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The Effects of Asymmetric Regulatory Measures on North-South Trade: A Case of South African Beef Exports to the European Union

by Chikumbutso Banda and Mmatlou Kalaba

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1 Introduction

Global tariff protection has been on the downward trend since the World Trade Organisation (WTO) formation in 1995. This was motivated by various trade negotiations at the multilateral level, regional integration initiatives and bilateral agreements (Kalaba et al., 2016; WTO, 2008). Despite the reduction in tariff, regulatory measures like the Non-tariff measures (NTMs) have been observed to be rising in international trade (Fugazza, 2013; Santeramo and Lamonaca, 2019). According to 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 other trade partners. The differences can be either in the type or number of the measures or both. Most studies have shown that asymmetric regulatory measures have negatively affected trade flows (Arita et al., 2015; Santeramo and Lamonaca, 2019; Murina and Nicita, 2017). It has been argued that asymmetric measures increase trade costs. The costs are associated with compliance with the partner’s measures (Yalcin et al., 2017).

There is evidence that the use of regulatory measures affecting international agriculture trade has been increasing (Santeramo and Lamonaca, 2019). This implies that countries exporting agricultural products need to comply with such measures to access the markets. The reasons for imposing regulatory measures on agricultural products include food safety, to protect people from diseases, pests, or contaminants that might arise from imported products (Kareem et al., 2018). Murina and Nicita (2017) indicated that there are non-trade policy objectives that have also propelled the rise in utilising regulatory measures. The use of the regulatory measures adds barriers and stand out as impediments to trade (Cadot et al., 2015; Skorobogatova and Knebel, 2011). The

measures add costs to trade because they require importing countries to increase compliance, inspection, and operational activities. The costs to trade can be higher and deemed restrictive if the exporter is a developing country, and the importer is a developed one or what is referred to as South-North trade. This is because developed countries tend to have more measures than developing, and thus gives rise to the asymmetric application.

The European Union (EU) has a high propensity to engage in the asymmetric use of regulatory measures. Because it is one of the largest importers of agricultural products and is constituted by mostly developed countries. This is because it is one of the developed regions in the world (Hadjinikolov, 2020). Again, it is the largest importer of agricultural products and uses regulatory measures relatively more than other trade partners (Matthews, 2018; Santeramo and Lamonaca, 2019). Most of the EU regulatory measures are in the agri-food sector (Schlueter et al., 2009). Agri-food products involve many categories, including meat and meat products. On the other hand, South Africa is caught up in this conundrum of trade regulations with the EU. It is a developing country, the EU's largest trading partner in Africa and one of the main exporters of agricultural products (EU, 2020).

South Africa and the EU engaged in the first trade negotiations in the mid-1990s (Larsén, 2007). The negotiations were concluded within half a decade when they signed the EU-SA Free Trade Agreement (FTA), also known as the Trade, Development and Cooperation Agreement (TDCA) (Kalaba et al., 2005). This came into effect in the year 2000. The TDCA introduced free trade after a 12-year transitional period of reducing tariffs in almost all sectors (Kalaba et al., 2005). Again, in 2016, the two parties signed another trade agreement, the EU – Southern African Development Community (SADC) Economic Partnership Agreement (EPA), with five other southern African countries (Botswana, Lesotho, Mozambique, Namibia, and Swaziland) (EU, 2019). At the end of the transitional period, the EU-SADC-EPA will supersede the TDCA, and the latter will cease to exist.

The signing of the free trade agreement between the EU and South Africa was expected to increase trade flows (Balogh and Leitão, 2019). On the contrary, South African beef exports to the EU declined over the years. Figure 1 below shows South African beef exports to the EU and the rest

of the world. Furthermore, the figure shows the EU regulatory measures on beef. 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.

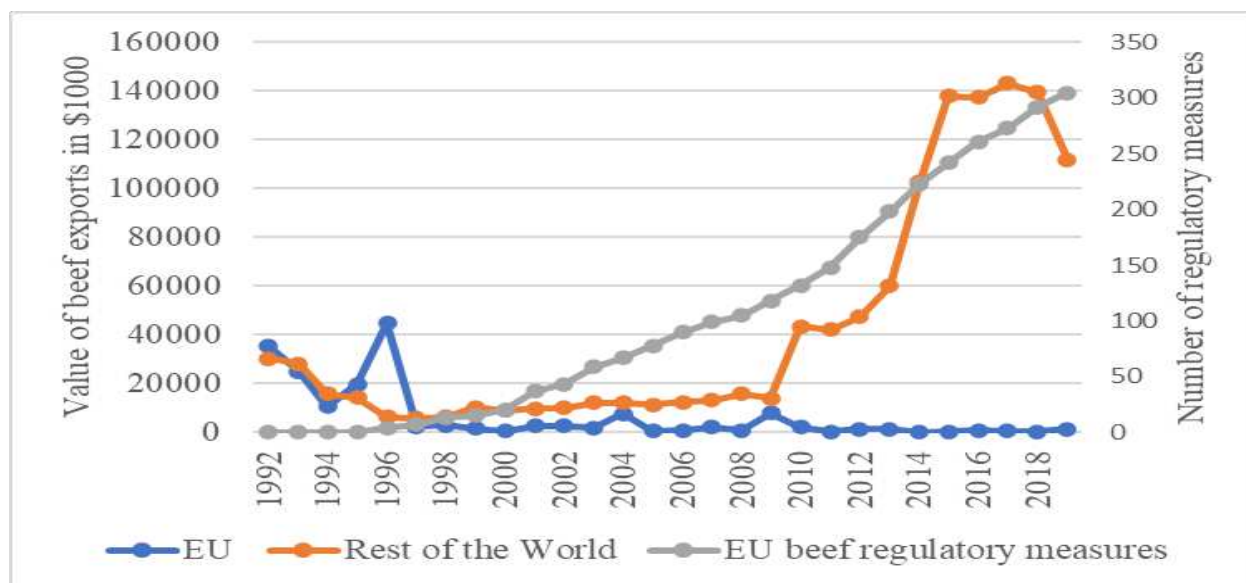


Figure 1: South African beef exports to the EU, rest of the world and EU regulatory measures on beef 1992-2019

Source: Author plot using data from WITS

Figure 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.

The signing of the free trade agreement between the EU and South Africa creates a situation where asymmetric regulatory can apply (Balogh and Leitão, 2019). Unlike tariffs, the use of regulatory measures was not part of the negotiations in both agreements. This was then left to each party to apply them as deem fit but in compliance with the WTO regulations. Therefore, this article aims to determine whether trade between South Africa and the EU has features of asymmetric regulatory measures. South Africa beef exports to the EU are used as a case study. Specifically, the article has the following objectives:

- To determine whether the application of regulatory measures is asymmetric.
- To evaluate the effects of regulatory measures on South African beef exports to the EU; and
- To determine whether EU regulatory measures diverted beef exports to other partners.

The rest of the article is organized as follows: section 2 gives South African beef exports by trade partners and the concept of asymmetric regulatory measures. Section 3 presents the methods and procedures used and the theoretical framework. Section 4 presents the results and discussion. Lastly, the article brings the conclusion of the study.

2 South African beef exports by trade partners

The article looked at South African beef exports to the trade partners to determine the trends over time and identify major importers. The study used the supply shares of South African beef exports to the partners. The supply shares have been used because it gets the partner's shares out of the total values supplied. Again, the shares have been used because it controls for inflation. The supply shares of South Africa beef exports under this section refers 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. Again, the countries were grouped within the region.

The values of beef for countries within the same region were aggregated to represent that region. The trade partners are the EU, SADC, the Middle East, China, the Rest of African countries, and the Rest of the World. The EU, SADC, the Middle East, and China include all the countries under such regions which imported South Africa beef. The rest of Africa 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 not grouped as above.

Table 1 shows South Africa's supply shares to the trade partners from 1992 to 2019. The study divided the periods into intervals of 4 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.

Table1: 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 the WITS database (2020)

Table 1 shows that South African beef exports have been increasing from the year 1992 to 2019. South African beef exports' values on average periods have increased from 44.68 million USD to 134.18 million USD. The EU was the greatest destination market for South African beef exports from 1992 to 1999 as it had up to 50% shares. However, from 2000 to 2019, South African beef exports to the EU declined to 1% from 2012 to 2019.

When the South African beef exports to the EU declined, it was not the case with other trading partners. For instance, the SADC had its imports of South African beef increased. From 2000 to 2015, SADC was the main importer of South Africa beef, as shown in Table 1. According to data on World Integrated Trade Solutions (WITS) (2020), the key markets for SADC were Mozambique, Mauritius, Angola, Lesotho and Eswatini. From 2016 to 2019, the Middle East, China and SADC were the leading importers of South African beef. The Middle East's key markets were Kuwait, Qatar, Jordan, and the United Arab Emirates. In brief, Figure 1 and Table 1 show that over the past three decades, South Africa's beef exports have shifted from dominantly North to South.

3 The concept of asymmetric regulatory measures in economics and trade

The central theme of this study deals with regulatory measures. As discussed in the previous section, the use of regulatory measures in international trade has been increasing over time (Crivelli and Gröschl, 2016). In this section, the discussions move to the concepts of asymmetric regulatory measures. The basics of asymmetry are discussed, followed by its use in economics, international and regional trade. Finally, the case of asymmetric regulatory measures used in the context of bilateral trade is discussed.

At a basic level, asymmetry is explained from its opposite, which is symmetry. Symmetry, according to Merriam-Webster Dictionary (2016), means balanced proportions, equal, balanced, correspondence in size, shape, or relative position. So, any concept or situation that lacks such properties is described as asymmetric (Alvarez-Ramirez et al., 2009). This also applies to the concept of asymmetric regulatory measures. However, before going to regulatory measures, we discuss the concept as it is 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. This is because there is an imbalance of information flow. Such a situation is undesirable as it does not lead to an efficient distribution of resources.

In international trade, the concept of asymmetry is also often applied. A typical example is handling measures that distort trade (amber box) where different WTO members were 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 done in a way that follows the principle of asymmetry. Developed countries were required to reduce the high percentage of their producer support quicker than the developing world. The least developing countries were not required to reduce any support measures, even if they were deemed to be trade-distorting (Musselli, 2016).

The concept of asymmetry in trade was taken a step further by the SADC region in the implementation of the trade protocol (Kalaba, 2014). In its liberalisation of trade, SADC applied a two-fold asymmetric principle. The first one was with the timeline of 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 their economic development. In the First group was South Africa and its SACU members, Botswana, Eswatini, Lesotho and Namibia. These countries reduced 80% of 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 of countries. The rest of the countries, Malawi, Mozambique, Tanzania, and Zambia, were given eight years.

The second way in which SADC followed the asymmetry principle was with respect to the sectors or products. Each country submitted a list of products in three categories (A-C) for liberalisation (Kalaba, 2014). Products in category A were liberalised at the start of implementation, and category B half-way through the implementation process. Products in category C, which were classified as sensitive products, were liberalised last, between year 8 and 12 of 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 FTA.

Asymmetry in regulatory measures follows the same understanding of other disciplines, however, treatment of it is different from the examples discussed above. The existence of asymmetric regulatory measures is observed using 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 with asymmetric regulatory measures are not necessarily with different numbers or types but their varying trade effects.

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

Apart from affecting the prices and the quantity, 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, asymmetric regulatory measures' presence harms the competitive process and strongly affects the trade (Abbott and Singham, 2013). The measures imposed by importing partners limit the number and range of suppliers. For instance, regulatory measures like license requirements, bans, certifications and quality standards restrict entry in the imposing country. In addition, the regulatory measures limit the ability of the suppliers to compete. The standards imposed takes the form of anything that can reduce the intensity with which firms compete. The regulatory measures also reduce the incentive of suppliers to compete.

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, remedial action is put in place. In the case of asymmetric information related to perfect competition, when it exists, it causes market failure (Salvatore, 2012). Then that becomes the basis for government intervention to address the problem. In the context 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 regulatory measures do not have a known systemic remedial process. The undesirable outcomes of the use of asymmetric measures are left to the individual and affected parties to deal with. The absence of such remedial action on asymmetric regulatory measures in the long term may undermine the same principle of regional integration, creation of regional blocs and even core principles of the WTO, which include free and fair trade.

4 Methods and procedure

The research to determine whether the application of regulatory measures is asymmetric used the t-test. The t-test was selected because it is used to determine significant differences between them (Kim, 2015). To evaluate the effects of regulatory measures on South African beef exports to the EU and determine whether it created a diversion to other trade partners, a gravity model of

international trade was applied. The gravity 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).

4.1 The theoretical framework of regulatory measures in trade

The theoretical framework for the effects of regulatory measures considers requirements for compliance. Any government regulation increases production costs (Kareem et al., 2018). Such costs will thus shift the supply curve backwards and result in a new equilibrium point. The effects are illustrated in Figure 2 through *panel a* and *panel b*.

Panel a of Figure 2 illustrates the effects of regulatory measures in the country or region that imposes such measures. *Panel b* represents the same effects of regulatory measures in the alternative, but as imposed by country or region in *panel a*, and not their own. Alternative markets include any other options where the supplier or suppliers can divert their products towards should they find regulatory measures in panel a to be restrictive. Orden et al. (2012) found that restrictive regulatory measures induce a third market trade diversion effect. So, *panel b* of Figure 2 follow that trade diversion effect to illustrate the opposite effects of regulatory measures in the third market.

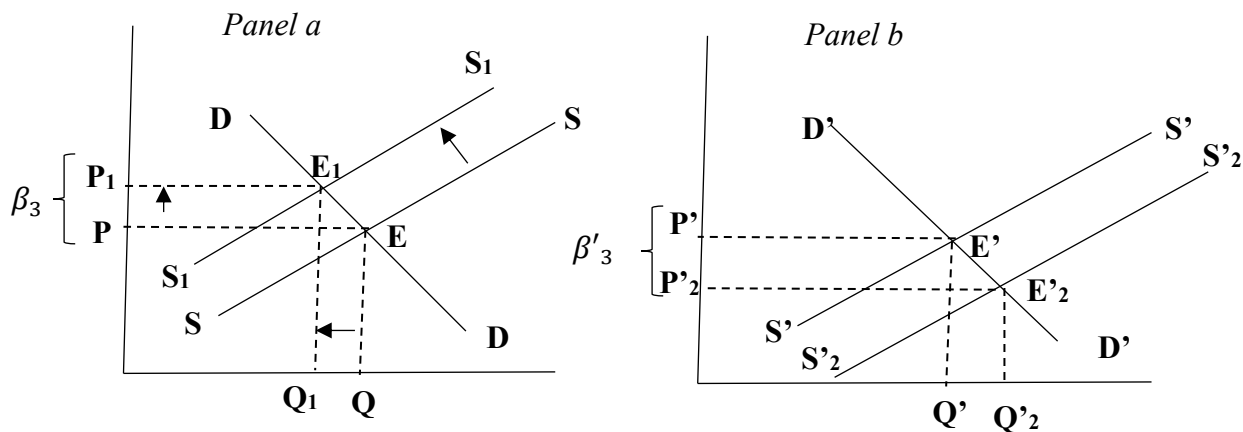


Figure 2: Illustration of regulatory measures on the imposing and alternative markets.

Sources: Authors' creation.

The regulatory measures affect trade and markets through their price-raising effects. The price raising effects are due to compliance costs which are eventually passed through to the consumers. Figure 2 *panel a* shows that the original equilibrium is at point E, with demand and supply curves DD and SS, respectively. When the country or region introduces or adds regulatory measures, then the exporting countries will incur compliance costs. Such costs lead to a price increase from P to P_1 , and subsequently, supply will shift backwards to S_1S_1 . Inevitably, the law of demand dictates that consumers in the market will buy less quantities of the product as the new equilibrium is found at E'_1 . Thus, the overall quantity declines from Q to Q_1 .

In *panel b*, where alternative markets are considered, the effects reflect a contrast of what happens in *panel a*. As a result of the introduction of regulatory measures in *panel a*, suppliers who cannot fully comply will then divert their products to alternative markets. So, the original supply $S'S'$ will then shift to $S'_2S'_2$. The prices will then decline because of increased supply, and quantity will increase from Q' to Q'_2 . In summary, the introduction or increase in regulatory measures is expected to increase prices in their own markets and reduce supply while increasing supply in alternative markets and reducing prices. So the effects of regulatory measures can be observed on both prices and quantities.

Mathematically, the study aims to evaluate the effects of price changes ($P - P_1 = \beta_3$) on the overall supply of the affected market ($Q - Q_1$). The same evaluation is done in other markets through the price changing effects of regulatory measures from the same region, but in other markets, i.e., $P' - P'_2$ on the supply of those markets, $Q' + Q'_2$. The effects of regulatory measures will be estimated by basically taking the derivative of the export supply function with respect to price. Regulatory measures thus induce price changes. The next section will illustrate how the model incorporates the estimation of the effects of regulatory measures.

4.2 The Gravity models

For empirical analysis, the gravity model is mainly used as an efficient trade model (Shang and Tonsor, 2019). It was theoretically developed from the trade model proposed by Anderson and Van Wincoop (2003). The gravity model is suitable for the analysis conducted following the trade

between two countries (Cernat, 2003). The model has become an essential part of trade literature and used by many researchers to explain and predict trade partners' trade flows. (Fassarella et al., 2011; Kalaba and Kirsten, 2012).

4.2.1 Specification of the Model

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 Staats, 2003). The following is the basic form of the model.

$$T_{it} = K \left(\frac{Y_i Y_t}{D_{it}} \right) \quad (0.1)$$

Where T_{it} is exporting value from exporting country to importing country, Y_i & Y_t is the measure of the economic size of exporting and importing country. D_{it} is the distance between the cities of exporting and importing countries. The model can also be used in the log-linear form, as presented in equation (0.2):

$$\ln T_{it} = \alpha + \beta_1 \ln Y_i + \beta_2 \ln Y_t + \beta_3 D_{it} + \varepsilon_{it} \quad (0.2)$$

Other variables are added to the model to estimate how they affect international trade. In this study, variables such as EU regulatory measures and tariff rates for partners on beef, GDP per capita for both exporter and importer, exchange rates were added. This yields the following generalised gravity model that the study used.

$$\text{Log } T_{it} = \alpha + \beta_1 \text{LogSAGDPPC}_{it} + \beta_2 \text{LogGDPPC}_{it} + \beta_3 \text{LogEUREGM}_{it} + \beta_4 \text{LogTAR}_{it} + \beta_5 \text{EXTR}_{it} + \varepsilon_{it} \quad (0.3)$$

Where:

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

α is the intercept.

β is the slope.

SAGDPPC_{it} is South Africa GDP per capita i at time t ;

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

EUREGM_{it} is the number of the EU regulatory measures on beef i at time t ;

TAR_{it} are the tariff rates for the importing partners i at time t

$\beta_5 \text{EXTR}_{it}$ are the real exchange rates for importing partners i at time t ;
 ε_{it} is the error term.

The key variable for the article is the EU regulatory measures and their effects on trade partners. The same EU regulatory variable, i.e., β'_3 was used for SADC, the Rest of African Countries, the Middle East, China and the Rest of the World.

5 Results and discussions

The results were obtained in line with the objective of the research. As explained earlier, the research used a t-test and gravity model. The research also looked at the South African beef exports supply shares to the trade partners. This was done to determine South African beef exports and the trends over time to the trade partners.

5.1 Asymmetric trade between the EU and South Africa

This section aims to determine whether there are significant differences in beef regulatory measures among the EU and South Africa. Again, it seeks to test the existence of asymmetric trade arrangements between the 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 the two groups (Kim, 2015).

For the study to explain the existence of asymmetric trade arrangements, it used the number of beef regulatory measures for both partners. Both the EU and South Africa have regulatory measures on beef in which the exporting countries must comply. 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 must comply with the EU set measures.

Table 2 shows the results for the t-test to determine the significance of differences in the number of regulatory measures on beef. The study used regulatory measures on beef from 1992 to 2019 for both South Africa and the EU.

Table 1: 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 2 shows that South Africa has about ten regulatory measures on beef on average, while the EU has ten times (107) more regulatory measures than South Africa. The p-value for the test is significant at a 1% level. Since the results are significant, the study rejected the null hypothesis that there are no significant differences in the number of beef regulatory measures between the partners. This results confirm that there is evidence of the existence of the differences in the number of regulatory measures applied to beef trade between the partners which can also be classified as asymmetric. This asymmetry is favour of the EU.

5.2 The effect of the EU regulatory measures and other factors affecting South Africa beef exports to the EU.

The previous section revealed differences in the number of regulatory measures between the EU and South Africa. That demonstrated existence of asymmetry in these measures. However, the presence of asymmetric measures on its own is not a problem. The problem arises when such measures affect the trade of one partner negatively. This section estimates the effect of the EU regulatory measures on South Africa beef exports. Again, it discusses other factors affecting South Africa beef exports to the EU. The estimation was done using a panel data analysis of the gravity model.

The study used the gravity model equation 0.3 to estimate the effects of the EU regulatory measures and evaluate other economic factors contributing to South African beef exports to the EU. The study runs the pooled, fixed, and random effects of gravity model estimation. Later, the

poolability and Hausman tests are conducted to select the best model. Table 3 gives the outcomes of the test and the estimates of the gravity model.

Table 2: Gravity model estimates for effects of regulatory measures on South African beef exports to the EU

Independent variable	Fixed model
Log EU real exchange rate	-1.47970 (0.000) ***
Log EU regulatory measures	-1.9727 (0.000) ***
Log EU tariff rate	1.1630 (0.377)
Log South Africa GDP per capita	-9.0905 (0.000) ***
Log EU GDP per capita	15.7887 (0.000) ***
Constant	-5.1734 (0.000) ***
R-squared	0.9795
Poolability test	8.88 (0.000) ***
Hausman test	44.40 (0.000)***
Number of observations	106

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

Source: Author's computations

The poolability test showed significant effects as it has a p-value less than 0.05, and it is significant at a 1% level of significance, as presented in Table 3. The study then rejected the null hypothesis of pooling the data and run a pooled model. The study then runs the Hausman test, and the results have shown that the test was significant as it has a p-value which is less than 0.05 and significant at a 1% level of significance. The results mean that the preferred model is the fixed-effect model. Therefore, the study estimated the effects using the fixed effects model of the gravity model. The results showed that South African GDP per capita, the EU GDP per capita, the EU regulatory measures and the EU real exchange rates had a significant result. On the other hand, the EU tariff rate showed to have insignificant effects.

The results showed that the EU regulatory measures affect South African beef exports to the EU negatively. This is shown by the negative sign of the gravity model's coefficient and a p-value of 0.000. The p-value means the coefficient of regulatory measures is significant at a 1% level of

significance. The results signify that quantity of South African beef exports declined due to the EU regulatory measures.

The study's findings are consistent with what other researchers have found about the EU's use of regulatory measures. Countryman and Muhammad (2017) argued that EU regulatory measures restrict beef exports into the EU market. The study was done for the period from January 2010 to December. It used Argentina, Australia, Brazil, Uruguay, and U.S. Brazil as the primary supplier of beef to the EU during the timeframe. The Rest of the World was used to account for the remaining countries. In support of similar outcomes, Arita et al. (2015) argued that EU regulatory measures have an impending trade effect on beef imported from other countries. The study used covered the period from 2010 to 2012. It used various commodities and had the United States and the EU as the case study. Their study revealed that the EU regulatory measures negatively affected the United States (US) beef exported into the EU.

Again, the beef exporting countries' access to the EU markets was constrained by EU regulatory measures (Arita et al., 2014). Although the EU regulatory measures aimed at protecting consumers health, it has a protectionism attribute that limits imports (Kareem et al., 2018). Kareem et al. (2018) argued that EU market conditions affect countries' probabilities of exporting to the EU. This was supported by Kareem and Martinez-Zarzoso (2020), who argued that the high cost of complying with the EU standards adversely affect exports competitiveness.

On the other hand, the EU tariff shows to have insignificant results. The research expected the EU tariff to have reduced trade cost. This is so because the EU tariff on beef was reduced due to the partners' free trade agreement. Various literature had agreed that reducing tariff rates reduces trade costs; hence, it should increase agricultural exports.

On other factors affecting South African beef exports to the EU, the study showed that the EU GDP per capita had a significant positive effect. As shown in Table 3, the outcomes revealed that the EU GDP per capita had a positive coefficient, and it was significant at a 1% level of significance. The GDP per capita represents the income for consumers. The results mean that the consumer's income is high, which was supposed to increase trade flows. According to the

literature, high income is associated with high demand and hence positively influences trade. The results imply that the EU economy supports increased importation of South Africa beef. When it comes to South Africa GDP per capita, the results showed a significant negative effect. Table 3 shows that South Africa GDP per capita had a negative coefficient, and it was significant at a 1% level of significance.

The EU real exchange rate showed to have a significant negative effect. This was shown when the real exchange rate has a negative coefficient and a significant p-value at a 1% level of significance, as shown in table 3. It is reported that when the real exchange rate is high, the relative price of goods at home is higher than the relative price of goods abroad. In this case, the import is likely because foreign goods are cheaper, in real terms than domestic goods. Thus, when the real exchange rate is high, net exports decrease as imports rise. The EU real exchange rate was supposed to increase South African beef exports to the EU.

In summary, the section has revealed that the EU regulatory affected South African beef exports to the EU. The results signify that quantity of South African beef exports declined due to the EU regulatory measures. The EU regulatory measures acted as a trade barrier and constrained South Africa beef exports in their market. The section has also revealed that the EU GDP per capita positively affected South African beef exports to the EU. The results meant that the consumer's income is high, which was supposed to increase trade flows. The study also revealed that the EU real exchange rate was high; thus, South African beef imports were expected to increase. This is so because when the real exchange rate is high, net exports decrease as imports rise.

5.3 The effects of the EU regulatory measures on South Africa beef exports to other trade partners

As observed in the previous section, the EU regulatory measures negatively affected South African beef exports to the EU. This section aimed to determine whether the EU regulatory measures affected South African beef exports to other trade partners. The other trade partners are SADC, the rest of Africa Countries, the Middle East, China, and the rest of the world.

At first, the study runs pooled, fixed and the random-effects model. After running the models, best selection model tests were conducted. The poolability test results for all the trade partners were significant. The poolability tests results implied that the pooled model was not suitable. The Hausman test was done to ascertain which model is between the fixed and random effect models. The Hausman results for SADC and the Middle East were significant, and the study used the fixed effects model. As for China, the rest of the African countries and the rest of the world were not significant, and the study used a random-effects model. Table 4 gives the gravity estimates for each partner and the results of the Hausman test.

Table 5: Gravity estimates for the effects of EU regulatory measures on South African beef exports to other trade partners.

Variable	SADC	Rest of African countries	Middle East	China	The Rest of the World
Log real exchange rate	0.9116 (0.000)***	-0.4409 (0.002)***	-5.0404 (0.079)*	9.9923 (0.000)***	-3.9161 (0.000)***
Log EU regulatory measures	0.4656 (0.000)***	0.39907 (0.002)***	3.4774 (0.000)***	-3.4855 (0.000)***	0.5353 (0.003) ***
Log tariff rate	-0.2359 (0.002)***	1.4769 (0.000)***	0.6865 (0.100)	-0.3301 (0.738)	-0.3404 (0.227)
Log South Africa GDP per capita	-0.2083 (0.118)	-0.3843 (0.158)	-5.3827 (0.000)***	-9.5746 (0.000)***	1.9703 (0.000)***
Log GDP per capita	0.0504 (0.774)	0.8982 (0.010)***	-0.4440 (0.434)	10.3541 (0.000)***	-4.0046 (0.000)***
Constant	1.3128 (0.000)***	-0.0005 (0.998)	4.7188 (0.000)***	0.0006 (0.995)	9.2943 (0.000)***
R-squared	0.9271	0.9971	0.9441	0.8565	0.9914
Hausman test	34.39 (0.000)***	0.018 (0.999)	161.82 (0.000)***	3.78 (0.581)	66.26 (0.000)***
Number of observations	106	106	106	106	106

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

Source: Author's computations

Table 4 shows the gravity estimates results on the EU regulatory measures' effects on other trade partners. The results had revealed that the EU regulatory measures positively affected South African beef exports to all other trade partners except China. Table 4 shows that the EU regulatory measures for all other trade partners have a positive coefficient and significant p values at a 1% level of significance. However, the results revealed that China had negatively been affected by EU regulatory measures. This was shown by a significant negative effect of the EU regulatory measures, as shown in table 4. The results imply that when South African beef exports to the EU declined due to EU regulatory measures, it was diverted to the other trade partners.

According to Orden et al. (2012), restrictive regulatory measures induce a significant third country trade diversion effect. The results also support the observation in section 2, where trade partners like SADC from the year 2000 imported 57% of the South Africa beef exports. Again, SADC registered increased imports of South Africa beef up to 2019. The highest was from 2008 to 2011, where it imported 73% of South Africa beef.

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

The research observed in section 2 that China had increased South African beef shares despite the EU regulatory measures negatively affected it. This can be that other positive factors are more powerful than the effect of the EU regulatory measures. The results in table 4 showed that China has a significant positive GDP per capita. This means that they have enough income to afford South African beef. That can explain the increase in beef to china despite the EU measures effect.

6 Conclusion

The use of regulatory measures has been on the rise at a time when other forms of trade barriers like tariffs were declining. This use of such measures is relatively high in developed countries and agricultural products. Thus, these measures tend to affect exporters of agricultural products, mainly from the developing world. These contrasting trends in the timing and how different countries use measures raised concerns that the measures are new forms of trade protection.

But the contrast could not be more profound than in the case of South Africa's one of the leading exporters of agricultural trade amongst developing countries and the EU, the largest importer of agricultural products. The EU is also the global leader when it comes to the use of regulatory measures. The two countries signed two trade agreements in the past quarter of a century, thus presenting an opportunity to evaluate the effects of regulatory measures on beef trade. The article set out to determine whether asymmetry exists in the use of regulatory measures, and whether such measures affected exports to the EU and whether the trade was diverted to other markets.

The existence of asymmetric regulatory measures was confirmed between the EU and South Africa. The EU had more regulatory measures than South Africa. For every regulatory measure that South Africa introduces, the EU had 11. This also confirmed the notion that agricultural exports from developing to developed countries, South-North tend to face more regulatory measures than the reverse trade flow.

Furthermore, it was found that South African beef exports to the EU have declined because of these measures. This was confirmed strong and negative relationship between the EU regulatory measures and South Africa beef exports. Finally, it was concluded that the EU regulatory measures contributed towards the diversion of South African beef exports to other partners. South Africa's other trade partners such as SADC, the Middle East and China became important beef exports markets. Eventually, the asymmetric South-North trade inadvertently facilitated the South-South trade.

These findings point to the use of asymmetric measures, which resulted in trade diversion, which has welfare reducing attribute. Asymmetry, as it exists in other areas, is often accompanied by

remedial action, leading to undesirable outcomes. However, when it comes to regulatory matters, such effects are left to individual countries to address. There is a need to adopt a set of steps to address the negative effects of the use of asymmetric regulatory measures. However, without remedial action that is recognized in the global and regional trading systems, these measures will continue to undermine competitive trade and reverse the gains of trade liberalization.

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