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Asymmetric trade arrangements: a case of regulatory measures affecting South African beef exports to the European Union

By

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DECLARATION

I, Chikumbutso Katukula Banda, hereby declare that this dissertation I submit for the MSc (Agric) Agricultural Economics at the University of Pretoria is a result of my effort and work. I have never submitted this dissertation at the University of Pretoria or elsewhere to award any academic qualification.

Signature: _____

Date: _____/_____/_____ (day/month/year)

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ABSTRACT

ASYMMETRIC TRADE ARRANGEMENTS: A CASE OF REGULATORY MEASURES AFFECTING SOUTH AFRICAN BEEF EXPORTS TO THE EUROPEAN UNION (EU)

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The international trade in agriculture and food markets are characterised by extensive use of regulatory measures. Most of the measures used comprise Sanitary and Phytosanitary measures (SPS) and Technical Barriers to Trade (TBT). The use of regulatory measures between members can be asymmetric. This implies that one partner implements more regulatory measures than another might. This can lead to trade imbalance or be viewed as trade barriers by exporters. Global exporters of agri-food products to the European Union (EU) need to comply with more regulatory measures than for any other region. These measures apply to all exporting countries, regardless of trade agreements.

South Africa has signed two free trade agreements with the EU since the beginning of the 21st century. These free trade agreements imply that South African exports in general to the EU would be expected to increase and vice versa. However, in the case of South African beef exports to the EU, these declined from 2000 to 2019. This study aimed to evaluate the effect of EU regulatory measures on South African beef exports to the EU. From this perspective, four objectives were specified in pursuit of this aim, namely to: (1) determine whether there were significant differences in the number of regulatory measures between the EU and South Africa; (2) determine whether the EU regulatory measures affected South African beef exports to the EU; (3) determine whether the EU regulatory measures affected South African beef exports to other trade partners; and (4) evaluate other factors affecting South African beef exports to the EU.

The study used t-tests and a gravity model to address the specific objectives. A panel data set from 1992 to 2019 was used, which covered six trade partners. These were: the EU, SADC, the Rest of other African countries, the Middle East, China, and the Rest of the world. The gravity model was conducted using pooled, fixed and random effects. Later, the best model selection tests were conducted. At first, the study did the poolability test, which was followed by the Hausman test.

The study found that from 1992 to 1999, the EU was the leading importer of South African beef. However, from 2000 to 2019, the EU imports of South African beef declined. These exports were diverted to other trading partners. The study found that from 2000 to 2011, the SADC was the main importer of South African beef. From 2012 to 2019, the Middle East, China, and the SADC became the leading beef importers of South African beef.

The study also found that there were significant differences in the numbers of regulatory measures. It was revealed that there were both asymmetric regulatory measures and trade arrangements between the EU and South Africa. At first, the EU tariffs were high as compared with the regulatory measures. But later, when the tariffs reduced, the EU increased the regulatory measures. It was found that the EU regulatory measures negatively affected South African beef exports to the EU, while they positively affected South African beef exports to all other partners. Lastly, it was found that the EU tariffs negatively affected South African beef exports to the EU. The reduction in tariffs reduced the trade cost; hence, South African beef exports to the EU were expected to have increased.

On other factors that have affected South African beef exports to the EU, the study found that the EU GDP positively affected South African beef exports to the EU. Furthermore, the EU population was found to have a negative effect, and the EU exchange rate was insignificant in determining beef exports.

This study recommended that there should be negotiations on the use of regulatory measures. Secondly, there should be a development of mutual recognition between the parties. Lastly, policymakers should review regulatory measures to improve South African beef exports to the EU.

Key words: Asymmetric trade arrangements, South African beef exports, EU regulatory measures, EU GDP, EU population, EU exchange rate and EU tariff.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AAHC	Aquatic Animal Health Code
EE	Eastern Europe
EPA	Economic Partnership Agreement
EU	European Union
FAO	Food and Agriculture Organization
FSU	Former Soviet Union
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GNI	Gross National Income
ITC	International Trade Centre
ME	The Middle East
NTMs	Non-Tariff Measures
OECD	The Organisation for Economic Co-operation and Development
OIE	The World Organisation for Animal Health
REG	Regulatory measures
RoA	Rest of Africa countries
RoW	Rest of the world
SADC	Southern Africa Development Committee
SPS	Sanitary and Phytosanitary Measures
TAHC	Terrestrial Animal Health Code
TAR	Tariff
TBT	Technical Barriers to Trade
TDCA	Trade Development and Cooperation Agreement

T-TIP	Transatlantic Trade and Investment Partnership
UAE	United Arab Emirates
UN	United Nations
UNCTAD	The United Nations Conference on Trade and Development
US	United States of America
USD	United States Dollar
WHO	World Health Organization
WITS	World Integrated Trade Solution
WTO	World Trade Organization

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Global tariff protection has been reduced through various trade negotiations, regional integration initiatives and bilateral agreements (Kalaba et al., 2016; WTO, 2008). Despite the reductions in tariffs, regulatory measures like "non-tariff measures (NTMs)" have been observed to be rising in international trade (Fugazza, 2013; Santeramo and Lamonaca, 2019). According to the United Nations Conference on Trade and Development (UNCTAD) (2019), "NTMs are defined as policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded or prices or both". The use of regulatory measures among trade partners can be asymmetric. Some trade partners have more regulatory measures than others do (Bratt, 2017).

Asymmetric regulatory measures refer to a situation where a country or region implements different regulatory standards than their trade partner. The difference can either be type of standards or number of measures or both. Most studies have shown that asymmetric regulatory measures have negatively affected flows of trade (Bratt, 2017). It has been argued that asymmetric measures increase trade costs. The costs come in the form of compliance with the other partner's set standards (Yalcin et al., 2017).

The international agriculture trade has been observed to have experienced an increased use of regulatory measures (Santeramo and Lamonaca, 2019). For exporting countries to gain access to international markets, their agricultural products need to comply with importing countries' regulatory measures. Some regulatory measures are used to protect people from diseases, pests, or contaminants that might arise from imported products (Kareem et al., 2018). However, Murina and Nicita (2017) argued that non-trade policy objectives have primarily propelled a rise in the utilisation of regulatory measures.

As a leading importer, the EU is expected to have more regulatory measures in place than its trade partners do (Iliyasu and Zainalabidin, 2018). Most of the EU regulatory measures are in the agri-food sector (Schlueter et al., 2009). The agri-food products involve many categories, including meat and meat products. That implies that exporting countries have to meet the EU regulatory measures.

South Africa is one of the leading EU trade partners in Africa (EU, 2020). South Africa and the EU to have increased trade flows between each other, they signed the EU-SA Free Trade

Agreement (FTA), which came into effect in the year 2000 (Kalaba et al., 2005). The trade agreement introduced a bilateral free trade system over a 12-year transitional period, consistent with WTO rules (Kalaba et al., 2005). The parties committed themselves to reduce tariff on trade in almost all sectors. In June 2016, South Africa signed another trade agreement in the form of the EU-Southern Africa Development Committee Economic Partnership Agreement (SADC EPA). This was done together with five other southern African countries (Swaziland, Botswana, Namibia, Mozambique and Lesotho) (EU, 2019).

South Africa and the EU trade in various products comprising agri-food products, including beef products. Like all other partners, South Africa needs to comply with EU regulatory measures to export beef to the EU. As noted above, regulatory measures in bilateral trade agreements have the potential to affect one partner negatively. This is because the measures are associated with compliance costs. These costs can thus reduce trade by the other partner. Such kinds of trade costs have economic and welfare implications.

1.2 PROBLEM STATEMENT

The signing of the free trade agreements by the EU and South Africa in 1999 and 2016 was each expected to have increased trade flows (Balogh and Leitão, 2019). This also applies to South African beef exports to the EU, which were expected to increase. On the contrary, South African beef exports to the EU have declined over the years (Department of Agriculture, Forestry and Fisheries (DAFF), 2011). Figure 1.1 shows South African beef exports to the EU, rest of the world and EU regulatory measures on beef 1992-2019. The figure reflects data from 1992 to 2019, and beef exports are in values that are measured in $1000, and the EU regulatory measures are expressed as total numbers.

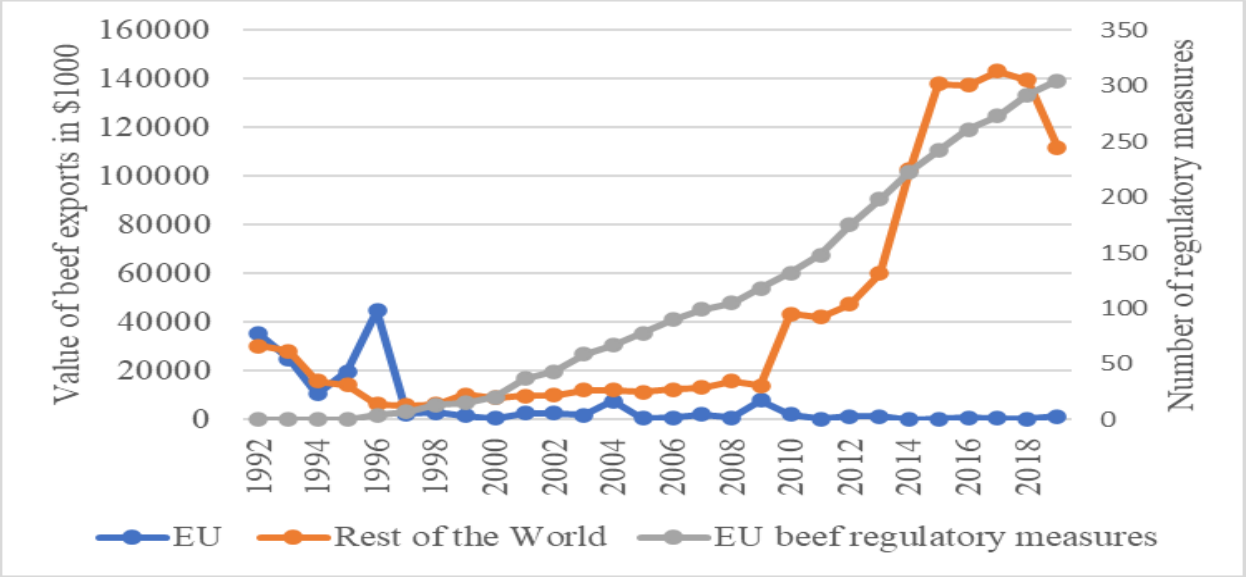

Figure 1:1: South African beef exports to the EU, rest of the world and EU regulatory measures on beef 1992-2019

Source: Author plot using data from World Integrated Trade Solution (WITS) 2019

Figure 1.1 shows that South African beef exports to the EU were high from 1992 to 1996. It also shows that from 1997 to 2019, South African beef exports to the EU declined. However, it declined much from 2011 to 2019. Furthermore, the figure shows that the supply of South African beef to other markets has increased. The EU regulatory measures on beef have shown been on the increase. The reason for South African beef exports to the EU decline is the course of research investigation.

Nevertheless, other studies have observed that regulatory measures affect international trade patterns (Arita et al., 2015; Jones et al., 2013; Jordaan and Kanda, 2011; Schlueter et al., 2009; Shang and Tonsor, 2019). The researchers argued that regulatory measures are taken as barriers to agricultural trade (Beckman and Arita, 2017). It is not known empirically whether the decline in South African beef exports is attributable to the EU regulatory measures or other causes.

1.3 RESEARCH OBJECTIVE

The main objective of this study was to analyse the existence of asymmetric regulatory measures between South Africa and the EU, and ascertain whether such measures have affected beef trade. As a result, the study had the following specific objectives:

i. To determine whether there are significant differences in the numbers of regulatory measures between the EU and South Africa.

ii. To determine whether the EU regulatory measures affected South African beef exports to the EU.

iii. To determine whether the EU regulatory measures created trade diversion of South African beef exports to other trade partners.

iv. Evaluate other factors influencing the decline of South African beef exports to the EU.

1.4 HYPOTHESIS

The following research hypotheses were used for the study. The hypotheses were formulated in line with the specific objectives of the study.

i. There are no significant differences in the number of regulatory measures between the EU and South Africa.

ii. The EU regulatory measures negatively affected South African beef exports to the EU.

iii. The EU regulatory measures resulted in South African beef exports being diverted to other trade partners.

iv. Other economic factors contributed to the decline of South African beef exports. These factors include the South African GDP, the EU GDP, the EU population, and the EU real exchange rate. The study hypothesised that EU GDP and EU population will positively affect South African beef exports to the EU. As for EU exchange rate and South African GDP, the study hypothesized that they would have a negative effect on South African beef exports to the EU.

1.5 RESEARCH METHODOLOGY

The study used a t-test to determine whether there are significant differences in the numbers of regulatory measures. The t-test was selected because it is used to determine if there are significant differences between two groups under investigation (Kim, 2015).

The study used a gravity model to address the remaining specific objectives. This model was selected because it is the standard framework used for analysing the impact of regulatory measures of trade costs and membership in trade agreements on trade flows. It is derived from the theoretical trade model proposed by Anderson and Van Wincoop (2003). The gravity model is suitable for conducting an analysis that follows the trade between two countries (Cernat, 2003). Many researchers have used the model to explain and predict bilateral trade flows, making it an essential aspect in the literature in trade (Fassarella et al., 2011; Kalaba and Kirsten, 2012).

The model assumes that "trade volume of the two countries is proportional to their respective economy sizes and inversely proportional the trading costs measured in terms of the distance among them" (Nouve and Staatz, 2003). To analyse the effect of the EU asymmetric regulatory measures on South African beef exports to the EU and the rest of the world, the study used the generalised gravity model specified in Equation 1.1. The same generalised gravity model was used to address other factors affecting South African beef exports to the EU.

$$LogT_{ij} = \alpha + \beta_1 LogSAGDP_i + \beta_2 LogGDP_{it} + \beta_3 LogPOP_{it} + \beta_4 EUREGMEAS_{ij} + \beta_5 LogTAR_{ij} + \varepsilon_{ij.} \quad (1.1)$$

where:

T_{ij} is the total value of South African beef exports to the EU and the trade partners.

α is the intercept.

β is the slope.

$SAGDP_i$ is the GDP of South Africa.

GDP_{ij} is the GDP of the EU and trade partners.

POP_{ij} is the population size of the EU and the trade partners.

$EUREGMEAS_{ij}$ is the number of EU regulatory measures on beef. The measure is a summation of the Sanitary and Phytosanitary (SPS) and the Technical Barriers to Trade (TBT) measures the EU introduced on beef.

Tar_{ij} is the tariff rates for South African beef exports to the EU and the trade partners.

ε is the error term.

The study used panel data from 1992 to 2019. The data had the following variables: South African exports of beef to the EU and the trade partners, EU's population and the trade partners, the EU regulatory measures on beef, and the tariff rates of South African beef exports to the EU and the trade partners. The data was retrieved from various sources, and Chapter 3 sets out the source depending on the variable.

1.6 JUSTIFICATION

South African agricultural exports assist in boosting the agricultural economy of the country. South African beef exports to various trade partners boost the growth of the beef industry. For the industry to achieve its potential growth, it is essential to identify the factors that affect beef exports with trading partners. The EU is the major importer of agricultural products. Considering that the EU and South Africa are trade partners in a free trade agreement, it was essential to understand why South African beef exports to the EU have declined.

The study findings have provided an understanding of the asymmetric trade arrangement between South Africa and the EU. It has also identified the empirical effects of the asymmetric trade arrangement. The study has provided insight into whether the objectives of the free trade agreement between South Africa and the EU have materialised.

Furthermore, the study findings have provided lessons to other countries that trade with the EU regarding the effects of EU regulation measures. The other countries will be well informed when drafting their policies regarding prioritising their regulatory measures or other factors to improve the beef trade.

Lastly, the study has aimed to inform policymakers regarding the review of local policies and aligning them to the demands of importers' beef standards. This would help to enhance efforts to abide by the regulatory requirements of developed countries.

1.7 STUDY OUTLINE

The study has been outlined as follows. Chapter 2 presents a literature review which gives an overview of world meat production, and the world meat and beef trade. Furthermore, the chapter outlines regulatory measures and their effects, beef regulatory measures and reasons for their use, the concept of asymmetric regulatory measures, and theoretical discussion. It concludes with a discussion of beef regulatory measures for the EU and South Africa. Chapter 3 presents the methods and procedures that the study employed, and the findings are shown in Chapter 4. Lastly, Chapter 5 presents a summary of the findings, conclusion and what is recommended.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter presents a review of relevant research work related to the study. As previously stated, this study aims to investigate why South African beef exports to the EU have declined. The chapter, therefore, aims to explain the concept of asymmetric regulatory measures, world beef production trends and trade. Furthermore, it seeks to explain regulatory measures and their effects. The chapter presents an extensive discussion on regulatory measures affecting beef exports and the reasons for their use. The last section sets out a summary and conclusion of this chapter.

2.2 THE CONCEPT OF ASYMMETRIC REGULATORY MEASURES: A THEORETICAL DISCUSSION

The central theme of this dissertation deals with regulatory measures. As discussed in the chapter one, the use of regulatory measures in international trade has been increasing, over time (Crivelli and Gröschl, 2016). In this section, the discussion moves to the concepts of asymmetric regulatory measures. The section will first address the basics of asymmetry, and its use in economics and in international and regional trade. Finally, the case of asymmetric regulatory measures used in the context of this study will be addressed.

At a basic level, the word asymmetry can be explained from its opposite, which is symmetry. Symmetry, according to the Merriam-Webster Dictionary (2016), means balanced proportions, equal, balanced, correspondence in size, shape or relative position. So, any concept or situation that lacks these properties can be described as asymmetric (Alvarez-Ramirez et al., 2009). This will also apply to the concept of asymmetric regulatory measures. However, before going to regulatory measures, one must look at the concept as used in other disciplines.

In economics, perfect or pure competition has five characteristics, namely: many buyers and sellers, homogenous products, equal market share, no barriers to entry or exit, and full information (Salvatore, 2012). When the last characteristic is absent, the market is said to have imperfect or asymmetric information. In this case, sellers (usually) are said to have more information than buyers do. This is because there is an imbalance of information flow.

In international trade, the concept of asymmetry is also often applied. A typical example is seen in handling measures that distort trade (amber box) where different WTO members are treated

differently (Musselli, 2016). The conclusion of the Uruguay Round was followed by actions to deal with systemic agricultural issues that resulted in trade distortions. The redress of structural imbalances due to production support was achieved in a way that follows the principle of asymmetry. Developed countries were required to reduce the high percentage of their producer support policies more rapidly than the developing world had to. The least developing countries were not required to reduce any support measures, even if they were deemed to be trade-distorting (Musselli, 2016).

Combatting the concept of asymmetry in trade was taken a step further by the SADC region in the implementation of the SADC trade protocol (Kalaba, 2014). In its liberalisation of trade, the SADC applied a two-fold asymmetric principle. The first aspect dealt with the timeline for the application of the tariff reduction by member states to meet the requirements of the free trade area (FTA) status. Countries were grouped into their categories according to the stages of their economic development. The first group comprised South Africa and its SACU members, Botswana, Eswatini, Lesotho and Namibia. These countries reduced 80% of their tariffs within four years. In the second group, Mauritius and Zimbabwe were given two extra years to reduce the same tariffs as the first group countries did. The rest of the countries, Malawi, Mozambique, Tanzania and Zambia, were given eight years.

The second way in which the SADC dealt with the asymmetry principle was with respect to the sectors or products. Each country submitted a list of products, divided into three categories (A-C), for liberalisation (Kalaba, 2014). Products in Category A were liberalised at the start of implementation, and Category B halfway through the implementation process. Products in Category C, which were classified as sensitive products, were liberalised last, between year 8 and 12 after implementation. The objective of the principle was to ensure that there were no sudden shocks due to trade liberalisation and to allow countries time to deal with possible negative effects of the FTA.

Asymmetry in regulatory measures follows the same understanding, although the treatment of it does not always follow the examples discussed above. The existence of asymmetric regulatory measures is observed through the varying use of such standards on the same product by trading partners. In simple terms, asymmetric regulatory measures refer to a situation where trade partners are implementing different standards, either by number or type. The main problems of asymmetric regulatory measures are not the different numbers or types, but their effects on trade.

Like tariffs, regulatory measures add to trade costs due to compliance requirements. These costs affect either the prices or the quantities of goods to be traded (UNCTAD, 2019). Sometimes, regulatory measures can affect both prices and quantities. The compliance costs incurred by one partner may be higher than those of another partner, and thus negatively affect prices or quantities (or both) due to the type or number of regulatory measures. This is the core of asymmetric regulatory measures, i.e. when one partner's standards have a negative effect on trade with another partner.

Apart from affecting the prices and the quantity of produce traded, the asymmetric regulatory measures jeopardise the competitiveness of products on the market. According to Chang (2004), markets are competitive when there are no trade barriers to entry and contestable. However, the presence of asymmetric regulatory measures harms the competitive process and strongly affects trade, negatively (Abbott and Singham, 2013). The measures imposed by importing partners in effect limit the number and range of suppliers. For instance, regulatory measures such as licence requirements, bans, certifications and quality standards restrict open entry into the imposing country. In addition, the regulatory measures limit the ability of the suppliers to compete with one another. The standards imposed take the form of anything that could operate so as to reduce the intensity with which firms compete. The regulatory measures also reduce the incentive of suppliers to compete in such importing markets.

Throughout the illustration of asymmetry cases, there is a common theme. That theme is that where asymmetry is present and likely to lead to unfairness or negative outcomes, a remedial measure should be put in place. The existence of asymmetric information related to perfect competition might cause market failure (Salvatore, 2012). That then becomes the basis for government intervention to deal with the problem. In the perspective of international and regional trade, the differential treatment of either countries or sectors is both the acknowledgement and redress of asymmetries that exist. Unlike other areas where asymmetry is present, the categories of regulatory measures do not have a known systemic remedial process.

2.3 WORLD BEEF PRODUCTION

This section aims to explain world beef production and to assess the trends by regions. Moreover, it seeks to provide details of beef production growth in various regions and compare the trends of developing and developed countries. The beef production is broken down into six regions, i.e., North America, Oceania, Africa, Latin America, Europe and Asia. The world beef

production referred to is for the period from 1990 to 2019. The production was recorded by volume and measured in tonnes, thousands.

According to FAO (2019), beef registered a great increase in meat production. Despite the increases, beef production differs among developing and developed countries as well as among regions. Figure 2.1 below shows beef production between developing and developed countries. Beef production was measured in tonnes, from 1990 to 2019.

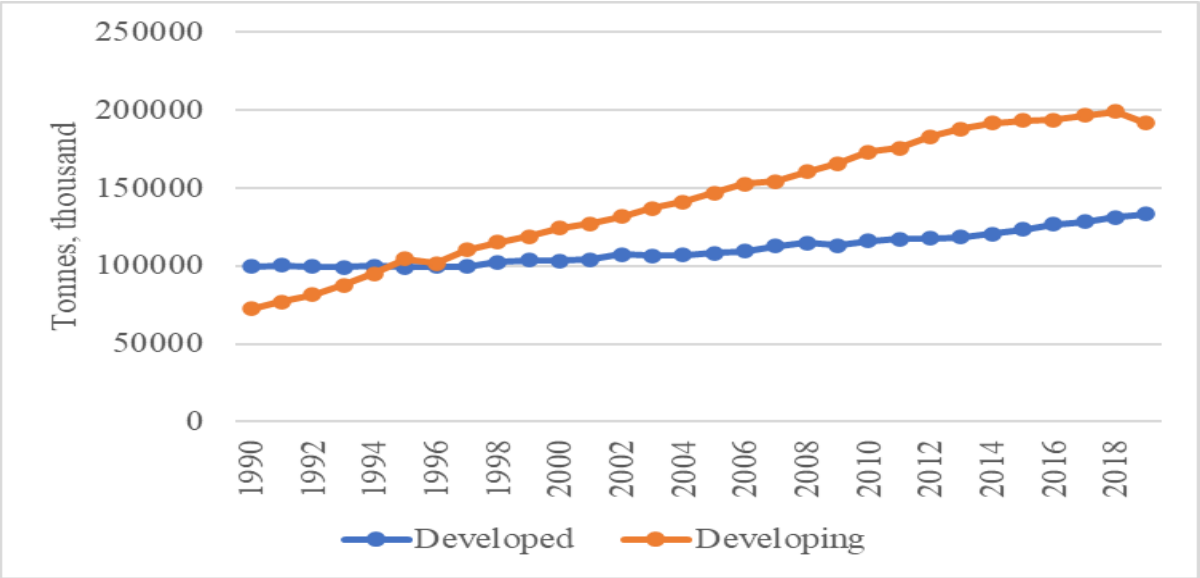

Figure 2:1: Beef production by developed and developing countries, 1990-2019

Source: Author plot using data from OECD-FAO 2020-2029 Agricultural Outlook

Figure 2.1 shows that beef production has increased for both developing and developed countries. The developing countries are shown to have increased beef production more than the developed countries have. The developing countries had a steep increase in beef production from 1990 to 2018, which slightly declined in 2019. As for the developed countries, it shows that there was a flattish period from 1990 to 2008. It was later shown to have increased somewhat from 2009 to 2019. FAO agricultural outlook statistics (2019) illustrate that beef production in developing countries has increased by 6.5%, and by 2.5% in the developed countries. Again, they made projections that beef production in the developing countries will be 17% higher by 2028 (FAO-OECD, 2019). The developed countries are expected to have beef production increased by 8% by 2028 (FAO-OECD, 2019).

The increases in beef production also differ among the regions. Figure 2.2 shows beef production across regions. The study used all six regions to explain beef production across the

regions. Beef production was measured in tonnes, thousand, and used data from 1990 to 2019 for all the six regions.

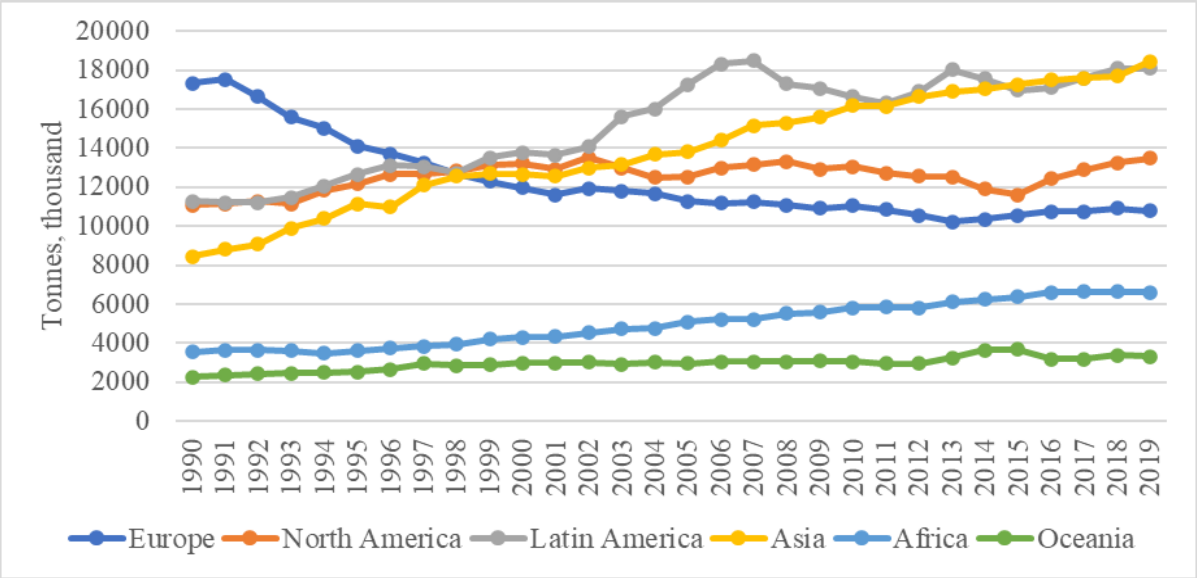

Figure 2:2: Beef production across regions, 1990-2019

Source: Author plot using data from OECD-FAO 2020-2029 Agricultural Outlook

Figure 2.2 shows beef production across various regions. It has been shown that Asia, North America, Europe and Latin America are the regions that have higher beef production. Asia is shown to have increased beef production from 1990 to 2019. As for North America, beef production increased from 1990 to 2002. It later declined from 2003 to 2015 and rose from 2016 to 2019. It was also observed that Europe, from 1990 to 1991, experienced higher beef production, which dropped from 1992 to 2013, and later became constant. Figure 2.2 also shows that Latin America has registered a great increase in beef production. The trend for Latin America shows that it increased beef production from 1990 to 2019. As for Africa, it can be observed that beef production has increased in Africa. The increase is well observed from 1994 to 2019. There was stable growth for Oceania in beef production, which rose slightly from 2012 to 2019.

In summary, beef production was revealed to have increased for developing countries than for developed countries. The study observed that developing countries had overtaken the developed world in beef production, and that the gap is growing. Across regions, it was observed that beef production for Europe has declined, starting from 1992 and continuing through to 2019. Europe is expected to increase beef imports because beef production will be less than consumption will be (Hocquette et al., 2018).

2.4 BEEF CONSUMPTION

The previous section has shown that the beef production has increased for developing countries than developed. This section aims to determine the consumption of beef over the years to assess the major beef consumers. Figure 2.3 below shows beef consumption by the regions in the world. The consumption covers the period from 1990 to 2019 and encompasses all the regions. Beef consumption was measured in tonnes, thousand.

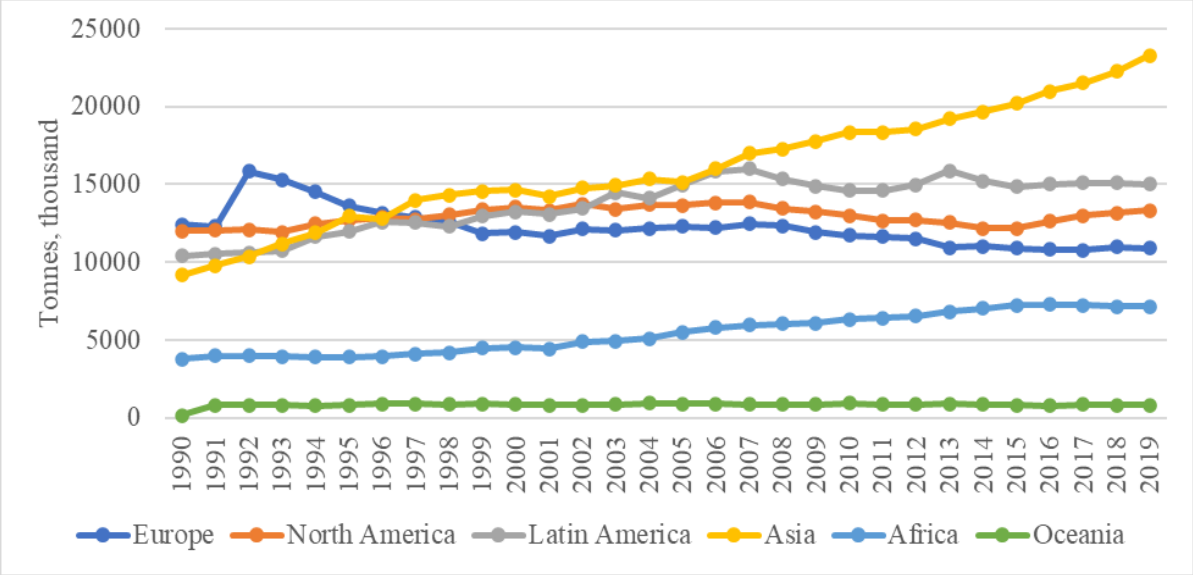

Figure 2:3: Beef consumption by regions, 1990-2019

Source: Author plot using data from OECD-FAO 2020-2029 Agricultural Outlook

Figure 2.3 shows that beef consumption has increased for all the regions, except Oceania and Europe. It was observed that Asia and Africa are regions with increased beef consumption. The beef consumption in Asia rose from 1990 to 2019, and the increase is significant when compared with other regions. A similar increase was noted in Africa, where it rose from 2001 to 2019. Europe was noted to have increased beef consumption from 1990 to 1991, after which it declined from 1992 to 1999. It later became constant up to 2019. As for North America and Latin America, it was noted that these regions experience higher beef consumption, which is almost constant. As for Oceania, it has low beef consumption and constant, whereby the consumption is neither increasing nor decreasing.

In summary, it can be noted that Asia and Africa have increased beef consumption compared with other regions. According to FAO-OECD (2019), the increased beef consumption in Africa and Asia is attributable to population growth. Furthermore, it was argued that, in Asia, there is a positive perception that bovine and ovine meat is healthier and disease-free. According to

Meat and Livestock Australia (2020), increased beef consumption in Asia is attributable to rising incomes, urbanisation and populations, and the related demand for meat. It was noted that the beef consumption of Europe was high and slightly reduced. North America and Latin America remained high beef-consuming countries, and their trends were almost constant. The section also observed an inverse relationship between the trends for Asian and European beef consumption. It was noted that when Asia had low beef consumption, it was high for Europe and vice versa.

2.5 WORLD BEEF TRADE

This section aims to provide insights on the world beef trade. This is set out determine the trends of world beef trade, and lastly, to determine the major exporting and importing regions for beef. According to FAO (2019), bovine meat had registered a great increase in its exports. Figure 2.5 shows the beef exports by regions. The study covered all the six regions for the period from 1990 to 2019. Beef exports were measured in tonnes, thousand.

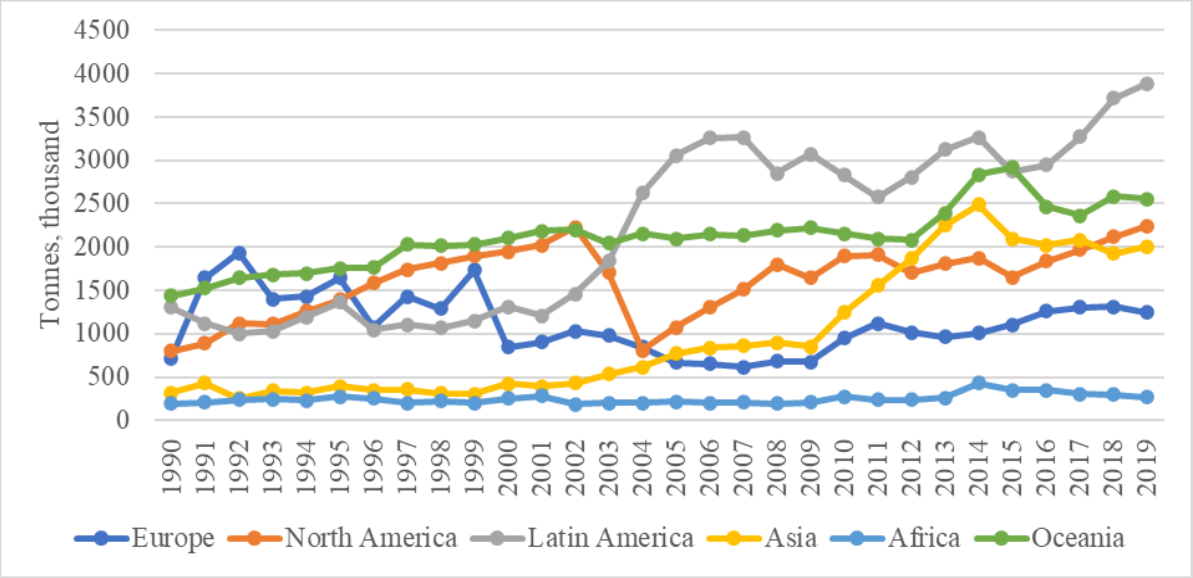

Figure 2:4: Beef export by regions, 1990-2019

Source: Author plot using data from OECD-FAO 2020-2029 Agricultural Outlook

Figure 2.4 shows that beef exports in all regions have increased. Regionally, beef exports by Europe declined, as compared with other regions. For the period from 1990 to 1992, Europe increased beef exports, but these later declined, up to 2009. There was a slight increase in beef exports by Europe from 2010 to 2019. Figure 2.5 shows that Latin America, Oceania and Asia greatly increased beef exports.

It can also be shown that North America had increased beef exports from 1990 to 2002. The increase dropped from 2002 to 2004. The decline in North America beef exports was attributable to the outbreak of mad cow disease (Commission for Environmental Cooperation, 2015). However, it was noted that, from 2004, North America beef exports rose again, up to 2019.

After looking at the trends of world beef exports, this section now switches to analyse imports. Figure 2.5 shows the beef imports by regions. The figure covers the period from 1990 to 2019. It covers all the regions and shows the trends for each.

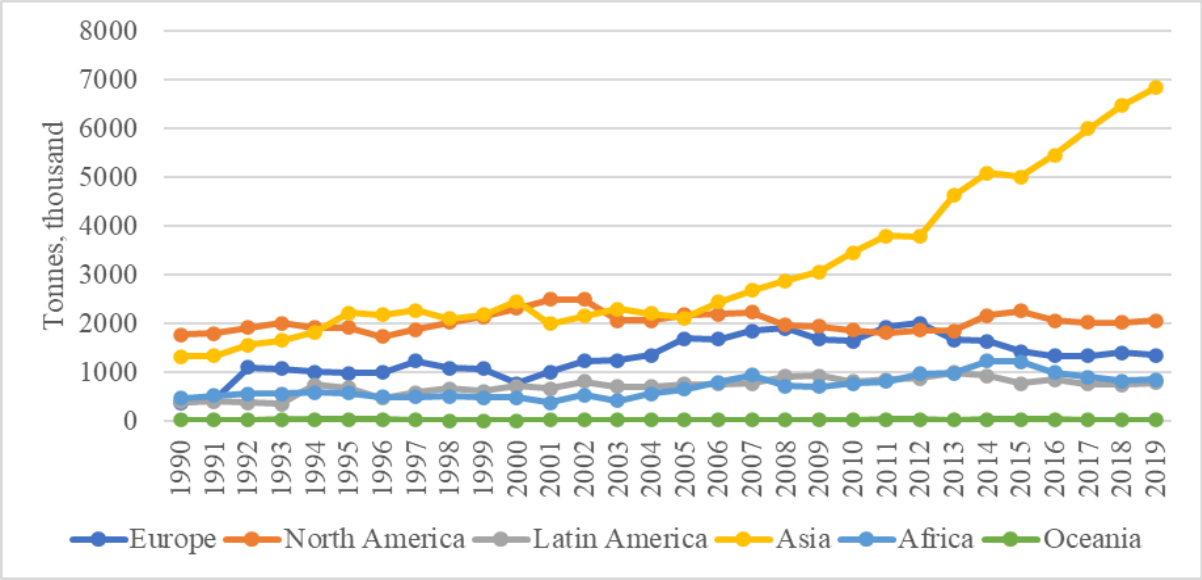

Figure 2:5: Beef imports by region, 1990-2019

Source: Author plot using data from OECD-FAO 2020-2029 Agricultural Outlook

Figure 2.5 shows the beef imports by regions from 1990 to 2019. The figure shows that there have been increased beef imports for all the regions except Oceania. It has been shown that North America, Europe, Latin America and Africa have almost constant, high beef imports. It can be noted that Europe increased beef imports from 1991 to 2012. It later slightly declined and then became stable. It has been observed that Asia substantially increased beef imports. Figure 2.5 shows that Asian beef imports increased from 1990 to 2019. Moreover, these imports increased substantially from 2005 to 2019.

Asia comprises many countries that contribute to its increase in demand for beef imports. One of the countries is China, the largest cattle meat market in Asia (Li et al., 2018). Again, there are many contributing factors as to why Asia has increased beef imports. The first reason is that it offers a good import price for beef. It is argued that the beef import price in Asia stood.

For example, it was US$5 039/ton in 2019, rising by 6.9% against the previous year (Lee and Hansen, 2019). Another contributing factor is the increases in urbanisation and population, and rising incomes. According to Lee and Hansen (2019), Asia's composite population, urbanisation and income have increased and expanded. It is reported that "the GDP per capita for the region has increased annually by the rate of 3.4 per cent over the last decade and is projected to grow slightly faster, at 3.5 per cent annually, over the next decade" (Lee and Hansen, 2019).

In summary, the study noted that beef exports by North America had declined because of an outbreak of mad cow disease. The section has revealed that Asia is a growing market for beef. The market seems not to be plateauing, as it has continued to substantially increase beef imports. The section has also revealed some of the reasons why Asian beef imports have increased greatly, compared with other regions. It was noted that China has contributed positively to Asia's increase in beef imports. Furthermore, good import prices played a significant role in Asia's increased beef imports. The other contributing factor is the increases in urbanisation and population, and rising incomes.

2.6 SOUTH AFRICAN EXPORTS OF BEEF TO THE EU AND THE REST OF THE WORLD

As noted in the previous sections, beef exports and imports have increased in all the regions under survey. Furthermore, it was pointed out that higher beef consumption was experienced for the regions in the world. This section aims to explain the trends of South African beef exports to the EU and the rest of the world (RoW). In this section, RoW means all other countries except countries in the EU. Like many other countries, South Africa and the EU have signed a free trade agreement. The signing of the agreement was intended to facilitate trade between them. Apart from the EU, South Africa also trades with other partners.

Figure 2.6 shows South African exports of beef to the EU and the rest of the world. It covers the period from 1992 to 2019. This is in line with the study period. Beef exports are given by value and measured in 1000 USD. The study used two different vertical axes to show the trends of beef exports clearly. The right vertical axis shows beef exports to the rest of the world, while the left vertical axis shows beef exports to the EU. The beef exports for all the axes are measured in values expressed in $1000.

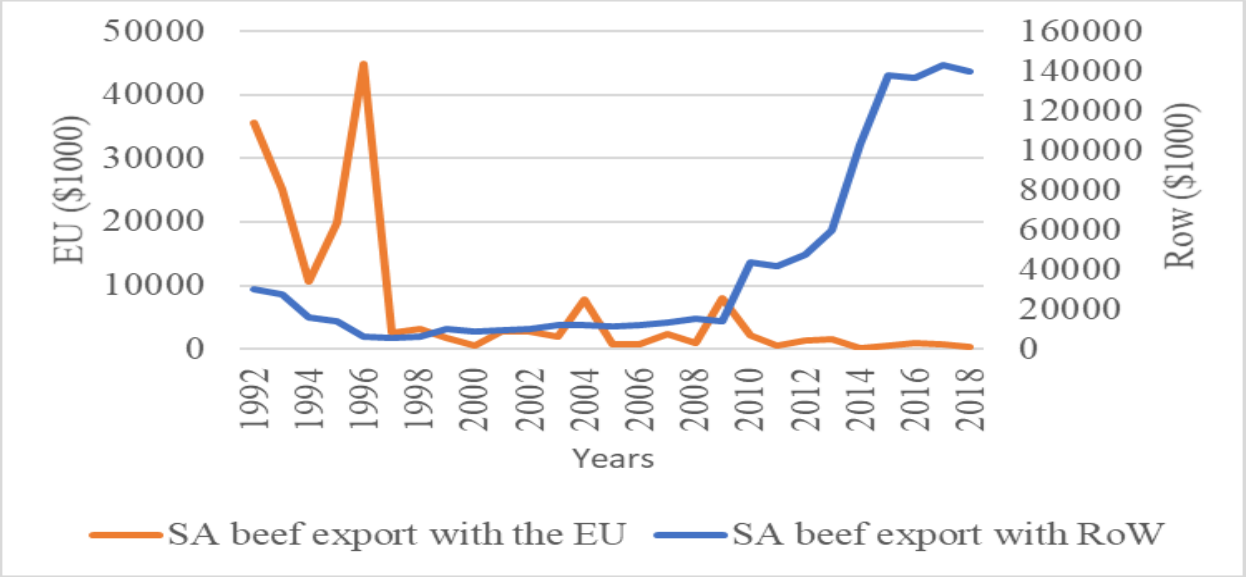

Figure 2:6: South African beef exports to the EU and rest of the world from 1992 to 2019

Source: Author plot using data from UN COMTRADE

Figure 2.6 indicates that South African beef exports to the EU increased from 1994 to 1996, and later dropped in 1997. The trend from 1997 shows that exports had been decreasing, and then gained an increase in the year 2000. The beef export increases were observed from 2000 to 2004, after which exports dropped again from 2005 to 2007. The beef exports from South Africa to the EU decreased from 2009 until 2019. Continuing the trend, South Africa registered almost zero beef exports to the EU in the period from 2010 to 2019.

On the other hand, South African beef exports to the rest of the world have been increasing, as shown in Figure 2.6. The increase in South African beef exports to the rest of the world started in 1996 and continued to 2019. From 2009 to 2015, the beef exports increased substantially, as shown in Figure 2.6. It can be noted that beef exports in the year 2015 had a small decrease, but later started increasing.

In summary, South African beef exports were high from 1990 to 1996. It declined in the periods from 1996 to 1998, this was so because there were cases of Foot and Mouth Disease (FMD) which let to the banning of most of South African exports. It was noted that the EU was the premier destination market for South African beef. However, from 1997 to 2019, South African exports of beef to the EU declined. The section has observed a plateau period from 1997 to 2008 in South African exports of beef to the world. Different reasons can be advanced as contributing to this plateaued trend in beef exports. One of the reasons is that this was a transition period for South Africa, moving from apartheid to democracy. South Africa officially

attained democracy in 1994, which meant acceptance into world markets (Wood, 2001). Moreover, South Africa joined the WTO in 1995 (Edwards, 2005). In 1996, it started negotiations with the EU for concluding a Trade, Development Cooperation Agreement (TDCA).

2.7 REGULATORY MEASURES AND THEIR EFFECTS

The previous section has shown that as South African exports of beef to the EU declined in the period from 2008 to 2019, they increased to the rest of the world. This section aims at discussing the relevant regulatory measures and their effects. According to literature, regulatory measures are on the increase in international agriculture trade and have a negative effect on trade (Kareem et al., 2018). Regulatory measures mean any regulation, law, rule, policy, procedure, decision, or similar administrative action by a Party (Merriam-Webster Dictionary, 2016). The regulatory measures that are considered in this study are non-tariff measures that affect beef trade. As asserted by the (UNCTAD, 2019), "Non-tariff measures are defined as policy measures other than ordinary customs tariffs that can have an economic effect on international trade in goods, changing quantities traded, or prices or both".

According to Minetti and Salvatici (2016), Non-Tariff Measures (NTMs) comprise policies and regulations that restrict or facilitate trade. These measures run from barely imagined ones affecting products, industries and countries, to increasingly substantial ones established in national institutions and policies. "The characterization comprises technical measures like sanitary or environmental protection measures and others traditionally used as commercial policy instruments" (UNCTAD, 2019). These measures incorporate, for instance, "quotas, price control, export restrictions and contingent trade protective measures and as well as those other behind the border measures".

Various sources in the literature have explained how regulatory measures affect trade. Most sources have argued that regulatory measures restrict trade. Otsuki et al. (2001) examined the impact of SPS standards that the EU placed on food trade. The study examined the trade between Africa and the EU. The study argued that the EU standards imposed more significant trade impediments. Similarly, Iliyasu and Zainalabidin (2018) analysed how the EU SPS standards have affected the developing countries when they endeavour to export agricultural food products to the EU. The study used data from 2011 to 2015. It was found that exports of food and agricultural products were significantly and negatively affected by SPS measures.

Grant and Arita (2016) conducted a study to examine how NTMs have impacted upon the agri-food trade. The article sheds more light on SPS measures landscapes and how they have affected the agri-food trade. The study used data from 1995 to 2014 and SPS and TBT information. The findings revealed that SPS measures comprise a significant concern for agri-food export as they obstruct trade for a significant amount of time. The major products that were of substantial concern were fruits, vegetables, and meat products. The regulations regarding healthy animal products limit trade as there are precautions about disease outbreaks, food safety, and pest-control-related concerns. There is a higher level of concern regarding countries with large markets that have higher standards.

Supplementing the above research studies, Beckman and Arita (2017) assessed how EU SPS measures had affected US meat exports. The study examined pork, poultry, and beef meat products. It was found that the SPS measures restricted market access. The study also argued that SPS measures are primary obstacles for beef, pork and poultry exports, and that removing them would lead to sizable exports. In the same vein, a study by Henson et al. (2000) revealed that the SPS standards are mostly unsuited for the prevailing "systems of production and marketing of products in developing countries". For effective participation in the market, these countries need to comply with the SPS measures. The regulatory measures make it difficult for many countries to participate effectively and comply with the measures, which are associated with costs restricting trade.

In summary, this section has shown that regulatory measures comprise any regulation, law, rule, policy, procedure, decision, or similar administrative action taken by a relevant party to a transaction. The NTMs constitute regulatory measures as they are regulations, policy and administrative action taken by importing parties. The use of regulatory measures in trade has its effects. Most studies have argued that regulatory measures affect trade flows negatively. In most scenarios, they act as a trade barrier. It has also been argued that regulatory measures increase trade costs. Most researchers have argued that regulatory measures double the costs of trade than the tariff rates.

2.8 THE REGULATORY MEASURES AFFECTING BEEF TRADE

In accordance with the study focus, this section will discuss regulatory measures that affect the beef trade in detail. The measures that will be especially examined are SPS and TBT. These are the measures that affect food and agricultural trade, specifically on meat and meat products (Sotharith et al., 2016). The following sections give explanations of the SPS and TBTs.

2.8.1 The Sanitary and Phytosanitary Measures (SPS)

In the first place, it must be noted that the SPS apply to all standards that have a direct or indirect effect on trade, internationally. According to the World Trade Organization (WTO) (2015), "the SPS measures include all relevant laws, decrees, regulations, requirements, and procedures". The standards are implemented for the safety of human life, animal life or plant life and health (Kalaba, 2014; Pay, 2005; Schlueter et al., 2009; Soon and Thompson, 2019). The measures are implemented within a member territory to obviate risks associated with imported products. Countries or member states can apply SPS measures when conducting a risk valuation to measure the level risk anticipated. To apply the SPS measures, it must be considered that trade is not affected. The SPS standards must be based on scientific principles and justified with evidence of a scientific approach (WTO, 2015).

2.8.1.1 Reasons for the use of SPS measures

SPS measures were introduced to protect human life from potential risks in imported products (UNCTAD, 2019). The reasons for SPS measures are classified into two categories. The first deals with the technical regulations and the other set deals with conformity assessment procedures (UNCTAD, 2019). However, this study will not detail each category, but rather point them out as general reasons for SPS use. The following are the reasons why SPS measures are introduced and what they contain.

The first reason is the prohibition of imports for SPS reasons (UNCTAD, 2019). The products that pose risks are denied entry into the importing country. The prohibited products include those that come from regions or countries that are affected by infectious or contagious diseases. For instance, imports of cattle and related products are prohibited if they originate from an area affected by foot-and-mouth disease. Furthermore, the imports of certain products are restricted until exporters provide sufficient safety conditions. The exporting countries need to have authorisation requirements. For instance, the approval by the country health, "the European Commission's Directorate-General for Health and Consumers (DG SANCO) applies a procedure to assess the candidate's third country compliance with EU Public and Animal Health conditions" (European Commission, 2009). Under this requirement, the conditions include that the consumers need to know how the food was produced, processed, packaged, labelled and sold.

The restricted use of substances and tolerance limits for residues comprise another reason as to why SPS measures are introduced (UNCTAD, 2019). The measures establish the maximum acceptable limit of substances such as chemicals in food and feed used during production. Furthermore, the measures often prescribe bans and restrictions on the use of certain substances in food and feeds**.** For instance, feed materials intended for use as animal feed may only be accepted if they do not represent a danger to humans. It also includes conditions on the use of growth hormones and antibiotics in cattle production.

The other reasons are labelling, marking and packaging requirements (UNCTAD, 2019). The products to be exported are required to have labels that give specified information directly related to food safety. The consumers need to know, for example, storage conditions and ingredients used, to mention just a few. The measures also deal with what materials were used for packaging, hygienic practices used, and microbiological criteria for food safety.

Hygiene requirements comprise another category of SPS measures that exporting countries need to comply with. The measures are imposed so that exporting countries comply with all hygienic practices and microbiological criteria prescribed for food safety (UNCTAD, 2019). The measures apply also to final products, where the statement regarding the microorganisms of concern should be quantified in the final product. The EU has Council Directives covering foodstuff hygiene and the production and placing on animal origin products (European Commission, 2009). The hygiene requirements for beef sector are hygienic practices and microbiological criteria prescribed for food safety. Again, the health certificate issued by an official veterinarian.

Another reason comprises requirements related to production and post-production processes (UNCTAD, 2019). In this context, the measures are concerned with how animals are raised, and how final products of food or feed production are processed to meet the prescribed sanitary conditions. For instance, the animals should not use growth hormones and feeds that are not acceptable by the EU standards. It is also recommended that products are required to be prepared in approved establishments. The EU has European Food Safety Authority (EFSA). EFSA provide guidelines in beef sector for the approved establishments Most of the animal products can be imported into the EU market if they appear on the list approved by the DG SANCO (European Commission, 2009).

The last reason for the use of SPS measures is conformity assessment (UNCTAD, 2019). Countries impose SPS measures based on testing requirements, certification, inspection, traceability and processing history. The products first need to be registered by the exporters to the recommended bureaus and approved in order for them to be exported. Measures are also imposed for products to be tested against given regulations, such as for maximum levels of accepted limits. Again, the measures are set to provide information that makes it possible to trace product processes. For example, to export products to the EU market, "products need to have health conditions related to the public and the livestock protection, country health approval, approved Establishments, health certificates and health control" (European Commission, 2009).

2.8.2 The Technical Barriers to Trade measures (TBT)

In its context, the TBT measures refer to regulations that are technical, and stages are taken to assess conformity with set regulations (UNCTAD, 2019). Those regulations that are technical constitute an archive that provides prescribed item qualities or related procedures and creation strategies, including the appropriate managerial arrangements, with which consistency is required (Sotharith et al., 2016). Likewise, the regulations might incorporate or manage packaging, terminology, labelling requirements and symbols as they apply to an item, procedure, or creation strategy. The procedure to assess conformity comprises any strategy that is utilised, legitimately or in a roundabout way, to decide if pertinent prerequisites in technical regulations or standards have been satisfied (Minetti and Salvatici, 2016).

2.8.2.1 Reasons for the use of TBTs

The reasons for implementing TBT measures fall into two categories. The first category deals with the enforcement of regulations that are technical or procedures to assess conformity. The other measures deal with technical regulations and production processes (UNCTAD, 2019). The following paragraphs highlight the reasons in detail, but not in their categorical terms.

The first reason is the licensing and import authorisation that is related to technical barriers to trade (UNCTAD, 2019). The measures that deal with authorisation, permits, approvals and licences relate to a consignment. The products need to be in compliance with the requirements stipulated by the relevant government agency first, before the importation.

The second reason is the restricted use of substances and prescribed tolerance limits for residues (UNCTAD, 2019). The measures are established to set the maximum levels of the use

of certain substances. The countries or regions can ban or restrict the use of a certain substance that is viewed as hazardous to human life (UNCTAD, 2019). The EU restrict the use of growth hormones in cattle production.

In addition, another reason for the implementation of TBTs deals with labelling, marking and packaging requirements (UNCTAD, 2019). Under this reason, all products are required to be well labelled and provide information that consumers can refer to gauge product safety. The labelling includes the date of manufacturing, expire date, origin and ingredients.

The production and post-production requirements comprise other reasons that TBTs measures are implemented (UNCTAD, 2019). The production of products is allowed a certain level of the use of a certain substance. The measures also look at the storage of the products and at how the products are transported. For beef to be transported, it needs to attain the temperature specified in the requirement. It also needs to leave the slaughterhouse, or a cutting room on the same site as the slaughter premises, immediately and transport takes no more than 2 hours. When transporting it, the temperature should be monitored and recorded and the should be supported by documented authorisation from the competent authority at the place of departure to make use of this derogation.

The use of TBTs measures also deals with the requirement to ensure product quality, safety or performance (UNCTAD, 2019). Under this category, measures are put in place to ensure that final products are safe for consumption and are of good quality. To determine the quality, there are assessments that are conducted by the designated agents of quality assurance and requirements for the assessment.

The last reason is to do with conformity assessment. Under this category, the measures are introduced to inspect products before reaching the consumers (UNCTAD, 2019). The measures are also put in place to check for product registration and approval of exportation. All the products must first be registered and approved before being imported. The importing countries set standards for products and conduct testing to assess whether imports have satisfied the prescribed requirements. Moreover, the products are required to have information disclosed so that it is possible to track the product. The information can help to track where the product comes from, its production, and how it was transported.

In summary, it has been noted that SPS and TBTs measures affect the trade of beef among partners. The section has outlined why the measures are used in international trade and the categories into which they fall. The main reasons for using regulatory measures are to protect

consumers from risks arising from imported products. However, other researchers have argued that such regulatory measures are sometimes used as an act of protectionism. Most of the time, the measures have the effect of restricting trade among partners because of the costs associated with attaining compliance with the set standards.

2.9 BEEF REGULATORY MEASURES FOR THE EU AND SOUTH AFRICA

The previous sections have, in detail, explained the relevant regulatory measures and their effects, and furthermore explained the regulatory measures that affect beef trade and the use of such measures. This section will discuss the beef regulatory measures for the EU and South Africa. This is done to illustrate how the partners have been implementing the measures and their differences. At first, the section explained the free trade agreement that South Africa and the EU signed and its objectives.

South Africa and the EU are members in a free trade arrangement. The agreement was intended to reduce the tariff rates in order to increase trade flows between them. The agreement was agreed to be implemented in phases, and these were: 'before', 'phasing', and 'full implementation'. The 'before' period refers to all years before 2000, and the 'phasing' period was from 2000 to 2010. The 'full implementation' period started in 2011 and continues to date. In the full implementation period, it is intended that there are to be zero tariff rates for products. That means that the costs of trade between South Africa and the EU, which are attributable to tariffs, are to be eliminated. Therefore, it can be seen that when the EU reduced the tariffs, it increased the use of regulatory measures. The use of regulatory measures becomes a problem when it negatively affects the other partner.

Table 2.1 shows the numbers of beef regulatory measures for the EU and South Africa. The measures used were the summation of all the measures the EU and South Africa introduced on beef. The appendix provides the information of all the total measures for each year that the partners introduced. In this section, the measures were summarised into periods of four intervals and has covered both the EU and South African measures introduced from 1992 to 2019.

Table 2.1: Beef regulatory measures for the EU and South Africa, 1992-2019

Period	**South Africa**	**The EU**
1992-1995	0	0
1996-1999	2	10
2000-2003	4	40
2004-2007	6	84
2008-2011	10	126
2012-2015	17	210
2016-2019	31	283

Source: Author compilation using WTO database (2020)

Table 2.1 shows that both the EU and South African regulatory measures on beef had been increasing during the period under review. However, the EU regulatory measures are far higher in number than those of their trade partner, South Africa. The EU regulatory measures are shown to have been increasing much in later years. In earlier years, for example the period from 1992 to 1995, it had implemented zero measures. Then, during the period from 1996 to 1999, the EU introduced ten measures. Later, the number of EU regulatory measures on beef rose to 283 in the period from 2016 to 2019. On the other hand, South Africa had implemented zero measures for the period from 1992 to 1995. During the period from 1996 to 1999, South Africa introduced two measures. The South African measures later increased to 31 in the period from 2016 to 2019.

The EU regulatory measures had been increasing from 1996 when it was introduced to 2019. According to the stated EU objectives on the use of regulatory measures, it has shown that most of these were for securing the safety of the human beings, protection of animal and public health, food safety, and protecting their territory. According to Gormley et al. (2010), the EU chooses a high level of health protection in its food laws, which results in the EU imposing more numbers of regulatory measures. This finding regarding the EU having numerous regulatory measures is similar to what other researchers have found. According to Sbarai and Miranda (2012), high numbers of EU regulatory measures were found regarding beef. Similarly, Arita et al. (2015) have argued that EU regulatory measures on beef were found to be high.

The section has revealed the differences in the numbers of regulatory measures between South Africa and the EU. For instance, from 1996 to 1999, the EU regulatory measures were five times the number of those in South Africa. That means that when South Africa introduced one measure, the EU introduced five measures. Another observation was noted for the period from 2016 to 2019, when the EU regulatory measures were nine times those in South Africa. That means when South Africa introduced one measure in the period from 2016 to 2019, the EU had introduced nine measures.

2.10 SUMMARY AND CONCLUSION

In summary, this chapter has provided a review of literature related to the study. The chapter has shown that world beef production was increased in production for developing countries than for developed countries. The study observed that developing countries had overtaken the developed world in beef production, and that the gap is growing. Across the regions under survey, it was observed that beef production for Europe has declined. The decline implies that Europe is expected to have increased its beef imports.

The chapter also noted an increase in beef consumption for Asia and Africa, as compared with other regions. The increase in beef consumption in Africa and Asia is attributable to population growth. Furthermore, consumption has increased in Asia because of rising incomes, urbanisation, populations and meat demand. Europe, North America and Latin America remained high beef-consuming countries, and their trends were almost constant.

The chapter has also shown that the world beef trade has increased in both exports and imports. Europe has shown that it has slightly reduced its beef exports, although its beef imports remained to be high and constant. The chapter has also revealed that Asia is a growing market for both meat and beef. The Asian market does not seem to be plateauing as it has continued to substantially increase beef imports. The chapter has also revealed some of the reasons why Asian beef imports have increase greatly, compared with other regions. Firstly, it was noted that China has contributed positively to the Asian beef increase in imports. Furthermore, good import prices have played a significant role in Asia's increased beef imports. The other contributing factor comprises the increase in urbanisation and population, and rising incomes.

The chapter has shown that regulatory measures comprise any regulation, law, rule, policy, procedure, decision, or similar administrative action by a party in relating to another party. The NTMs constitute regulatory measures as they are regulations, policy and administrative action

taken by trading parties. The use of regulatory measures in trade has its effects. Most studies have argued that regulatory measures affect trade flows negatively. In most scenarios, they act as a trade barrier. It has also been argued that regulatory measures increase trade costs. Most researchers have argued that regulatory measures double the costs of trade, as opposed to tariff rates, which do not.

The asymmetric regulatory measures were well explained in the chapter. It was noted that there are different forms of symmetries. Those regulatory measures that do not have the characteristics of symmetry are referred to as 'asymmetric'. It was found that asymmetric regulatory measures negatively affect exporters' prices and the quantities of their exported products. The asymmetric regulatory measures do not have a remedial action. This means that their negative effects can have greater adverse effects, as compared with other measures.

Lastly, the chapter presented the beef regulatory measures for South Africa and the EU. It was revealed that there are differences in the numbers of regulatory measures between the EU and South Africa. The EU has implemented more numbers of regulatory measures than South Africa has. The two trading partners, South Africa and the EU, are parties to a free trade arrangement. The agreement was intended to reduce the tariff rates in order to increase trade flows between them. However, when the EU reduced its tariffs, it increased its use of regulatory measures. The use of regulatory measures becomes a problem when they negatively affect the other partner.

CHAPTER 3: METHODS AND PROCEDURE

3.1 INTRODUCTION

This chapter describes all the empirical approaches that the study applied to address the research objectives mentioned in Chapter 1. The study used a t-test to address the first objective, which aimed to assess whether there are differences in the relevant regulatory measures. The t-test was selected because it is typically used to determine if there are significant differences between the two groups under consideration (Kim, 2015). A gravity model was then used to deal with the remaining three objectives. The model was selected because it explains and predicts the effects of policies and trade regulatory measures on bilateral trade flows between partners (Anderson and Van Wincoop, 2003). The first section of the chapter introduces the analytical method used, where the t-test and gravity model are explained. The other sections describe the model specification, estimation of the model and the diagnostic tests. The chapter then discusses the data and data sources, explanatory variables, and their expected signs.

3.2 ANALYTICAL MODEL

The study used a t-test and a gravity model to address all its study objectives. The first objective, which aimed to assess whether there are differences in the numbers of regulatory measures, was addressed by using the t-test. The sections below explain the gravity model, the model specification, and the estimation of the study model.

3.2.1 The gravity model

For empirical trade analysis, a gravity model is mostly used as an efficient trade model (Shang and Tonsor, 2019). It was developed theoretically from the trade model proposed by Anderson and Van Wincoop (2003). The gravity model is suitable for an analysis conducted on the trade between two countries (Cernat, 2003). The model has become an essential part of trade literature and has been used by many researchers to explain and predict trade flows between members who are parties to trade agreements (Fassarella et al., 2011; Kalaba and Kirsten, 2012).

3.2.2 Model Specification

The model assumes that “the volume of trade between the two countries is proportional to the sizes of their respective economies and inversely proportional to the costs of trading usually

measured in terms of the distance between the trading nations" (Nouve and Staatz, 2003). The following is the basic form of the model.

$$T_{ij} = k\,(Y_i\ Y_j)/D_{ij} \qquad (3.1)$$

where T_{ij} is the exporting value from exporting country to importing country, and Y_i &Y_j are the measures of the economic sizes of the exporting and the importing country. D_{ij} is the distance between the cities of exporting and importing countries. The model can also be used in log linear form, as presented in Equation (3.2):

$$LnT_{ij} = \alpha + \beta_1 LnY_i + \beta_2\ LnY_j + \beta_3\ D_{ij} + \varepsilon_{ij} \qquad (3.2)$$

Other variables are added to the model to estimate how they affect international trade. Variables, such as exchange rates, population, common membership and other dummy variables, are added. In this study, variables such as EU regulatory measures and tariff rates for partners on beef were added. This then yields the following generalised gravity model that the study used.

$$LogT_{ij} = \alpha + \beta_1 LogSAGDP_i + \beta_2 LogGDP_{it} + \beta_3 LogPOP_{it} + \beta_4 EUREGMEAS_{ij} + \beta_5 LogTAR_{ij} + \varepsilon_{ij} \qquad (3.3)$$

where:

T_{ij} is the total value of South African beef exports to the EU and the trade partners.

α is the intercept.

β is the slope.

$SAGDP_i$ is the GDP of South Africa.

GDP_{ij} is the GDP of the EU and the trade partners.

POP_{ij} is the population size of the EU and the trade partners.

$EUREGMEAS_{ij}$ is the number of EU regulatory measures on beef. The measure is a summation of the SPS and the TBT measures that the EU introduced on beef.

Tar_{ij} is the tariff rates for South African beef exports to the EU and the trade partners.

ε is the error term.

3.3 ESTIMATING THE GRAVITY EQUATION

The estimation of the gravity model equation differs among the researchers. Some use Ordinary Least Squares (OLS), while others use fixed and random effects models. OLS has been a traditional way of estimating gravity models (Kepaptsoglou et al., 2010). However, many researchers have observed that the use of OLS has produced biased outcomes because heterogeneity is not controlled for in an appropriate way (Cheng and Tsai, 2008). To deal with the problem, researchers have turned towards using panel data. Panel data have the advantage that they permit more general types of heterogeneity (Westerlund and Wilhelmsson, 2011).

Unobserved heterogeneity in panel data can be readily controlled (Baltagi, 2015). The study used panel data analysis to estimate the model. According to Baltagi (2015), panel data analysis allows the control for individual heterogeneity, exploits greater variability for more efficient estimation, and improves measurement accuracy. It is used in Equation 3.3, as shown above. According to Baltagi (2015), panel data analysis uses a pooled, fixed and random effects model. The study used all the models to estimate the gravity model.

The study, before running the models, created the interaction variables. According to Wooldridge (2016), interaction terms compare a variable's effects across various categories. In this study, the interaction variables were created to determine how the EU regulatory measures affect trade partners. The interaction variables were created by multiplying the variable by the dummy variable. For instance, to find the effect of the EU regulatory measures on South African beef exports to the EU, the EU's dummy variable as a trade partner was created, where ‘1’ means exported to the EU and ‘0’ means not exported to the EU. The created dummy variable was multiplied to all the variables of the study. The same was done for the other trade partners analysed in this study.

The study runs the pooled, fixed and random model. The pooled OLS method assumes that there are neither significant differences nor significant temporal effects; hence, we can pool all the data (Baltagi, 2015). This means that all the individual-specific effects are ignored. The fixed effects model assumes that the individual effects or time-specific are correlated with the model's independent variables. On the other hand, the random fixed effects model assumes that the individual effects are not correlated with the model's independent variables (Baltagi, 2015).

3.4 DIAGNOSTIC TESTS

As previously discussed, the study used a pooled, fixed and random effects model. The study conducted diagnostics tests to select the best model to use. Accordingly, the study conducted poolability and Hausman tests. The poolability test was used to determine whether to pool the data and run the pooled model only. On the other hand, the Hausman test was used to decide whether to use the fixed or random effects model. The following sections discuss the diagnostics tests in detail.

3.4.1 Poolability test

The poolability test was conducted to select the best model between a pooled and a fixed effects model. The model assumes the same coefficient across all the individuals (Croissant and Millo, 2008). The poolability test has the null hypothesis that the intercept and slope are the same across individuals (Baltagi, 2015). In other words, it tests for the presence of individual effects. When the test results are significant, we reject the null hypothesis. We then conclude that the intercepts and slopes are not the same. In such a situation, the pooled model is not an ideal for estimation, and a fixed model would be better.

3.4.2 Hausman test

The Hausman test was done to select which model to use, choosing between the fixed and random effects models. This was done because the test assists in selecting the fixed or the random effects model (Baltagi, 2015) – "The null hypothesis for the test is that there is no correlation between the error term and the independent variables in the panel data model (the preferred model is random effects)". When the test results are significant, the study rejects the null hypothesis and concludes that the fixed effect is the best model to use.

3.5 DATA AND DATA SOURCES

The study used panel data from 1992 to 2019. The variables for the study were selected based on factors that affect trade. One of the factors is the Gross Domestic Product (GDP). The GDP brings the force of attraction between trade partners (Gebrehiwet et al., 2007). The trade flows are determined by the GDPs of trading countries, which show their respective productive and consumption capacities. Mostly, it is anticipated that the GDP of the importing country will determine the trade flows from the exporting countries. This is the case because GDP is a proxy for the income of the country concerned. As such, the GDP of an importing country reflects the income of the consumers. When the GDP is good, then consumers would have sufficient

income that they could use to purchase products. On the other hand, the GDP of exporters shows the capacity to produce products (Gebrehiwet et al., 2007). The GDP of an exporter is anticipated to play a less substantial part in determining its trade flows.

Similarly, the population of a country is another factor that affects trade among partners. The larger the population of a trade partner country is, the larger its market size is, which could lead to an increased trade flow to it (Gebrehiwet et al., 2007). On the other hand, a large population in a poorer country could indicate a low per capita income; hence, this might negatively affect the trade flow to such a country.

The study used the exchange rate as another factor that affects trade among partners. There is a significant link between exports and the exchange rate (Nguyen, 2010). If the domestic currency is weak, imports to it become very expensive. Conversely, if the domestic currency is strong, it hinders exports and imports become cheaper.

The study also examined the EU regulatory measures, which in the study context refers to a combination of SPS and TBTs that the EU has introduced on beef imports. The existence of regulatory measures can either facilitate trade or restrict trade among partners (Bratt, 2017). In some cases, the regulatory measures can divert trade flows from the imposing countries to other trade partners that have not imposed similar regulatory measures (Orden et al., 2012).

The study also considered a tariff variable, comprising tariffs on beef for the trade partner. Considering that most trade partners have made trade agreements that have made tariff decline, the study assessed the tariff's effect on trade flows.

The data were retrieved from various sources according to the variable in question. Table 3.1 summarises the study's variables, variable descriptions, expected signs, units of measurement and the data sources.

Table 3.1: Summary of data, data sources and variables with their expected signs

Variable name	**Variable description**	**Units of measurements**	**Data source**
T_{ij}	South African beef exports to the EU and the rest of the world	1000 US$	WITS
GDP_{ij}	The GDP values of South African beef importers	Current US$	World Bank database
$SAGDP_{i}$	The GDP value of South Africa as an exporter	Current US$	World Bank database
POP_{ij}	The population of South African beef importers	Total number	World Bank database
$EUREGMEAS_{ij}$	The EU regulatory measures on beef (SPS + TBT)	Total number	WTO database
Tar_{ij}	The importer's tariff rate on South African beef	Percentage	WITS

Source: Compiled by the author

The following section discusses how the variables shown in Table 3.1 were measured. The EU regulatory measures variable is the main variable of interest, and as such, it will be extensively discussed regarding how the study built the data set. The building of the data set for EU regulatory measures will be discussed in Section 3.5.2 below.

3.5.1 Measurement of variables

The variables used for the study were measured based on the study objectives. The following describes how the variables used for the analysis were quantified.

The South African beef exports to various trade partners were first retrieved from WITS. The retrieved data were then summed, from 1992 to 2019, to ascertain South African world beef exports. This was done to calculate the supply shares of South African beef exports to trade partners to be used in the study. The EU, as one of South Africa's trade partners, had its data summed up by the website, which included all the beef exports to the EU member countries. The study selected the following as South Africa's trade partners: the SADC, the rest of African countries, the Middle East, China, and the rest of the world. For each region, the South African

beef exports to that region's member countries were summed up. The value obtained by the summation represented what was exported to that trade partner. The rest of the world included all other countries that imported South African beef, but were not in the study categories.

Details of the populations and GDPs of trade partners were retrieved from the World Bank database for the period from 1992 to 2019. The study examined the EU, the SADC, the rest of African countries, China, the Middle East and the rest of the world to develop the GDP and population for each of those trade partners. The EU data on both the GDPs and populations of EU member states were already available and needed no summation. WITS information was used for the other trade partners to see which countries in those regions imported South African beef, and summations for their populations and GDPs were made.

The data on regulatory measures were retrieved from the WTO database, and it has details for both the SPS measures and TBTs on beef. The WTO data recorded the notification measures made in a particular year, including from 1992 to 2019 for purposes of this study. After retrieving details of the regulatory measures, the study performed an accumulative calculation. Cumulative calculations were made for SPS and the TBTs and later combined, depending on the year, to identify what this study called regulatory measures (SPS + TBT for that year).

Regarding tariffs, the study used the trade agreement and "Most-Favored Nation (MFN) Tariffs". The "MFN tariffs are referred to what countries promise to impose on imports from other members of the WTO" (WTO, 2010). The study used the MFN for tariffs on beef for partners that trade with South Africa, but not in terms of a trade agreement. As for the partners in trade agreements, the tariffs were calculated using the MFN and the agreements made on the reduction of percentages on entry into the agreements. For instance, the free trade agreement for EU-SA had the following tariff agreement on beef:

- on the date of entry into force of the agreement each duty shall be reduced to 75% of the basic duty
- One year after entry into force of the agreement, each duty shall be reduced to 50% of the basic duty.
- Two years after the entry date into force of the agreement, each duty shall be reduced to 25% of the basic duty.
- Three years after the entry date into force of the agreement, the remaining duties shall be abolished.

3.5.2 The building of the database for the EU regulatory measures

The study used the approach developed by Kalaba (2014) to build the database for the EU regulatory measures affecting beef exports. The following steps were followed to build the database.

The first step was to identify the sources of information. In the first place, the study identified the sources of the EU regulatory measures on beef exports. As indicated above, the study retrieved the information from the WTO database. The database covered both SPS and TBT measures.

The second step was to identify documents available from the source. The website for the EU regulatory measures had links to the documents. The measures have been published as notified, and the documents incorporated all the details required for this study. For example, the documents recorded the relevant notifying member, products covered, regions or countries affected, descriptions of the content, and objectives.

The third stage was to identify regulations referred to in each document. As previously reported, the documents had all the information and the study identified from each document the relevant regulations. The study focused only on regulations that affect beef exports to the EU. For instance, the only TBT measures considered were those that the EU has introduced and which the exporting countries must abide with. Likewise, the only SPS measures considered were those that the EU has introduced which affect beef exports to the EU market.

The next step was to identify and classify measures within each regulation. This step required that the regulations be classified into various categories. However, all the regulations were already categorised when received, and this made the study easy. For instance, each measure had the corresponding codes and the objectives of the measures.

The final step was to identify the affected products. As noted above, this study only examined measures that affected beef exports to the EU. The study covered all the relevant measures from 1992 to 2019, which was the study coverage period. The study recorded the measures for each year as notified, incorporating both the SPS and the TBT measures.

3.6 EXPLANATORY VARIABLES AND THEIR EXPECTED SIGNS

This study when estimating the model specified in Equation 3.3, expected the results that are presented in Table 3.2. The explanatory variables are expected to have different effects, varying according to the relevant trade partner.

Table 3.2: Explanatory variables and their expected signs

Variable	Description	Expected signs
SAGDP	South Africa Gross Domestic Product	-
GDP	Gross Domestic product for trade partners	+
POP	The population of the trade partners	+, -
EUREGMEAS	EU regulatory measures on beef	-,+
TAR	Tariff rates for partners on beef	-,+

Source: Compiled by the author

The SAGDP is expected to be negative in relation to all the trade partners. According to Gebrehiwet et al. (2007), an exporter's GDP is anticipated to play a less significant role in determining its trade flows. The GDP of an importing trade partner is expected to be positive. This is so because an importer's GDP is representative of consumer's incomes that influence the demand for beef. The higher the incomes consumers have, the more they will be able to afford imported beef. This will, in turn, result in an increase in beef demand, and subsequently, an increase in beef importation.

The Population is expected to be positive for all the trade partners that import South African beef. The increase in population implies an increased market size. Again, it means there will be greater demand for more beef in those areas. It is argued that an increasing population increases trade flows. The increased trade flows can, in turn, increase South African beef exports to its partners. The populations of the partners can also have a negative effect on trade flows in that an increased population might lead to low per capita incomes for such a population.

The EUREGMEAS factor is anticipated to have a negative effect on South African beef exports to the EU. This is so because the regulatory measures are associated with increased compliance costs, which negatively affect trade flows. As for other trade partners, the study expected

EUREGMEAS to have a positive effect. This is so because the EU's regulatory measures can create trade diversion for South African beef exports to other trade partners.

This study expected TAR to have a negative effect on the EU and SADC. This is so because there is a free trade agreement between those parties and South Africa. The free trade agreement reduced the tariffs, which then in effect reduced the costs of trade. When the cost of trade is reduced, it is expected to result in increased trade flows. This study expected TAR to positively contribute to the flow of trade for other partners.

3.7 CONCLUSION

This chapter explained the empirical approach that the study used to assess whether there are differences in the numbers of regulatory measures applied between South Africa and the EU by each partner. Furthermore, this approach was used to determine how the EU regulatory measures affected South African exports of beef to the EU and to the rest of the world. This chapter also explained which other variables the study used to ascertain other factors that have affected South African beef exports to the EU.

The study used a t-test to determine whether there are differences in the numbers of regulatory measures between the EU and South Africa. The t-test was selected because it is used to determine the significant differences between the two groups. To deal with the remaining objectives, the study used the gravity model of panel data analysis. The chapter explained why the gravity model was selected for the study and provided the model specification used. The variables chosen for the model were those that affect trade among partners, and these were taken into consideration for the study. The chapter also explained the estimation of the gravity model equation in detail.

Before conducting the analysis, interaction variables were created, and this was done to determine the effects of the EU regulatory measures for individual trade partners. The estimation was done using the pooled, the fixed and the random effects model. Diagnostic tests were conducted to select the best model to use for the analysis. These were the Poolability and Hausman tests. The chapter also provided the explanatory variables, together with their expected signs. The EU regulatory measures were expected to have a negative effect on South African beef exports to the EU. Furthermore, the study anticipated that the EU regulatory measures would create a diversion of South African beef exports to other trade partners.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents a discussion of the results that were obtained in line with the objective of the study. Specifically, the chapter presents the empirical results to determine whether there are significant differences in the numbers of regulatory measures between the EU and South Africa. The results also determine whether the EU regulatory measures have affected South African beef exports to the EU and other trade partners. Lastly, the results identify other factors that have affected South African beef exports to the EU. Regarding these factors, the study specifically examined the effects of the EU GDP, EU exchange rate, EU tariffs, and the South African GDP.

4.2 SUPPLY SHARES OF SOUTH AFRICAN BEEF EXPORTS TO THE TRADE PARTNERS

This section aims to determine the flows and trends of South African beef exports to its trading partners. This study used supply shares to determine the trends and flows of South African beef exports. The supply shares have been used because these indicate a partner's share in the total values supplied. Furthermore, these shares have been used because they are able to control for inflation. The supply shares of South African beef exports under this section refer to what was exported to trade partners from 1992 to 2019. For this study, the trade partners were grouped into six categories. The partners were grouped according to which countries South African beef was exported. Furthermore, the countries were grouped within their respective regions. The values of beef exports to countries within the same region were aggregated to represent that region. The trade partners are the EU, the SADC, the Middle East, China, the Rest of African Countries (RoA), and the Rest of the World (RoW). The EU, the SADC, the Middle East, and China include all the countries within such regions that imported South African beef. The Rest of African Countries refers to all non-SADC countries in Africa that imported beef from South Africa. The Rest of the World refers to all the countries that imported South African beef, but are not grouped in any other region referred to above.

This section will discuss the supply shares of South African beef export to its trade partners. Table 4.1 shows South Africa's supply shares to the trade partners from 1992 to 2019. The study divided the periods into intervals of four years. The table also includes the values of South African beef that were exported to the world. The values are the averages of the periods.

Table 4.1: Supply shares of South African beef exports to the trade partners from 1992 to 2019

Period	SA beef export (million USD)	The EU	SADC	Middle East	China	Rest of African Countries	Rest of the World
1992-1995	44.68	50%	7%	0%	0%	3%	40%
1996-1999	20.17	40%	26%	2%	1%	11%	20%
2000-2003	20.15	9%	57%	13%	0%	5%	16%
2004-2007	28.07	9%	61%	6%	0%	4%	20%
2008-2011	38.34	8%	73%	9%	0%	5%	5%
2012-2015	87.18	1%	61%	21%	5%	5%	7%
2016-2019	134.18	1%	30%	45%	16%	3%	5%

Source: Calculated by the author using data from WITS database (2020)

Table 4.1 shows that South African beef exports had been increasing from 1992 to 2019. Table 4.1 shows that the values of South African beef exports over the periods have, on average, increased from 44.68 million USD to 134.18 million USD. It has also been shown that the EU was the major destination market for South African beef exports in the period from 1992 to 1999, as it had received up to 50% of the export shares. However, from 2000 to 2019, South African beef exports to the EU declined to 1% over the period from 2012 to 2019. Although South African beef exports to the EU declined, this was not the case with other trading partners. For instance, the SADC increased its imports of South African beef. From 2000 to 2015, the SADC was the main importer of South African beef, as shown in Table 4.1. According to data provided by World Integrated Trade Solutions (WITS) (2020), the key markets within the SADC were Mozambique, Mauritius, Angola, Lesotho and Eswatini. From 2016 to 2019, the Middle East, China and the SADC were the leading importers of South African beef. The Middle East's key internal markets were Kuwait, Qatar, Jordan, and the United Arab Emirates.

In summary, the EU was the main destination market for South African beef exports from 1992 to 1999. During that period, South African beef exports supply share to the EU was high. However, during the period from 2000 to 2019, South African beef exports to the EU declined.

The case was not the same for other partners. It was noted that the SADC, the Middle East, and China became the main destination markets for South African beef exports. The key markets in the SADC, China and the Middle East remained as the leading importers of South African beef.

4.3 ASYMMETRIC TRADE ARRANGEMENTS BETWEEN THE EU AND SOUTH AFRICA

This section aims to determine whether there are significant differences in beef regulatory measures between the EU and South Africa. Furthermore, it seeks to test the existence of asymmetric trade arrangements between these trade partners. The study used a t-test to determine whether there are significant differences in beef regulatory measures between the EU and South Africa. The test was selected for the study because it is applied to ascertain if there is a significant difference between two groups (Kim, 2015).

The study used the number of beef regulatory measures as shown in appendix which was implemented by both partners to explain the existence of asymmetric trade arrangements. The regulatory measures on beef, for the context of this study, comprise the combination of the SPS and the TBTs measures in place. Both the EU and South Africa have implemented regulatory measures on beef that an exporting country must comply with. In order for the EU to export beef products to South Africa, it needs to meet South Africa's set regulatory measures. Likewise, for South Africa to export beef to the EU market, it is required to comply with the EU's set measures.

Table 4.2 below shows the results for the t-test that was used to determine the significance of differences in the numbers of regulatory measures on beef between the EU and South Africa. The study examined regulatory measures on beef from 1992 to 2019 that were imposed by South Africa and the EU.

Table 4.2: T-test results to determine the significance of the differences in regulatory measures on beef

Partner	Mean	Standard Error	Standard Deviation
South Africa	9.8214	2.0201	10.6876
The EU	107.2857	19.1445	101.3033
Degrees of freedom	54		
P-value	0.0000 (***)		

*Notes: *** denotes 1% significance, ** denotes 5% significance, * denotes 10% significance*

Table 4.2 shows the t-test results that identify the significant differences in the numbers of beef regulatory measures. The results show that, on average, South Africa has implemented ten regulatory measures on beef. The EU has, on average, implemented 107 regulatory measures on beef. The p-value for the test is significant, at 1% level of significance. Since the results are significant, the study rejects the null hypothesis that there are no significant differences in the number of beef regulatory measures between the partners. Therefore, it concludes that there is a statistically significant difference in the numbers of regulatory measures on beef between the partners.

In summary, the section has shown a significant difference in the numbers of beef regulatory measures, as implemented by South Africa and as implemented by the EU. This was demonstrated by the t-test results, which showed a significant p-value at a 1% level of significance. The section also ascertained that both the EU and South African regulatory measures in beef have increased. However, the EU has implemented regulatory measures on beef that are higher in number than those of its trade partner, South Africa. The section also revealed the asymmetric regulatory measures and trade arrangements. It has been noted that, on average, the EU has 107 measures in place, whereas South Africa has 10 in place. This implies that when South Africa introduces one regulatory measure, the EU introduces 11 regulatory measures.

The asymmetric trade arrangement was shown by the inverse relationship of the EU tariffs and their regulatory measures. It was noted that when the EU tariffs on beef declined to zero, the EU increased the regulatory measures. The signing of the EU and South Africa free trade agreement was intended to remove trade costs and increase trade flows. However, with the increased EU regulatory measures, trade costs are still being encountered. According to

(Alaeibakhsh and Ardakani, 2012; Alam and Ahammad, 2018; Arita et al., 2015; Bratt, 2017), the regulatory measures entail double the costs that the tariffs entail. The costs are associated with compliance with the stipulated regulatory measures.

4.4 THE EFFECT OF THE EU REGULATORY MEASURES AND OTHER FACTORS AFFECTING SOUTH AFRICAN BEEF EXPORTS TO THE EU

The previous section identified differences in the numbers of regulatory measures prevailing between the EU and South Africa, thus demonstrating the existence of asymmetry in these measures. However, the presence of asymmetric measures is not necessarily a problem. The problem arises when such measures affect the trade of one partner negatively. This section estimates the effects of the EU regulatory measures on South African beef exports. It also discusses other factors that affect South African beef exports to the EU. The estimation was carried out by conducting a panel data analysis of the gravity model.

The study used the gravity model specified in Equation 3.3 (set out in Chapter 3) to estimate the effects of the EU regulatory measures and to evaluate other economic factors that contribute to the decline in South African beef exports to the EU. The study runs the pooled, fixed, and random effects of gravity model estimation. The pooled model assumes that there is a constant slope and intercept (Baltagi, 2015). The fixed effects model assumes the individual-specific effects are correlated with the independent variables (Baltagi, 2015). On the other hand, the random effects model assumes that individual unobserved heterogeneity is not correlated with the explanatory variables (Baltagi, 2015). The poolability test was conducted to select the best model between a pooled model and a fixed effects model. The null hypothesis of the poolability test is that the slope and intercept are the same across all the individuals (Croissant and Millo, 2008). The test results showed that both the chi-square and the p-value were significant, as shown in Table 4.2. Hence, the study rejected the null hypothesis and concluded that it was not appropriate to use the pooled model.

The Hausman test was conducted to select the best model between the fixed and random effects models. The null hypothesis of the Hausman test is that the preferred model is a random effects model (Baltagi, 2015). In this study, the Hausman test results showed that the p-value was statistically significant, at 1% level of significance. Hence, the study concluded that the fixed effect model is the best model to use for estimating the model. Table 4.4 gives the outcomes of the test and the estimates of the gravity model.

Table 4.3: Gravity model estimations

Independent variables	**Fixed model estimates**
Log South African GDP	-3.8541 (0.000) ***
Log EU GDP	10.7933 (0.000) ***
Log EU Exchange Rate	-0.5420 (0.201)
Log EU Population	-280.9418 (0.000) ***
EU Regulatory measures	-0.0246 (0.040) **
Log EU Tariffs	-0.5634 (0.007) ***
Constant	511.6911 (0.000) ***
Number of observations	126
R-squared	0.9714
Poolability test	25.28 ***
Hausman test	126.42 ***

*Notes: *** denotes 1% significance, ** denotes 5% significance, * denotes 10% significance*

Source: Author's computations

The fixed effects model was selected after the Hausman test results showed a significant outcome, as indicated in Table 4.3. The fixed effects model was shown to have an overall model significance and an R-squared of 0.9714. The R-squared means that the data explain 97.14% of the model. The results showed that the South African GDP, the EU GDP, the EU population, the EU regulatory measures, and the EU tariffs had a significant result. On the other hand, the EU exchange rate was shown to have insignificant effects.

The results showed that the EU regulatory measures negatively affect South African beef exports to the EU. This is indicated by the negative sign of the gravity model's coefficient and by the p-value of 0.040, which means it is significant, at 5% level of significance. The results signify that South African beef exports to the EU were negatively affected by the EU regulatory measures, as hypothesised. The findings of the study are similar to those that other researchers have found. Countryman and Muhammad (2017) argued that EU regulatory measures act as a restriction to beef exports into the EU market. Arita et al. (2015) support a similar proposition,

arguing that EU regulatory measures have an impeding trade effect on beef imported from other countries. Their study revealed that the EU regulatory measures negatively affected beef exported by the United States of America to the EU.

Furthermore, the access by beef exporting countries to the EU markets has been constrained by EU regulatory measures (Arita et al., 2014). Although the EU regulatory measures are aimed at protecting consumers' health, it has the effect of a protectionism tool that limits imports (Kareem et al., 2018). Kareem et al. (2018), in an article on protecting health or protecting imports, argue that EU market conditions affect the probabilities of countries being able to export to the EU. This was supported by Kareem and Martinez-Zarzoso (2020), who have argued that the high costs of complying with the EU standards adversely affect the competitiveness of exports.

On the other hand, the EU tariff is shown to have a significantly negative coefficient. The results in Table 4.3 show that the p-value is significant, at 1% level of significance. This result implies that reducing the EU tariff on beef was supposed to reduce a trade cost. When that item of the cost of trade was reduced, it was expected that South African beef exports to the EU would have increased. Various sources in the literature agree that reducing tariff rates should reduce the cost of trade; hence, that reduction should result in an increased value of agricultural exports (Hoekman and Nicita, 2018; Johnson, 2014; Jordaan and Kanda, 2011; Kalaba et al., 2005; Murina and Nicita, 2017). The reduction of the EU tariff on South African beef exports was brought about by the terms of the trade agreements between the two countries.

The EU-SA free trade agreement, concluded between South Africa and the EU, came into effect in 2000 (Kalaba et al., 2005). Subsequently, the countries signed the EU-SADC EPA in 2016 (EU, 2020). The EU-SA free trade agreement, among other things, reduced the beef tariff to a zero percentage (EU, 2019). Based on the agreement regarding the reduction of tariffs for agricultural products, beef exports have attracted a zero percentage of tariffs, from 2003 to date. However, during this time, South African exports to the EU have declined substantially. Therefore, this is the possible reason why the results show significant tariff effects on exports of beef.

Regarding other factors that affect South African beef exports to the EU, the study has shown that the EU GDP has a significantly positive effect. As shown in Table 4.3, the results indicate that the EU GDP has a positive coefficient, which is significant at 1% level of significance.

The results imply that the EU economy supports the increased importation of South African beef.

On the contrary, the results for the EU population factor are shown to have a significant, negative effect. Table 4.3 shows that the EU population had a negative coefficient, significant at a 1% level of significance. The EU has populations that have not been growing fast, as compared with other regions and developing countries.

When it comes to the South African GDP, the results showed that the South African GDP had a significant, negative effect. These results align with the study expectations, as the GDP of an exporting country is anticipated to have a negative effect on exports. This is so because it means that the domestic consumers' income is reduced and provides opportunities for exports. The results means than South African beef exports to the trade partners were supposed to increase.

The EU exchange rate is shown to have a negative coefficient and an insignificant p-value. These results are not what the study expected. The study expected the EU exchange rate to have a significant and negative effect. The EU is one of the regions that have a strong domestic currency.

In summary, this section has shown that asymmetric regulatory measures have negatively affected South African beef exports to the EU. The EU measures are acting as a barrier to South African beef exports. Compliance with such measures increases the costs of trade. The section has also ascertained that the EU population is another factor that has contributed to the decline in trade. It has been noted that the EU population has a negative effect on South African beef exports to the EU. On the other hand, the EU GDP has positively contributed to South African exports of beef to the EU.

4.5 THE EFFECT OF THE EU REGULATORY MEASURES ON SOUTH AFRICAN BEEF EXPORTS TO OTHER TRADE PARTNERS

As observed in the previous section, the EU regulatory measures have negatively affected South African beef exports to the EU. This section aims to determine whether the EU regulatory measures have affected South African beef exports to other trade partners. Separate models were used to estimate the effects of the EU regulatory measures on South African beef export to other trade partners. The models were run for the SADC, the Rest of Africa Countries, the Middle East, China, and the Rest of the World. The models factored South African beef exports to the partner as the dependent variable, and factored the EU regulatory measures and the tariff

on beef for that trading partner, the GDPs of South Africa and the trade partner, and the trade partner's population as the regressors. To begin, the study calculated the pooled, the fixed and the random effects models.

After running the models, best selection model tests were conducted. The first test was the poolability test that was used to select the best model between the pooled and fixed effects models. All the results were statistically significant, implying that the pooled model is not suitable for use. The study then conducted the Hausman test to ascertain which model between the fixed and random effect models is suitable. The Hausman test results for the Rest of the World and China were significant, and accordingly the study used the fixed effects model. The results for the SADC, the Rest of the African Countries and the Middle East were not significant, and accordingly the study used a random effects model. Table 4.4 below gives the gravity estimates for each partner and the results of the Hausman test.

Table 4.4: Gravity estimates for the effects of EU regulatory measures on South African beef exports to other trade partners

	SADC	**Rest of African Countries**	**Middle East**	**China**	**Rest of the World**
Log South African GDP	-0.1867 (0.400)	-0.2157 (0.321)	-5.4783 (0.000) ***	-7.1912 (0.000) ***	2.0725 (0.000) ***
Log GDP	0.6767 (0.011) **	-0.5005 (0.038) **	1.4418 (0.000) ***	6.3374 (0.000) ***	-4.8587 (0.000) ***
Log Exchange rate	0.7471 (0.000) ***	-0.4156 (0.000) ***	-0.3148 (0.891)	4.8027 (0.022) **	-4.3294 (0.000) ***
EU Regulatory measures	0.0037 (0.019) **	0.0094 (0.000) ***	0.0137 (0.000) ***	0.0569 (0.000) ***	0.0361 (0.000) ***
Log Tariff	-0.0210 (0.874)	-1.7580 (0.000) ***	0.2672 (0.467)	0.4712 (0.709)	-1.3191 (0.000) ***
Log Population	-0.2877 (0.277)	1.6594 (0.000) ***	5.6176 (0.000) ***	-148.4317 (0.000) ***	-16.1705 (0.000) ***
R-squared	0.9987	0.9986	0.9983	0.7456	0.9853
Number of observations	126	126	126	126	126
Hausman test	1.89	1.37	4.83	52.91***	94.63***

*Notes: *** denotes 1% significance, ** denotes 5% significance, * denotes 10% significance*

Source: Author's computations

Table 4.4 shows the gravity estimates results regarding the effects of the EU regulatory measures on other trade partners. The results also indicate how different factors have contributed to South African beef exports to the partners. The results indicate that the EU regulatory measures positively affected South African beef exports to all other trade partners. Table 4.4 shows that the EU regulatory measures for all other trade partners have a positive coefficient and significant p values, at different levels. These results imply that, when South African beef exports to the EU declined because of the EU regulatory measures, South Africa

then exported beef to the other trade partners. According to Orden et al. (2012), restrictive regulatory measures induce a significant third-country trade-diversion effect. These results are what the study expected and hypothesised. The results also support the observation made in Section 4.2, that trade partners like the SADC, from the year 2000, imported 57% of South African beef exports. Furthermore, the SADC registered increased imports of South African beef, up to 2019. The highest figures registered were from 2008 to 2011, when it imported 73% of South African beef exports.

Similarly, other trade partners like the Middle East and China, which did not import South African beef from 1992 to 2012, have since become important export markets. According to DAFF (2018), South Africa has been exporting more beef to these trading partners than to the EU. It has been reported that South African beef exports were destined for markets such as the United Arab Emirates (UAE), China, Hong Kong and Kuwait. Sihlobo (2020) has reported that key markets for South African beef are the UAE, Qatar, Jordan, Mauritius, Namibia, China, Lesotho, Mozambique, Eswatini, Angola, Hong Kong, Vietnam and Kuwait.

On the other hand, the tariffs for the other trading partners returned varying results. The results for the SADC, the Middle East and China showed that their tariffs are insignificant. These results were not as was expected by this study. As for the rest of African countries and the rest of the world, the tariffs had a significant and negative effect on South African beef exports.

The GDPs of the exporting and importing trade partners also showed varying results. The South African GDP showed a significant and negative effect for China, the Middle East, and the rest of the world. These results were as expected by this study. The results for the South African GDP regarding the SADC and the rest of African countries showed a negative, but not significant, coefficient.

Although the results showed significant effects regarding the GDPs of importing countries, the effects differed. The SADC, the Middle East and China each had a significant positive effect, as expected by this study. According to the literature, an importing country's GDP is anticipated to determine the trade flows from exporting countries. This is because an importing country’s GDP, like a consumer's income, plays a significant role in determining the demand for the goods. The GDPs for the rest of African countries and the rest of the world are shown to have significant, negative effects.

The population of other regions also returned varying results. Table 4.4 above shows that the population results for the Rest of African Countries, China, the Middle East, and the Rest of

the World were significant. The population of the SADC showed insignificant results. The populations of the Rest of African Countries and the Middle East are shown to have significant, positive effects. That implies that there is an increased demand for beef products due to increased population. These results were expected by the study, as the literature agrees that the Middle East and Africa are among those regions with increased population growths.

The computations made regarding exchange rates returned varying results. Table 4.4 shows that the SADC, China, the Rest of the African Countries and the Rest of the World have significant results, although with differing effects. The results show the Middle East exchange rate to be insignificant. The exchange rates for the Rest of African Countries and the Rest of the World showed significant and negative effects. On the other hand, those for the SADC and China are shown to have significant, positive effects.

In summary, this section has shown that the EU regulatory measures have had a significant and positive effect on South African beef exports to its other trade partners. The EU regulatory measures have been restrictive towards South African beef exports. As a response, South African beef exports were diverted to other trade partners. The section has also ascertained that other factors have contributed to increased South African beef exports to the other partners. The section noted that the factors for population, GDP, tariff and exchange rate played a significant role for beef exports to other trade partners. For instance, the GDPs of the Middle East, China and SADC are shown to have significant, positive effects. The results indicate that their economies support importations of South African beef. The results also showed that the Middle East population played a significant role, as it has a significant and positive effect. That implies that the increasing population in the Middle East will, in turn, result in increased demands for beef products. The Rest of African Countries also showed a high population, as shown by its significant, positive effect.

4.6 CONCLUSION

This chapter aimed to determine the flows and trends of South African beef exports to its trade partners. It has been ascertained that the EU and the Rest of the World were the main importers of South African beef from 1992 to 1999. However, from 2000 to 2019, South African beef exports to the EU dropped to 1% of the supply shares of beef exported. It was shown that when South African beef exports to the EU declined, South Africa increased its exports to other trade partners. For instance, the SADC became the leading importer of South African beef, from 2000 to 2015. The study has shown that, from 2016 to 2019, the Middle East, China, and the

SADC had become the main key markets for South African beef exports. The key market countries were Mozambique, Mauritius, Angola, Lesotho, Eswatini, China, Hong Kong, Kuwait, Qatar, Jordan, and the United Arab Emirates.

This chapter also endeavoured to determine whether there are significant differences in the numbers of regulatory measures in force between the EU and South Africa. The t-test results have revealed that there were significant differences in the numbers of regulatory measures. This shows that asymmetry exists in the regulatory measures between the EU and South Africa. The results also confirm that the EU has implemented 107 regulatory measures, on average, whereas South Africa has implemented 10 such measures. This implies that when South Africa introduces one regulatory measure, the EU introduces 11 regulatory measures.

Having found that asymmetric regulatory measures exist, the study endeavoured to ascertain the effects of the EU measures on South African beef exports. The empirical results have shown that the EU regulatory measures have negatively affected South African beef exports to the EU. The empirical results also show that the EU regulatory measures have positively affected South African beef exports to all its other trade partners. This implies that as South African beef exports to the EU declined, the exports were diverted to other regions, such as the SADC, the Middle East and China.

The empirical study showed that the EU tariffs showed a significant and negative coefficient for tariff rates. These results indicate that the reduction of the EU tariffs in turn reduced trade costs. Hence, it was expected that South African beef exports to the EU would have increased. On the other side, the tariffs for the trading partners have returned varying results. The results for the SADC, the Middle East and China showed that their tariffs are insignificant. The tariffs for the Rest of African Countries and the Rest of the World were significant and had negative effects.

Regarding other factors that affect South African exports of beef to the EU, the empirical results revealed that the EU GDP positively affected South African beef exports. This implies that the EU economy had not contributed to the decline in South African beef exports to the EU. On the other hand, the results have shown that the EU population had a significant and negative effect on South African exports of beef to the EU. These results implied that the EU population had not been growing as fast as the populations of other trade partners have, hence negatively affecting South African beef exports to the EU. The EU exchange rate was shown to have a negative coefficient and an insignificant p-value.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

The use of regulatory measures has extensively characterised international agriculture trade. It has been observed that leading importers of agri-food products use greater numbers of regulatory measures than their trade partners do. The differences in the types and numbers of measures being implemented bring about an element of asymmetry. The existence of asymmetric regulatory measures is not necessarily a problem. The problem comes when such measures affect the trade of one partner negatively.

As the leading importer of agri-food products, the EU is expected to have more numbers of regulatory measures in place than its trade partners have in place. This means that exporting countries need to comply with the EU measures to gain access to the EU market. South Africa is one of the countries that trade with the EU. The two trading partners have concluded two free trade agreements to facilitate trade flows between them. The signing of the agreements was expected to result in an increase in South African trade flows to the EU, and vice versa. However, this has not been the case with South African beef exports to the EU, as these have declined.

Therefore, this study aimed to understand why South African beef exports to the EU declined, despite the countries being in the free trade agreement. It is well documented in trade literature that a decline in tariffs often results in the rise of regulatory measures. Accordingly, this study aimed to determine whether there were significant differences in the numbers of regulatory measures being implemented between the EU and South Africa. Furthermore, it aimed to determine whether the EU regulatory measures affected South African beef exports to the EU and to other trade partners. Lastly, the study assessed other factors that affected South African beef exports to the EU. Specifically, the study examined other factors such as the South Africa GDP, the EU GDP, the EU exchange rate, and the EU population.

This study categorised South Africa's trade partners into six groups. These were the EU, the SADC, the Rest of other African Countries, China, the Middle East, and the Rest of the World. In order to address the specific objectives, the study conducted a t-test and worked a gravity model of international trade. It covered data from 1992 to 2019. The t-test was used to determine whether there are significant differences in the numbers of beef regulatory measures. The gravity model was used to deal with the remaining objectives of the study. The gravity

model explains and predicts the flows of trade, and has been used by many researchers. This study then performed a panel data analysis of the gravity model. It ran pooled, fixed and random effects models. Poolability and Hausman tests were conducted to select the best model to use for the study.

Since the study also endeavoured to examine the effects of EU regulatory measures for South African trade partners, interaction variables were created. The interaction variables were used to compare the effects across the various categories. The study used binary values, where 1 indicates the region under discussion and 0 indicates the other regions. For instance, to find the effect of the EU regulatory measures on South African beef exports to the EU, the EU's dummy variable as the trade partner was created, where 1 indicates exported to the EU, and 0 indicates not exported to the EU. The created dummy variable was multiplied to all the variables of the study. The same was done for the other trade partners.

5.2 SUMMARY OF THE FINDINGS

This study started with the calculation of the supply shares of South African beef exports to its trade partners. This was done to determine the trends over time and also to assess what had transpired with the exports. Various studies in the literature report that the use of regulatory measures prompts other parties to divert exports to other trading partners.

The study found that, from 1992 to 1999, the EU was the leading importer of South African beef, followed by the rest of the world. South African beef comprised up to 50% of the imports into the EU region. From 2000 to 2019, the EU imports of South African beef dropped to 1%. It was found that, when South African beef exports to the EU declined, South Africa diverted its exports to other trading partners. The study found that the Middle East, China and SADC become the leading importers of South African beef.

Secondly, the study found that there were significant differences in the numbers of regulatory measures implemented between the EU and South Africa. Furthermore, it was revealed that both asymmetric regulatory measures and trade arrangements existed between the EU and South Africa. The asymmetric trade arrangement came in when the EU regulatory measures and the EU tariffs were looked more closely and compare the periods. From 1992 to 1999, the EU tariffs had a greater effect than the regulatory measures. The signing of the free trade agreement between the EU and South Africa was intended to facilitate trade flows by reducing and removing the trade costs. When the trade costs were reduced by the removal of EU tariffs,

the EU in effect introduced other trade costs, which were associated complying with the EU regulatory measures. The study reveals that, from 2000 to 2010, the EU regulatory measures were 13 times higher in number than the South Africa measures. The EU regulatory measures from 2011 to 2019 were ten times the number of South Africa measures.

Thirdly, it was found that the EU regulatory measures negatively affected South African beef exports to the EU. When it comes to all the other trade partners, it was found that the EU regulatory measures positively affected South African beef exports to all the other partners. It was observed that, as South African beef exports to the EU declined, these exports were diverted to other regions, such as the SADC, the Middle East and China.

Lastly, it was found that the EU tariffs had negatively affected South African beef exports to the EU, even though the reduction in tariffs was expected to reduce trade costs, with the added expectation that South African beef exports to the EU would have increased. Furthermore, the study found that the EU GDP positively affected South African beef exports to the EU. However, the EU population was found to have a negative effect, while the EU exchange rate had an insignificant effect.

5.3 CONCLUSION

This study has concluded that an asymmetric trade arrangement exists between the EU and South Africa. The numbers of regulatory measures in effect between the EU and South Africa had significant differences. The EU has had more numbers of regulatory measures in place than its trade partner, South Africa. South African beef exports to the EU have declined because of the EU regulatory measures. This was ascertained when it was found that the EU regulatory measures have had a significant and negative effect on South African beef exports. Secondly, the study concluded that the EU regulatory measures have created a trade diversion of South African beef to other partners. The study found that the SADC, the Middle East and China have become key markets for South African beef. Thirdly, the study concluded that the EU tariff was not a reason for the decline of South African beef exports to the EU. The EU tariff was found to have reduced the costs of a trade. Fourthly, the study concluded that the EU GDP positively contributed to the importation of South African beef.

5.4 RECOMMENDATIONS

The existence of asymmetric regulatory measures is not necessarily a problem – the problem comes when the asymmetry affects another trading party negatively. The study findings show

that the asymmetric EU regulatory measures have negatively affected South African beef exports to the EU. The study now makes the following recommendations.

The study recommends that negotiations should be undertaken on the use of regulatory measures between the EU and South Africa. These measures should not be used to operate as a barrier to trade between the parties.

Secondly, the study recommends the development of mutual recognition among the parties. There is a need for mutual recognition of conformity assessment in sectors of mutual economic interest, for cooperation in quality management, and for assurance in selected sectors of importance.

Lastly, the study recommends that trade policymakers should review regulatory measures to improve the position of South African beef exports to the EU. The reviewing of regulatory measures will help to understand where these are deficient and to provide proper strategies to address the challenges. This study can ably argue that South Africa is not benefiting much from the trade agreement because of the EU regulatory measures. Despite the reduction in the EU tariffs, South Africa cannot profitably increase its beef exports to the EU.

5.5 ACHIEVEMENTS AND LIMITATIONS OF THE STUDY

The study managed to determine the existence of asymmetric regulatory measures between the EU and South Africa. It was found that the EU had more regulatory measures than South Africa on beef. The study also found that the EU regulatory measures negatively affected South African beef exports to the EU. On the other trade partners, it was found that it diverted the South African beef exports to SADC, China and the Middle East.

Despite achieving all the research objectives, the study faced some limitations. The first limitation was finding all the required data for South African beef exports in quantities. There was missing data for some years for South African beef exports in quantities. As a result, the study used the values of South African beef exports.

The second limitation was data for EU tariffs. There were missing data for tariffs on South African beef exports to the EU. The study used the calculations and other sources to come up with the tariffs. The third limitation was lack of data on measures of China, Middle East and other partners and the price information.

5.6 RECOMMENDATIONS FOR FURTHER STUDIES

The study findings concluded that the EU regulatory measures created trade diversions of South African beef to other trade partners. It was noted that the Middle East, China and SADC become key markets for South African beef exports. As such the study recommends that further study should be done on determinants that has increased South African beef exports to the other trade partners.

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APPENDIX

TABLE A: South Africa and the EU number of regulatory measures

Year	Beef		Live animals and meat products		Agriculture	
	SA	EU	SA	EU	SA	EU
1995	0	0	0	18	0	18
1996	1	4	1	26	2	30
1997	1	7	1	32	2	39
1998	3	13	4	43	7	56
1999	3	15	5	47	8	62
2000	3	20	5	58	8	78
2001	3	37	5	78	8	115
2002	3	43	5	90	8	133
2003	5	59	10	114	15	173
2004	5	67	10	131	15	198
2005	5	78	12	133	17	211
2006	6	90	15	148	21	238
2007	7	99	17	161	24	260
2008	7	105	17	178	24	283
2009	9	118	20	209	29	327
2010	10	132	22	238	32	370
2011	12	148	26	265	38	413
2012	12	175	27	311	39	486
2013	15	198	32	348	47	546
2014	18	223	37	385	55	608
2015	22	242	44	413	66	655
2016	24	261	52	441	76	702
2017	29	273	63	461	92	734
2018	33	292	67	489	100	781
2019	39	305	76	513	115	818

Source: Calculated by the author using data from WTO database