (OLS) is a standard procedure. This is done by taking the natural logarithm of all the variables to derive a log-linear gravity equation (Kalaba and Kirsten, 2012). However, estimating the gravity equation using the OLS procedure presents challenges when there are zero trade observations in the dataset, and according to Xiong and Chen (2012), zero trade observations are a common feature in trade data. These observations pose an empirical problem when estimating the gravity equations since the dependent variable is the log of trade. The logarithm of zero is indeterminate since the logarithmic transformation is only valid for numbers greater than zero (Kareem, 2013; Fadeyi 2013).

There are several estimation techniques which can be used to estimate the gravity equation when there are zero data entries for the dependent variable. These techniques are discussed by Kareem (2013). The commonly used linear methods are truncation and censoring methods. In the truncation procedure, zero-valued

trade observations are removed from the dataset, while in the latter procedure, zero observations are replaced with a small positive arbitrary number.

Truncation and censoring procedures reduce the efficiency of the gravity model owing to loss of information and may lead to biased estimates because of data omission. This also leads to sample selection bias. Furthermore, this also leads to loss of important information on the probability of trade taking place. If factors, such as distances between two trade partners and the levels of GDPs, render trade as non-profitable and result in no trade taking place, removing zero trade observations can result in the underestimation of equation's coefficients (Kareem, 2013).

In recent years, literature concerning the estimation techniques for gravity equations has preferred the use of non-linear methods. These methods include the Nonlinear Least Squares (NLS), Feasible Generalised Least Squares (FGLS), and Gamma and Poisson Pseudo Maximum Likelihood (GPML and PPML). These estimation techniques have been subjected to several tests by various researchers (Kareem, 2013).

The Heckman selection model is also suggested in the literature as being a feasible procedure for estimating the gravity equation when there are zero trade observations. The Heckman sample selection model uses a two-step statistical approach, estimated under the normality assumption, to estimate the gravity equation. The first step, which is a selection equation, describes the probability of positive trade taking place, given a set of explanatory variables. The second step, which is an outcome equation, describes the possible response of positive trade flows, given a set of explanatory variables (Van den Bosse, 2013).

The Heckman selection model corrects for selection bias in non-randomly selected samples and has regularly been applied in trade literature to address the problem of zero trade flows (Crivelli and Groschl, 2012). The model is ideally thorough and provides a well-structured way of estimating the gravity equation when there are zero trade observations, as it makes use of the information provided by such observations (Linders and De Groot, 2006).

3.5 SUMMARY AND CONCLUSION

This chapter presented a review of the literature relevant to this study. This chapter discussed relationships between tariff liberalisation and trade. The discussion confirmed that tariff liberalisation is indeed expected to result in improved trade, which is also the basic argument of this study. That is, tariffs are expected to have an inverse relationship with trade. Furthermore, the discussion also revealed that if trade does not improve following successful tariff liberalisation, welfare benefits for both consumers and producers are lost. Since it is shown in the earlier chapters of this study that tariff liberalisation has led to improved meat trade, it can be safely concluded that such benefits are not being transferred to the people of SACU countries and Zambia through the improvement in meat trade.

The chapter also presented an extensive discussion on NTMs. On the relationship between NTMs and trade, the discussion revealed that this relationship is ambiguous. Researchers have found different outcomes when analysing this relationship. Some researchers have found a negative relationship between NTMs and trade, whereas others found a positive relationship. This means that it will not come as a surprise if the relationship between NTMs and meat trade between SACU countries and trade is not negative, as suspected. Furthermore, this also means that the hypothesis of this study on NTMs is testable.

Furthermore, the section discussing NTM incidences in the SADC revealed that NTMs are heavily used in regulating agricultural trade in the SADC. From the discussion, it would be expected that NTMs are also heavily used in regulating the meat trade between SACU countries and Zambia. As a result, a negative relationship between NTMs and the meat trade between SACU countries and Zambia is highly probable.

The discussion on the regulation of NTMs, by both international and regional bodies, revealed that there are indeed provisions aimed at ensuring that NTMs are not used merely as trade barriers. However, these provisions have one excuse in common. They all allow countries to adopt NTMs which can be more trade restrictive than measures developed based on these provisions. If these provisions are not better managed, countries will continue to implement much stricter NTMs to restrict entry into their markets of specific products. If the NTMs adopted by SACU countries and

Zambia have been developed based on this line of thinking, it would be highly expected that the relationship between NTMs and meat trade between these trading partners is negative. If that is the case, it would mean that NTMs have contributed to a low level of meat trade, despite tariff liberalisation.

In terms of other factors, other than NTMs, with the potential to influence trade, the chapter revealed that countries' GDPs and population sizes are expected to positively influence trade, although there is a possibility that an exporting country's GDP can negatively influence trade. In line with the second objective of this study, the relationship between GDP per capita and trade is expected to be positive since higher incomes are associated with increased demand and hence encourage trade. Distance, a proxy of transportation costs, is expected to negatively affect trade. This is because longer distances are associated with higher transportation costs, which discourage trade.

In terms of the empirical analysis, the gravity model is the most preferred model in the analysis of bilateral trade. It has already been used by many researchers to analyse the relationship between various factors, including NTMs, with the potential to influence trade. This study, like many others, will use the gravity model. This study is conducted against the background that tariff liberalisation has not led to any improvement in the meat trade between SACU countries and Zambia. This implies that the probability of the prevalence of zero trade is high. It was revealed in the discussion that estimating the gravity equation using the standard procedure, OLS, in the presence of zero trade observations can be problematic. This study will take caution in choosing the best estimation procedure to handle the problem of zero trade observations.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter presents the empirical approach used in this study to examine the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU countries and Zambia. The gravity model is the chosen empirical model for this purpose. The gravity model has been used by many researchers in explaining and predicting bilateral trade flows (Lee and Swagel, 1997; Deardorff and Stern, 2001; Anderson and van Wincoop, 2004; De Frahan and Vancauteren, 2006; Gebrehiwet et al., 2007; Schlueter et al., 2009; Fassarella et al., 2011; Kalaba and Kirsten, 2012). It has become an integral part of trade literature (Linders and de Groot, 2006). According to Kareem (2013), the gravity model is preferred by many researchers due to its extraordinary accomplishments in analysing trade flows.

The next section presents the gravity model specification, followed by a discussion on the modelling of the framework to estimate the gravity model, data description and sources, regression results, diagnostic checks, and a discussion on explanatory variables and their expected signs.

4.2 GRAVITY MODEL SPECIFICATION

As discussed in Chapter 3, the gravity model is grounded on Newton's Law of Universal Gravity. The Newton's law is specified as follows (Kareem, 2013):

$$\text{GF}_{ij} = C \frac{M_i M_j}{D_{ij}} \tag{4.1}$$

where GF represents gravitational force between two masses; C represents the gravitational constant; M_i and M_j are the masses; and D_{ij} the distance separating the two masses.

The original specification of the gravity model in international trade was given by Tinbergen in 1962 as follows:

$$X_{ij} = \beta_0 (Y_i)^{\beta_1} \left(Y_j\right)^{\beta_2} \left(D_{ij}\right)^{\beta_3} \mu_{ij} \tag{4.2}$$

where X_{ij} represents the value of imports or bilateral trade; Y_i and Y_j are the GDPs of trading partners; and D_{ij} represents bilateral distance.

Bicker (2009) outlines the main idea of the gravity model in that the trade flows from one country to another is dependent on: (i) the supply conditions in the country of origin; (ii) the demand conditions in the importing country; and (iii) several other factors which may either encourage or discourage such trade flow. Researchers using this model have increasingly adopted the addition of several other factors which have the potential to impact on trade flows (Trabelsi, 2013). Linders and De Groot (2006) have added other factors to the original gravity model, and specified the model as follows:

$$lnT_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 RIA_{ij} + \beta_5 ADJ_{ij} + \beta_6 Lan_{ij} + \beta_7 Col_{ij} + \beta_8 Rel_{ij} + \mu_{ijt}$$ (4.3)

where:

T_{ijt} is merchandise imports from country i to j;

Y_{it} and Y_{jt} are GDPs of the countries i and j;

D_{ij} is the distance between countries i and j;

RIA_{ij} is a dummy for the same regional integration agreement;

ADJ_{ij} is a dummy for common border;

Lan is a dummy for common primary language;

Col_{ij} is a dummy for a common colonial empire;

Rel_{ij} is a dummy for a common major religion; and

μ_{ijt} is a stochastic disturbance term..

In the model above, the parameters for the dummy variables for same regional integration agreement, common border, common primary language, common colonial empire and common major religion are all time invariant.

4.3 MODELING THE FRAMEWORK TO ESTIMATE THE GRAVITY EQUATION

As outlined above, researchers have adopted various modifications to the gravity equation. Based on Equation 4.3 above, the study aims to estimate the following

equation in order to examine the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU and Zambia:

$$lnM_{ijt} = \gamma_0 + \gamma_1 lnGDPPC_{it} + \gamma_2 lnMPV_{jt} + \gamma_3 lnISTrade_t + \gamma_4 \ln(1 + Tar_{ijt}) + \gamma_5 NTM_{ijt} + \gamma_6 lnDist_{ij} + \gamma_7 ADJ_{ij} + \varepsilon_{ijt} \tag{4.4}$$

where:

ln indicates the natural logarithmic function;

M_{ijt} is meat import volumes by country i from j at time t;

$GDPPC_{it}$ is the GDP per capita for the importing country i at time t;

MPV_{jt} is meat production volumes of country j at time t;

ISTrade is the intra-SACU meat trade volume for a specific SACU country at time t

Tar_{ijt} represents the tariff applied by country i to imports from country j and time t;

$Dist_{ij}$ is the distance between countries i and j;

NTM_{ijt} is the NTM dummy variable;

ADJ_{ij} is the common border dummy variable; and

ε_{ijt} is the error term.

This study uses GDP per capita and meat production volumes in place of GDPs and population numbers as demand and supply conditions, respectively. The former represents the importing country's propensity to import, and the latter the exporting country's potential to export. This is done to avoid the multicollinearity problem which may arise with the use of GDPs and population sizes.

The variable ISTrade is added to the list of independent variables to control for the meat trade relationship between SACU countries. This trade relationship is expected to have an impact on the meat trade relationship between individual SACU countries and Zambia. SACU countries will be assumed to prioritise trading with each other before considering trade with Zambia. This is because there are such advantages as the geographical proximity between the SACU member states and, as contained in Article 24 of the 2002 SACU Agreement, the freedom of transit.

Tar$_{ijt}$ represents the level of customs duty applied by country i to the imports originating from country j and time t. One is added to allow for the logarithm transformation during those years where tariff levels were at zero. Dist$_{ij}$ is the distance separating the two countries.

NTM$_{ijt}$ is a dummy variable indicating whether the imports into country i were subjected to at least one NTM during time t. ADJ$_{ij}$ is a dummy variable indicating whether the two countries share a common border or not; and ε_{ij} is the error term. In the dataset analysis, the NTM dummy takes the value of one if there was at least one NTM used to regulate meat trade between individual SACU countries and Zambia in that specific year, or zero otherwise. Likewise, the dummy variable on common border takes the value of one if two countries share a common border, or zero otherwise.

4.4 ESTIMATING THE GRAVITY EQUATION IN THE PRESENCE OF ZERO TRADE OBSERVATIONS

The meat trade data for this study displayed a prevalence of zero trade observations, which is a common feature of trade data, according to Xiong and Chen (2012). It was indicated in Chapter 3 that zero trade observations pose an empirical problem when estimating the gravity equation since the dependent variable is in log form. The logarithm transformation of zero is not feasible since it is only defined for numbers greater than zero. There are several ways of handling the problem of zero trade observations.

Linders and De Groot (2006) have argued that there is a need for careful consideration when choosing the right model to deal with the problem of zero trade observations. This study adopts the Heckman sample selection model developed by Heckman (1979) which corrects for sample selection bias and has regularly been used in trade studies to address the problem of zero trade observations. This model uses a two-step statistical approach. The first step describes the probability of positive trade taking place, given a set of explanatory variables. The second step is the outcome equation which describes the possible response of positive trade flows given a set of explanatory variables.

The Heckman sample selection model requires that an exclusion or selection variable be identified. The basic requirements for the selection variable include: (i) the selection variable features only in the selection equation and not in the outcome equation (Crivelli and Groschl, 2012); and (ii) it should be a dummy variable with the probability of 0.5 to be equal to either 1 or 0 (Martin and Pham, 2008).

The dependent variable in the selection equation is a latent variable which represents the probability of trade taking place between the two trading partners (Haq, Meilke and Cranfield, 2011; Tran, Wilson and Hite, 2012). A latent variable, as described in Bollen (2002), is a hypothetical construct which is not observable or measurable. Skrondal and Rabe-Hesketh (2007) define these variables as random variables whose realised values are not observed, of which their properties are inferred using statistical modelling linking them to observed variables.

According to Klaauw and Koning (2003), the equations for the sample selection model can be specified as follows:

Regression or outcome equation:

$$y_i = \beta'_1 x_{1i} + \varepsilon_{1i} \tag{4.5};$$

Selection equation:

$$z_i^* = \beta'_2 x_{2i} + \varepsilon_{2i} \tag{4.6}; and$$

$$y_i = z_i = \begin{cases} 1, & z_i^* > 0 \\ 0, & z_i^* \leq 0 \end{cases} \tag{4.7}$$

In the equations above, y_i and z_i^* (latent variable) are the dependent variables in the outcome and the selection equations, respectively; β'_1 and β'_2 are the parameters to be estimated; x_{1i} and x_{2i} are vectors of exogenous variables in the two equations; and ε_{1i} and ε_{2i} are the error terms in the outcome and the selection equations, respectively. Since z_i^* is a latent variable and not observable, a binary or dichotomous variable z_i is observed. The dependent variable y_i is only observed when variable z_i is equal to one.

The Heckman sample selection model can be estimated using Heckman's two-step estimator which is sufficiently robust to model misspecification and produce consistent parameter estimates, provided that two conditions (1) ε_{2i} has marginal normal distribution and (2) linearity of the conditional expectation of the outcome equation error term (ε_{1i}) conditional on the selection equation error (ε_{2i}) i.e. $E(\varepsilon_{1i}|\varepsilon_{2i})$ = $\rho\sigma\varepsilon_{2i}$, are met (Montes-Rojas, 2011). Furthermore, Klaauw and Koning (2003) indicate that when using this approach one can assume that the two errors ε_{1i} and ε_{2i} follow a bivariate normal distribution.

When using the two-step procedure, the selection equation is estimated using the Probit model which generates the inverse Mills ratio, $\lambda(\varepsilon_{2i}) = \frac{\emptyset(\varepsilon_{2i})}{\Phi(\varepsilon_{2i})}$, where $\emptyset(.)$ and $\Phi(.)$ are the standard normal density and cumulative distribution functions, respectively. The inverse Mills ratio serves as a proxy for the probability of selection and it measures the sample selection effect arising from the lack of observations in the dependent variable. Therefore, it is added to the list of independent variables in the outcome equation so that the outcome equation can be estimated consistently using the OLS method (Irfan, 2011; Tran et al., 2012).

The inverse Mills ratio is used as an additional independent variable in the outcome equation to correct for any bias in the coefficients in the outcome equation. The coefficient of the inverse Mills ratio provides information as to whether any selection bias has been corrected or mitigated (Kareem, 2014). The selection bias is present whenever there is covariance between the error terms of the two equations (Irfan, 2011).

If the coefficient of the inverse Mills ratio is different from zero, i.e. $\lambda(\varepsilon_{2i}) \neq 0$ it implies that selection bias exists and that it would have been incorrect to estimate the regression equation using OLS without the inverse Mills ratio as an additional independent variable. If it is negative, it shows that estimating the regression equation using OLS without the inverse Mills ratio would produce downwardly biased estimates, and if it is positive, the opposite would apply (Irfan, 2011). Furthermore, if it is statistically significant, it confirms the need to correct sample selection bias (Cipollina and Salvatici, 2013).

In addition, the two equations are expected to be positively correlated in order to conclude that there is a relationship between the two equations, sample selection and outcome equation (Linders and De Groot, 2006; Hoffmann and Kassouf, 2005). This is indicated by the correlation coefficient of the residuals and the statistical packages which are used to estimate the sample selection model compute this coefficient to show whether the two equations are related.

According to Tran et al. (2012), the Heckman solution to the estimation of the gravity equation maintains the log linear transformation. In order to evaluate the specific objectives, the study follows the sample selection model specification by Klaauw and Koning (2003) and also takes into consideration the assertion by Tran et al. (2012) that the Heckman solution maintains the log linear transformation of the gravity of the gravity equation. In examining the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU and Zambia, the study will estimate the equations below:

Outcome equation:

$$lnM_{ijt} = \gamma_0 + \gamma_1 lnGDPPC_{it} + \gamma_2 lnMPV_{jt} + \gamma_3 lnISTrade_t + \gamma_4 \ln(1 + Tar_{ijt}) +$$
$$\gamma_5 NTM_{ijt} + \gamma_6 lnDist_{ij} + \gamma_7 \lambda(\mu_{ij}) + \varepsilon_{ijt} \qquad (4.8)$$

Sample selection equation:

$$\tilde{\pi}^*_{ijt} = \gamma_0 + \gamma_1 lnGDPPC_{it} + \gamma_2 lnMPV_{jt} + \gamma_3 lnISTrade_t + \gamma_4 ln(1 + Tar_{ijt}) + \gamma_5 NTM_{ijt} +$$
$$\gamma_6 lnDist_{ij} + \gamma_7 ADJ_{ij} + \mu_{ijt} \qquad (4.9)$$

$$lnM_{ijt} = \tilde{\pi}_{ijt} = \begin{cases} 1, & \tilde{\pi}^*_{ijt} > 0 \\ 0, & \tilde{\pi}^*_{ijt} \le 0 \end{cases} \qquad (4.10)$$

In the selection equation, $\tilde{\pi}_{ijt}$ represents a latent variable capturing the probability of trade taking place between countries i and j. The coefficients to be estimated in order to determine the probability of trade taking place are γ_0 to γ_7 while μ_{ij} is the error term capturing all the other factors which have an influence in determining the probability of trade taking place. The variable Adj_{ij} is the chosen section variable and only features in the selection equation.

In the outcome equation, the coefficients to be estimated are γ_0 to γ_7 assuming that trade would have taken place i.e. $M_{ijt} > 0$. The variable $\lambda(\mu_{ij})$ is the inverse Mills ratio which is generated when the sample selection equation is estimated using the Probit model. The error term ε_{ij} captures all the other factors which would have played a role in determining the level of trade that took place. The outcome equation is estimated using the OLS method.

4.5 DATA DESCRIPTION AND SOURCES

This study focuses on the meat trade data between SACU countries and Zambia over the period 2001 to 2013. The study period was chosen to track meat trade performance during the period when SACU countries and Zambia were expected to have commenced and completed their tariff reduction commitments under the SADC protocol on trade. The study, however, extends the study period by a year beyond this point in order to capture any impact that tariff reductions in the last year, 2012, might have had on trade performance in the following year, 2013. In this manner, the analysis will generate useful information on meat trade performance in the face of declining tariff levels. The SACU countries included in the analysis are South Africa, Botswana, Namibia and Swaziland. Lesotho does not form part of the analysis due to data unavailability.

As shown Table 4.1 below, data for the dependent variable, *meat trade* (M_{ijt}) trade between SACU and Zambia, and for intra-SACU meat trade (*ISTrade$_t$)* was obtained from the ITC Trade Map. The dataset was supplemented by the data from WITS. In terms of the Harmonized Classification (HS) Code, meat is classifiable under Chapter 2 and the data was collected at heading (HS4 digit) level. The ITC Trade Map records trade data in tons, and as a result, the data was converted to kilograms (kg). Trade data from WITS was already recorded in kg.

The variable intra-SACU meat trade (*ISTrade$_t$)* is calculated as meat trade between one SACU country and the rest of the SACU countries in a particular year. For example, the intra-SACU trade value for South Africa is the volume of meat trade (import or export) between South Africa and the remaining SACU countries in a particular year. Trade data for this study was not an exception to the assertion by Xiong and Che (2012) that zero trade flows are a common observation in trade data.

Data on meat production volumes (MPV_{jt}) was obtained from the FAO statistics database and is expressed in kilograms. The data on GDP per capita ($GDPPC_{it}$) for the countries was sourced from the World Bank Development Indicators (WDI) database and is expressed in nominal terms as US$ dollars. Data on tariffs (Tar_{itj}) was obtained from the Department of Trade and Industry and is expressed in percentages. However, for the analysis, the tariffs are converted to decimal values. Data on bilateral distance ($Dist_{ij}$) was obtained from the website www.indo.com/distance. The distance between the two trading partners is expressed in kilometres between their two capital cities. Data on Common border (ADJ_{ij}) was obtained from the World Atlas.

Table 4.1: Variables and data sources

Variables	Data Source
Trade volumes (kg)	The World Integrated Trade Solution (WITS) and the International Trade Centre (ITC) trade map
GDP/Capita (USD)	World Bank Development indicators (WDI)
Meat production volumes (kg)	FAO
Distance (km)	www.indo.com/distance
Tariffs (%)	Department of Trade Industry (Dti)
NTM (numbers)	Kalaba (2014)
Intra-SACU meat trade volumes (kg)	The World Integrated Trade Solution (WITS) and the International Trade Centre (ITC) trade map
Common border	World Atlas at www.worldatlas.com

Source: compiled by author

The variable NTM (NTM_{ijt}) is our main variable of interest and is expressed as a dummy variable. It takes the value of one if at least one NTM was used to regulate meat trade between the trading partners in a particular year, and zero otherwise. The data for this variable was obtained from the database developed by Kalaba (2014). The data was updated to ensure that it covered the whole period of study, based on whether there was a notice of withdrawal of applied NTMs or the introduction of new NTM beyond the period covered by the database. If there was no notice of either of the two possible intensions, it is concluded that the status quo in the previous year remains.

4.6 REGRESSION MODEL DIAGNOSTICS

In testing the reliability of the results, the study ran three diagnostic tests, namely the Wald test, Regression Error Specification Test (RESET) and the Breusch-Pagan test for heteroskedasticity. The Wald test is one of the ways used to test for the overall significance of the models. If for a combination of explanatory variables, the Wald test statistic is significant, it would mean that at least one of the parameters for these variables are different from zero, and if the Wald test is not significant, then we can conclude that these explanatory variables do not explain the variation in the dependent variable (Agresti, 1990; Polit, 1996).

According to De Benedictis and Giles (1998), it is essential to test for the regression model specification in econometrics. This study used the RESET test to test if there is any functional form misspecification in the outcome equation. This model was developed by Ramsey (1969). The test is used to detect if the model has any omitted variables and if it is not correctly specified. It tests the null hypothesis that the model has been correctly specified and that there are no omitted variables. Rejecting the null hypothesis would mean that the model has omitted variables, and vice versa.

Heteroskedasticity is one of the problems usually associated with trade data. According to Silva and Tenreyro (2006), the OLS is not an efficient estimator when the data exhibits heteroskedasticity and the OLS estimates of the gravity model are severely biased. In order to detect if the data exhibits heteroskedasticity, statistical tests are run with the null hypothesis of homoscedasticity. These tests include the Breusch-Pagan and the White tests (Coenders and Saez, 2000).

Since the outcome equation will be estimated using the OLS procedure, the Breusch-Pagan test was conducted in order to check if the data exhibits heteroskedasticity problem. The Breusch-Pagan test for heteroskedasticity was based on the null hypothesis of the homoscedasticity assumption, i.e. constant variance of error terms:

$$Ho: E(u|X) = \Phi^2 \tag{4.11}$$

Failure to reject the null hypothesis of homoscedasticity would mean that the Heckman sample selection model has successfully dealt with the problem of heteroskedasticity. However, if the opposite occurs, it would mean that the

73

heteroskedasticity problem exists. As a result, other ways of dealing with such a problem will be explored.

4.7. EXPLANATORY VARIABLES AND THEIR EXPECTED SIGNS

The expected signs of the explanatory variables when estimating equations (4.8) and (4.9) are presented in Table 4.2 below. The explanatory variables are expected to have the same impact on both the probability of trade taking place and the observed level of trade.

Table 4.2: Explanatory variables and their expected signs

Variable	Description	Expected signs	
		Sample selection	Outcome equation
GDPPC	GDP per Capita	+	+
MPV	Meat Production Volumes	+	+
ISTrade	Intra-SACU meat trade	-	-
Tar	Meat Import tariffs	-	-
NTM	NTM dummy	-,+	-,+
Dist	Distance	-	-
ADJ	Common Border	+	N/A

Source: Compiled by author

The GDP per capita is expected to have positive sign in the selection and the outcome equations. This is due to the positive relationship between demand and consumption, and income levels. The higher the income is, the more the people will be able to afford the meat. This will in turn result in the increase in meat demand and the subsequent increase in meat consumption.

The MPV is expected to have a positive sign since high meat production volumes by the exporter would mean that more meat is available for the export market. This variable forms part of the supply conditions in the exporting country, and improvement in such conditions would mean that more can be made available for export. Tariff level is expected to have a negative sign since tariffs are trade costs, and hence higher trade costs are expected to negatively affect trade volumes. However, if the reduction in tariffs is not followed by an increase in trade, but rather a reduction, a positive sign for tariffs can be obtained.

Likewise, distance is expected to have a negative sign since longer distances are associated with high transportation costs, and hence will discourage trade. Also, the dummy variable on common border is expected to have a positive sign since trading

partners adjacent to each other are expected to trade more than those situated far apart. However, if Zambia trades more with SACU countries situated farther than those closer or those it shares the same border with, a positive sign for distance can be obtained.

The variable controlling for the impact of intra-SACU trade on meat trade between SACU and Zambia, ISTrade, is expected to have a negative sign. An increase in intra-SACU trade would mean that more trade is taking place among the customs union members, and that less trade would take place with third parties. There are incentives to trade within the customs union, such as free movement of goods, which could disadvantage any trade with third parties.

The NTM dummy variable is expected to have either a positive or negative sign. This is attributable to the possible impact of NTMs which is ambiguous. If the coefficient of the NTM dummy variable is positive and significant, it would mean that NTMs positive affect meat trade between SACU and Zambia, and vice versa. A negative sign would mean that we will fail to reject the null hypothesis that NTMs negatively affect meat trade between SACU and Zambia. This would mean that NTMs negatively affected meat trade between SACU and Zambia over the period 2001 to 2013. As a result, we will conclude that NTMs are part of the reason why the reduction in tariffs in SADC was not accompanied by increasing trade.

When interpreting the estimated coefficients, the coefficients for the logged variables will be interpreted as elasticities. This is due to the double logarithmic specification of the gravity model. That is, the coefficient of a logged variable, say GDPPC, represents a percentage change in the dependent variable as a result of a one percentage change in this variable.

4.8 CONCLUSION

This chapter explained the empirical approach which is used to examine the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU and Zambia. The gravity model is the chosen empirical model for this purpose. The gravity model has been used by many researchers in examining bilateral trade relationships. It has become an integral part of trade literature (Linders and De Groot, 2006). According to Kareem (2013), the gravity model is preferred by

many researchers due to its extraordinary accomplishments in explaining trade flows.

The chapter also discussed the variables which make up the dataset for this study, as well as their sources. Trade data showed that there was prevalence of zero trade observations. There are several approaches to address the problem of zero trade observations. However, the Heckman sample selection model is preferred due to its outstanding ability to address the problem of zero trade observations. It will be estimated using the Heckman's two-step estimator.

The explanatory variables expected impact on the dependent variables was discussed and the expected signs from the estimation were presented. The impact of variables, such GDP per capita, meat production volumes, and common border, is expected to be positive. Intra-SACU meat trade, tariffs, and distance are all expected to have a negative impact on meat trade between SACU and Zambia. The NTM dummy is expected to have either positive or negative signs, due to the ambiguous nature of the NTMs-trade relationship.

CHAPTER 5: RESULTS AND DISCUSSION

5.1 INTRODUCTION

This chapter presents the results and the discussion thereof in line with the objectives of the study. Specifically, the chapter presents the empirical results on the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU and Zambia. The Heckman selection model was preferred in estimating the gravity equation due to its ability to handle the problem of zero trade data. The Wald test was used to test the overall significance of the model; the Ramsey RESET was used to check if there is any specification problem with the model; and the Breusch-Pagan test was used to test if the model has successfully dealt with heteroskedasticity.

5.2 ESTIMATING THE GRAVITY EQUATION

Table 5.1 below presents the descriptive statistics for the variables in the analysis. In particular, it presents means and standard deviations of the variables. The dummy variables are excluded from the table. It can be seen from the table that high standard deviations are reported for all the variables, except for the tariff variable. The standard deviation provides a measure of spread for a data set in relation to the mean. High standard deviations imply that data entries are widespread or far from the mean (Al-Saleh and Yousif, 2009; Wooldridge 2009).

Table 5.1: Descriptive statistics

Variables	Description	Mean	Standard Deviation
Trade	Meat trade (kg)	329 385.50	277 198
GDPCC	GDP per Capita (USD)	2684.92	2 113.71
MPV	Meat Production Volumes (kg)	10 853 546 308	1 905 502 071
ISTrade	Intra-SACU Trade (kg)	116 748 846	49 476 592.20
Tar	Tariffs (%)	0.31	1.57
Dist	Distance (km)	1 644	173.26

Source: Compiled by author

The gravity model was estimated using the Heckman two-step sample selection model in examining the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU and Zambia. As discussed in Chapter 4, the diagnostic tests were conducted to determine the robustness of the model and the possible reliability of the results. The results for the Wald tests, the Ramsey RESET, and the Breusch-Pagan tests are reported in Table 5.2 below:

Table 5.2: Results diagnostics

Test	Null hypothesis (H₀)	Test Statistic and degrees of freedom	P-Value	Conclusion
Wald test	All coefficients in the model are jointly equal to zero	Chi square (6) =22.63	0.0009	Reject the null hypothesis
RESET Test	The Model has no omitted variable bias	F(3, 127)=1.56	0.2028	Fail to reject the null hypothesis
Breusch Pagan Test for homoskedasticity	Fitted values have constant variance	Chi square(1)=1.84	0.1748	Fail to reject the null hypothesis

Source: Compiled by author

The results show that the Wald test statistic is highly statistically significant, even at 1 % level of significance. As a result, we reject the null hypothesis and conclude that the dataset can be used to explain the relationship between the dependent and independent variables.

The Ramsey RESET test was used to test if the outcome regression equation has any specification error. The test was run with the null hypothesis that the model has no omitted variable bias. The results show that the RESET test statistic is statistically insignificant, even at 10 % level of significance. The probability of failing to reject the null hypothesis is very high with a p-value of 0.2028. As a result, we fail to reject the null hypothesis and conclude that the model has no omitted variable bias.

The Breusch-Pagan test was conducted to test if the Heckman two-step sample selection model has successfully dealt with the problem of heteroskedasticity. The null hypothesis for the test was that the fitted values of the dependent variable have a constant variance. The results show that the Breusch-Pagan test statistic is

statistically insignificant, even at 10 % level of significance. The probability of failing to reject the null hypothesis is very high, with a p-value of 0.1748. As a result, we fail to reject the null hypothesis and conclude that the Heckman two-step sample selection model has successfully dealt with the problem of heteroskedasticity.

The estimation results of the Heckman two-step selection model are presented in Table 5.3 below. The first column shows the explanatory variables included in the model, the second and third columns present the estimated parameter estimates and standard errors (in parentheses) from the estimation of the selection and the outcome equations, respectively. The table also shows the coefficient estimates of the inverse Mills ratio and the correlation coefficient (rho).

The total number of observation was 832. The censored observations represent the number of zero trade data, while the uncensored observation represents the non-zero trade data. This is a clear indication of the prevalence of zero trade observations in the dataset. This also justifies the need to use a model which can better handle the zero trade observations. Ignoring the zero trade observation would imply that the study was only going to use approximately 17 % of the dataset.

As discussed in the methodology section, using the Heckman two-step sample selection model requires that the two equations, for selection and outcome, to be correlated. This can be deduced from the correlation coefficient (rho) of the residuals. The correlation coefficient is different from zero, which shows that the two errors are indeed correlated. This confirms that the results of the sample selection equation played a role in the outcome equation.

The first equation was estimated using the Probit model to control for the sample selection bias which may arise due to the prevalence of zero trade observations in the dataset. The results of the Probit model generate the inverse Mills ratio which serves to control for sample selection bias arising from the selection equation in the outcome or regression equations. This variable is used as an additional independent variable in the outcome equation.

As noted in Chapter 4, if the coefficient of the inverse Mills ratio is different from zero, it means that if the inverse Mills ratio was not used in the outcome equation, the OLS estimates of the outcome equation would be biased. As can be seen from

Table 5.3, the co-efficient of the inverse Mills ratio is negative, at λ = -5.941. This means that estimating the outcome equation without the inverse Mills ratio as an additional explanatory variable could have biased the outcome equation's OLS estimates downwards.

Table 5.3: The Heckman two-step selection model results

Independent variables	Selection Equation (Probit model)	Outcome Equation (OLS)
	Dependent variable: $\tilde{\pi}_{ijt}^*$	Dependent Variable: lnM_{ijt}
lnGDPPC$_{it}$	-1.165 (0.214)***	4.809 (1.895)**
lnMPV$_{jt}$	0.459 (0.065)***	-1.462 (0.666)**
lnISTrade$_{i/jt}$	0.005 (0.012)	0.080 (0.048)*
lnTar$_{it}$	-0.608 (2.555)	2.179 (3.973)
lnDist$_{ij}$	0.419 (0.985)	6.122 (5.407)
NTM$_{it}$	1.399 (0.265)***	-4.495 (2.326)*
Adj$_{ij}$	0.046 (0.149)	-
Constant	-4.595 (7.953)	-35.056 (42.736)
Inverse mills ratio		-5.941 (2.218)***
Rho(ρ)	-1.000 (5.941)	
Number of observations	Total: 832 Censored: 694 Uncensored: 138	

Source: Compiled by author

Note: ****, **, * denote significance at the 1%, 5%, and 10% level, respectively. Common border is the selection variable and thus excluded in the outcome equation.*

The results of the Probit model are presented in column 2 in Table 5.3 above. These results, however, do not show the impact of the factors on the actual observed meat trade between SACU countries and Zambia, but rather their impact on the probability of meat trade taking place. The results show that only three variables have a statistically significant impact on the probability of trade taking place. These variables are GDP per capita, meat production volumes, and NTMs. The impact of other

variables, Intra-SACU trade, tariffs, distance, and common border, on the probability of observing positive trade was found to statistically insignificant.

The positive sign of the NTM dummy variable was expected since the impact of NTMs on meat trade can be either positive or negative. The positive impact would mean that the use of NTMs in regulating meat trade between SACU countries and Zambia should have encouraged trade to take place. This, as discussed in Chapter 3, is possible if, for example, the NTMs introduced serve as important quality signals, providing useful information to consumers. This would inspire consumer confidence in consuming the product and as a result stimulate demand.

The positive sign of the variable meat production volumes was also expected. It implies that the increase in meat production volumes should encourage meat trade to take place. As discussed in Chapter 2, all the SACU countries and Zambia generally displayed increasing trends in meat production volumes over the period under consideration. This, according to the results, should have led to an increase in the probability of trade taking place.

The negative relationship between GDP per capita and the probability of meat trade taking place was not expected, since high income is associated with high demand and hence positively influences trade. We already know, as the main argument of the study, that meat trade between SACU countries and Zambia has not improved following tariff liberalisation. The negative relationship implies that the continuous increase in GDP per capita has not positively influenced meat trade to take place.

The OLS estimation results are presented in column 3 in Table 5.3 above. The results present the impact of the independent variables on observed meat trade between SACU countries and Zambia. The results show that all the three independent variables which are part of the objectives of this study, NTMs, GDP per capita, and meat production volumes, have statistically significant relationships with the dependent variable. The other variable with a statistically significant relationship with the dependent variable is Intra-SACU trade.

The coefficient of the NTM dummy variable is negative and statistically significant at 10 % level of significance. This implies that there is a negative relationship between meat trade and NTMs. This relationship was expected since the impact of NTMs on

trade can either be positive or negative. The discussion on the relationship between NTMs and trade in chapter 3 revealed that the impact of NTMs on trade can be either positive or negative, or in some cases have no impact at all. In this particular case, the results show that the use of NTMs in regulating meat trade has negatively affected meat trade between SACU countries and Zambia.

The coefficient of GDP per capita is positive, as expected, and is statistically significant at 5 % level of significance. This is in line with the literature where an increase in income is associated with increasing demand. The coefficient estimate is 4.809. This implies that a 1 % change in GDP per capita would result in a similar increase in meat trade between SACU and Zambia of approximately 4.81 %.

The coefficient of meat production volume is negative and statistically significant at 5 % level of significance. This is, however, unexpected since the increase in meat production volumes would imply that more meat is available and that countries would venture into the export market. It is known from Chapter 2 that the SACU countries and Zambia have displayed increasing trends for meat production over the period 2001 to 2013. It is also known that the meat trade between SACU and Zambia over the same period had not been increased. This means that the increase in meat production volumes did not lead to an increase in trade, as expected. Hence, the results show a negative and statistically significant relationship between the two variables.

The results show a positive and statistically significant relationship between intra-SACU trade and meat trade between SACU countries and Zambia. This outcome was not expected. We already know that meat trade between these trading partners has not been increasing over the years. A positive relationship may mean that intra-SACU meat trade has also not been increasing over the same period.

The estimation results found an unexpected positive relationship between meat trade, and tariffs and distance. However, this relationship is statistically insignificant. The positive relationship between meat trade and tariffs is justifiable in the case of SACU and Zambia. The tariffs on meat trade have been reduced and eliminated under the SADC trade protocol, but there is still a lack of trade between these trading partners. A positive relationship can arise where a fall in trade volumes happened at the same time as the reduction and elimination of tariffs.

5.3 SUMMARY AND CONCLUSION

This chapter presented the results and discussion in line with the objectives of the study. The study used the gravity model to estimate the impact of NTMs, GDP per capita, and meat production volumes on the meat trade between SACU countries and Zambia. Due to the prevalence of zero trade observations in the dataset, the study used the Heckman two-step sample selection model to estimate the gravity equation. The Heckman sample selection model, as discussed in Chapter 4, is a known model which better handles the problem of zero trade observations.

The Wald test was used to test the overall significance of the model and the results confirmed that the dataset can indeed be used to explain the relationship between the dependent and independent variables. The RESET was used to check if there is any specification problem with the model, and the results confirm that there is no specification error. The Breusch-Pagan test was used to test if the model has successfully dealt with heteroskedasticity. The test results confirmed that the Heckman two-step selection model successfully dealt with the heteroskedasticity problem.

One of the requirements of using the Heckman two-step selection model requires that the two equations, for selection and outcome, should be correlated. The correlation coefficient for the two steps is different from zero, which shows that the two errors are indeed correlated. This confirms that the results of the sample selection equation played a role in the outcome equation. The co-efficient of the inverse Mills ratio is positive, at $\lambda = -5.941$, confirming that estimating the outcome equation without the inverse Mills ratio as an additional explanatory variable could have biased the OLS estimates downwards.

The main argument of this study, as discussed in the problem statement, is the failure of trade to improve in the face of tariff liberalisation. This is also the case for meat trade between SACU countries and Zambia. This implies that tariff liberalisation did not encourage improved meat trade between these trading partners. Interestingly, the study found a statistically insignificant relationship between meat tariffs and meat trade between SACU countries and trade. This confirmed that tariff liberalisation has not influenced meat trade performance between these trading partners.

It was also argued in the problem statement that the poor meat trade response to tariff liberalisation meant that there are other factors influencing trade. Based on the trade literature, NTMs were selected as comprising one of the factors with the potential to affect trade. As a result, the first specific objective of the study was to estimate the impact of NTMs on meat trade between SACU countries and Zambia. In line with this objective, the study found a negative and statistically significant relationship between NTMs and meat trade. This implies that NTMs negatively affected meat trade between these trading partners over the period 2001 to 2013. This finding can be supported by several justifications discussed in the preceding chapters of this study.

The work on the legislative frameworks with a bearing on meat trade for all the countries was presented in Chapter 2. It was revealed that all the countries included in the study have legislative provisions directly aimed at regulating the trade of animal and animal products, mainly meat. These legislative provisions are aimed at, among other things, ensuring that consumers are provided with safe and high quality meat, and controlling any spread of animal diseases. The resultant impact on trade will be the restricting of trade for such products that are deemed to pose risks in achieving these aims. As a result, it can be concluded that these types of legislation serve as a basis on which countries impose trade-restrictive NTMs.

Furthermore, the regulation of NTMs at both international and regional levels allows countries to develop regulations at a national level to provide better protection to their territories. Countries, on this basis, can implement much stricter NTMs to restrict entry into their market for specific products. Furthermore, the subsection on NTM incidences in the SADC revealed that NTMs are heavily used in regulating intra-SADC agricultural trade, and that their use is increasing at a high rate.

In line with the second objective, the study found a positive and statistically significant relationship between GDP per capita and meat trade. This finding is in line with what was expected since the relationship between income and demand, and hence trade, is expected to be positive. However, it is known from Chapter 1 that meat trade between SACU countries and Zambia did not increase over the period under consideration. A positive relationship between GDP per capita and meat trade could also imply that the incomes of the people in these countries have also not

been increasing, or that their additional increases in income have not been spent on meat. As a result, this did not influence improved trade to take place.

In terms of the third specific objective, the study found a negative and statistically significant relationship between meat production volumes and meat trade between SACU countries and Zambia. It was shown in Chapter 2 that all the SACU countries and Zambia generally displayed increasing trends in meat production volumes. Also, it is the main argument of this study that meat trade has not been increasing over the years. The negative relationship between these variables means that the increase in meat production has not positively influenced meat trade between these trading partners.

CHAPTER 6: SUMMARY, RECOMMENDATIONS AND CONCLUSION

6.1 INTRODUCTION

This study attempted to investigate why there has been a lack of improvement in meat trade between SACU countries and Zambia, despite tariff liberalisation. It is documented in trade literature that a decline in tariffs has resulted in the rise to prominence of NTMs in regulating trade. As a result, the study attempted to examine the impact of NTMs on meat trade between SACU countries and Zambia. The study also attempted to examine the impact of the GDP per capita and meat production volumes on meat trade between SACU countries and Zambia.

There are several approaches which can be used to examine the relationship between trade and the factors which can affect or influence trade. This study used the gravity model to examine the impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU countries and Zambia. This model has already been used by many researchers to analyse the impact of several factors which may either encourage or discourage trade, such as tariffs, other trade costs, and NTMs. In this sense, the model required very little adjustments to suite the current study.

The trade data displayed a prevalence of zero trade observations. Zero trade observations pose an empirical problem when estimating the gravity equation since the dependent variable is the log of trade. The logarithm transformation of zero is not feasible since the transformation is only valid for numbers greater than zero. There are several ways of handling the problem of zero trade observations.

Accordingly, this study used the Heckman sample selection model developed by Heckman (1979) which corrects for sample selection bias. It has regularly been adopted in trade literature to address the problem of zero trade flows. The sample selection model used a two-step statistical approach. The first step describes the probability of positive trade taking place, given a set of explanatory variables. The second step is the outcome equation, which describes the possible response of positive trade flows, given a set of explanatory variables.

6.2 SUMMARY OF FINDINGS

The impact of NTMs, GDP per capita, and meat production volumes on meat trade between SACU and Zambia was examined using a gravity model approach estimated by the Heckman two-step sample selection model. The study found that all the three independent variables which are part of the objectives of this study, NTMs, GDP per capita, and meat production volumes, have statistically significant relationships with the dependent variable, meat trade.

Firstly, the study found a statistically insignificant relationship between tariffs and meat trade between SACU countries and trade. This confirmed that tariff liberalisation has not influenced meat trade performance between these trading partners, and is in line with main argument of the study that the response of meat trade to tariff liberalisation has been very poor for these trading partners.

Secondly, the study found a negative and statistically significant relationship between NTMs and meat trade. This finding implies that NTMs negatively affected meat trade between these trading partners over the period 2001 to 2013. It also implies that, as argued in Chapter 1, there are indeed other factors influencing meat trade between SACU countries and Zambia, and that NTMs are one of those factors.

Thirdly, the study found a positive and statistically significant relationship between GDP per capita and meat trade. This finding is in line with what was expected since the relationship between income and demand, and hence trade, is expected to be positive.

Fourthly, the study found a negative and statistically significant relationship between meat production volumes and meat trade between SACU countries and Zambia. The negative relationship between these variables means that the increase in meat production has not translated into any improvement in meat trade between these trading partners.

Finally, the study confirmed that NTMs are indeed part of the reason why meat trade between SACU countries and Zambia has not improved in the face of tariff liberalisation.

6.3. HYPOTHESES TESTING

This section presents hypothesis testing in line with the hypotheses as set out in Chapter 1.

First hypothesis: NTMs contributed to the low levels of meat trade between SACU countries and Zambia.

- The study found a negative and statistically significant relationship between NTMs and meat trade between SACU and Zambia. Therefore, we fail to reject the null hypothesis and conclude that NTMs are indeed negatively related to meat trade between SACU countries and Zambia. This means that NTMs contributed to the low levels of meat trade between SACU countries and Zambia over the period 2001 to 2013.

Second hypothesis: There is a positive relationship between GDP per capita and meat trade between SACU and Zambia.

- The study found a positive and statistically significant relationship between GDP per capita and meat trade between SACU and Zambia. This means that there is indeed a positive relationship between GDP per capita and meat trade. As a result, we fail to reject this hypothesis.

Third hypothesis: There is a positive relationship between meat production volumes and meat trade between SACU and Zambia.

- The study found a negative and statistically significant relationship between meat production volumes and meat trade between SACU and Zambia. This means that there is a negative relationship between meat production volumes and meat trade between these trading partners. As a result, we reject this hypothesis.

6.4. POLICY IMPLICATIONS

The findings of the study show that NTMs had negatively affected meat trade between SACU countries and Zambia over the period 2001 to 2013. Although this study does not necessarily reveal which specific NTMs have negatively affected meat trade between these trading partners, it does give an indication of the negative

relationship between these variables. This is important in that it provides an indication of which factors contributed to the lack of trade improvement following tariff reductions. As a result, NTMs can represent a starting point in trying to solve the problem of poor trade response to tariff reductions. This can also be done for other agricultural products and for the rest of the intra-SADC agricultural trade.

In light of the above, this study can safely argue that NTMs are the main reason why there is a lack of improvement in the meat trade between SACU countries and Zambia following tariff reductions. This can also be argued for the lack of an improvement in trade in the overall intra-SADC agricultural trade. As a result, trade policy makers should prioritise the treatment of NTMs in trying to improve meat trade, and also overall agriculture trade, between SACU countries and Zambia, and the rest of the SADC countries.

The ideal starting point to address the problem of NTMs would be to prioritise resolving the known NTMs which prove to be trade restrictive in nature. Another important strategy would be to stop the development of any new trade restrictive NTMs. This could be better achieved through collaborative actions and consultations among the trading partners. It would also ensure that any new measure to be introduced is better understood by the partners, and that any unnecessary trade restrictive impact would have been removed before implementation.

6.5 ACHIEVEMENTS AND LIMITATIONS OF THE STUDY

This study endeavoured to investigate why there was a lack of improvement in the meat trade between SACU and Zambia. In particular, the study examined the impact of NTMs on meat trade between SACU and Zambia over the period 2001 to 2013 following tariff reductions. The study also examined the GDP per capita and meat trade volumes on meat trade between these trading partners. In order to achieve all this, the study used a gravity model approach. The gravity equation was estimated using the Heckman two-step sample selection due to the prevalence of zero trade observation in the dataset.

Using the above approach, the study managed to accomplish its objectives. The study found that NTMs negatively affected meat trade between SACU and Zambia. The study also found a positive relationship between GDP per capita and meat

trade. With regard to the impact of meat production volumes on meat trade, the study unexpectedly found that this variable has a negative relationship with the meat trade between SACU and Zambia.

Although the study successfully accomplished its specific objectives, it does, however, have some limitations. In terms on the impact of NTMs on meat trade, the study did not assess the impact of any specific NTM. An NTM dummy variable denoted the presence of any NTM, but not any specific NTM type.

6.6 FURTHER STUDY RECOMMENDATIONS

Since the study did not assess the impact of specific NTM categories on the meat trade, it can still be improved upon. Future research in this specific area could look at the impact of specific NTM categories on meat trade. Furthermore, future research could also look at the impact of such specific NTMs on different meat categories such poultry meat, beef, pork and/or mutton. In this sense, such future research would have gone a step further to the current study.

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