The Effects of AfCFTA on Food Security Sustainability: An Analysis of the Cereals Trade in the SADC Region

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Abstract: The signing of the African Continental Free Trade Agreement (AfCFTA) has stimulated a lot of trade potential in Africa that could see the continent significantly improving its intra-trade levels, thereby boosting the economic welfare of Africans. In light of food security sustainability in the Southern African Development Community (SADC) region, this paper employed the World Integrated Trade Solution, Software for Market Analysis and Restrictions on Trade (WITS-SMART) simulation model to assess the potential effects of the AfCFTA on trade in cereals. Cereals have been regarded as the most critical component of food security. The model indicated trading partners for each of the 15 SADC countries, their level of trade creation, trade diversion, consumer surplus, welfare and revenue effects of any regional trade agreement. The results indicated that the AfCFTA will only lead to positive outcomes in four (Angola, the Democratic Republic of Congo, Madagascar and Namibia) of the fifteen SADC countries, with the rest remaining unchanged. In general, previously closed economies, that is, economies which were not part of a free trade agreement (FTA) or a deeper arrangement will stand to gain more than open economies because they are already opened up at the free trade level, which is equivalent to the AfCFTA. Thus, as far as cereals and food security is concerned, the AfCFTA will add minimal value. However, the overall value gains are likely to be greater when all food categories are included in the simulations. In general, the study recommends that African countries should deepen their integration levels to perhaps common markets where production factors, that is, labour and capital, become mobile. This will have multiplier effects in improving continental food security sustainability from a trade perspective.

Keywords: trade; food security; agriculture; sustainability; economic integration; SADC; AfCFTA

1. Introduction

Africa's challenges are complex and intricate. On one hand, the continent is characterised by rapid growth of both its cities and its population. On the other hand, the continent is grappling with perennial poverty challenges, with an average poverty rate of approximately 41% in sub-Saharan Africa (SSA) [1,2]. Approximately 33% of Africans, who represent around 70% of the world's poorest people, live below the global poverty line [1]. In addition, 27 out of 28 off the world's poorest economies are in SSA, all with an average of 30%. Africa is projected to represent around 87% of the global poor in 2030. The other poorest countries outside the continent are Afghanistan, Haiti, Venezuela, North Korea and Papua New Guinea. Nigeria has since overtaken India to become the poverty capital of the world. Although poverty in Africa has generally decreased, the saddening statistics are that the number of people living in extreme poverty has increased since the 1990s [2]. In addition to poverty challenges, Africa is also characterised by inequality challenges, with seven of the 10 most unequal cities in the world being found in Africa. There are significantly large differences between urban and rural areas.

Moreover, the continent is grappling to sustain its food production due to drought challenges which are increasing in both frequency and severity, with some analysts largely attributing this to climate change [3–6]. While there are some regions which are obtaining surpluses in agricultural food production, Africa has poor distribution channels largely due to poor transport infrastructure (air, road, rail, sea), inefficient institutions which promote redistribution and trade facilitation, as well as information asymmetry. Taking into account the fact that the geopolitical space of Africa is larger than its European and Asian counterparts, poor infrastructure, high tariff and non-tariff barriers and weak trade facilitation procedures only add to the production and transaction costs of an already poor continent [7,8].

On the other hand, the continent is also characterised by rapidly growing populations and cities. This growth implies increasing demand which, if not catered for, would lead to looming levels of food shortages [1]. Taking into account these and other dynamics, there is therefore a need not only for an increase in sustainable food supply and food security, but also efficient measures to redistribute that food to deprived economic regions [7,9]. It is within this broad context that African leaders have decided, perhaps for the first time, to look for internal ways to address Africa's perennial challenges of poverty and inequality at the continental level by signing the African Continental Free Trade Agreement (AfCFTA) in March, 2018 in Kigali Rwanda [10]. The rationale behind African economic integration is stimulating intra-trade and promoting macroeconomic convergence, thereby reducing inequalities between wealth and poor economic regions [11,12]. In other words, economic integration improves the economic welfare of citizens [13]. Distribution of goods from surplus regions to areas where there is a shortage is expected to become cheaper and easier. Some authors argue that tariff and non-tariff barriers (NTBs) have been the biggest cost factors cited by cross border traders [4,14]. This is exacerbated by the fact that a majority of cross-border traders in Africa are small to medium players [15]. Thus, continent wide economic integration arrangements such as the AfCFTA will significantly lower trade costs, thereby increasing not only the volume but also value of trade and ultimately contributing to reducing poverty and inequality levels.

However, despite the widely accepted generic view that economic integration generally increases economic welfare, there is also another branch of economics which argues that formulation of this type of free trade agreement (FTA) generally leads to trade creation (TC) and trade diversion (TD) effects [16]. What this implies is that, although the overall effect might be positive, some economies and economic sectors, especially the vulnerable ones, might become worse-off after the FTA due to increased vulnerability. This is because large economies with diversified sectors will have economies of scale in both production and consumption of goods and can easily exploit regional markets, which have now been opened as a result of FTA. For instance, FTAs imply that markets are generally opened up to both international competition and markets. This usually leads to structural changes within the economy as some economic sectors will become less profitable while other sectors become more profitable. The implication of these structural changes are far reaching. Resources, especially "capital and labour", will begin to shift towards those profitable sectors because of the economic rationale of economic agents, that is, the profit motive. Thus, sectors such as agriculture, which maybe strategic to the national and continental agenda of reducing poverty and ensuring food security (Sustainable Development Goals) might be less profitable, resulting in economic resources being shifted towards other profitable sectors. The result will be a more fragile position in terms of food security, which in this case will be an unintended consequence. In addition, FTAs also imply a loss in customs revenue and as Pasara and Dunga (2019) indicated, this customs revenue generally forms a significant part of overall government revenue, which in some cases is as high as 50% [10].

As part of the economic welfare impacts, the AfCFTA is likely to impact food security across the continent. The Food and Agriculture Organisation states that "food security is achieved when all people, at all times, have the physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life security to its citizens" [17]. This can be achieved at three intervention levels: the individual, household and national level. If properly

designed, the AfCFTA is set to address food security issues in the continent by stimulating intra-trade among African countries thereby ensuring redistribution of agricultural produce from surplus to deficit regions. Although the AfCFTA was signed across all African countries, this study will focus on SADC economies for the following reasons. Firstly, it is likely that geographically closer economies will trade with each other more than with other countries due to transport costs and other logistical challenges which have been highlighted earlier. Secondly, the SADC region is the least integrated community in the continent operating at the free trade level with other regional economic communities operating at either customs unions, common markets or deeper levels. What this implies is that the main effect of the AfCFTA will be felt in the SADC area, since the SADC is also a free trade agreement.

Moreover, this paper will also focus its analysis on the potential effects of the AfCFTA on trade in cereals only. Cereals are widely considered as vital components of food security in any region and the study therefore considers the inclusion of cereals to be rational. The purpose of the study is not to provide an exhaustive treatise to potential trade effects but rather to provide practical intuition (using scientific arguments), which can be extended to the rest of the agricultural sector so that there is food sustainability in the region and the continent at large.

This study aims to investigate the possible impact of the AfCFTA on SADC food security in the SADC region. More specifically, the study will add to economic literature in three ways. Firstly, unlike several economic papers, this study attempts to cover several other nuances of economic analysis which are usually overlooked by econometric analysis by employing a simulation model. Secondly, the model is able to indicate the AfCTA effects on 15 SADC countries in terms of trade creation, trade diversion, consumer surplus, welfare effects and revenue loss. Thirdly, this study focuses on trade in cereals only, since they are considered to be the most significant part of food security in the region.

2. Trade Overview

Africa's models of trade were greatly influenced by historical developments. The majority of Africa's trade have been skewed towards the European and American regions. It is only recently that some African countries such as Tanzania, Kenya, Zambia and Zimbabwe are slowly shifting much of their trade towards Asian and Middle Eastern countries, especially with China, Russia, Japan and India, Saudi Arabia and the United Arab Emirates [3,8,15,18,19]. Consequently, Africa's intra trade statistics lag behind compared to other continents and economic regions. The level of intra-trade in the Asia-Pacific Economic Cooperation is approximately around 67%; by comparison, the European Union has an intra-trade figure of around 61% but Africa only has a meagre 12% intra-trade figure [10]. More specifically, the COMESA intra-trade levels range between 5% and 10%, the EAC is around 20%, while that of the SADC oscillates between 11% and 15% [13].

It is these distressing figures that have led to renewed interest in the continent over the past two decades to revive and boost intra-African trade. In 2008, COMESA, EAC and SADC Heads of States and Governments met in Kampala, Uganda to establish the Tripartite Free Trade Agreement (TFTA), which was later signed in 2015 in El Sharm Sheijk, Egypt. The TFTA had a combined population of 528 million with economies consisting of a combined GDP around USD 628 billion with an average per capita GDP of USD 1,184. Across the 26 TFTA countries, Makochekanwa (2012) highlighted that agricultural activities would contribute over 70% towards employment and 35% towards GDP [3]. Mold and Mukwaya (2017) and Pasara and Dunga (2019) highlighted that the trade potential for agriculture was an increase by approximately 16% and 18%, respectively [10,13]. Although these figures provide some insight into the effects of trade on the agricultural sector as a whole, these macro figures mask the details which may be required to provide relevant policy prescriptions for the sustainability of food security in the region. Thus, this study will narrow down the analysis to a micro level and focus on trade in cereals, since they are a very significant part of food security for the continent.

3. Literature Review

The notion of trade creation and diversion effects was first propounded by Viner (1950) when he argued that FTAs are not always welfare enhancing. Using a mathematical model in a partial equilibrium framework, Jacob Viner was able to show that FTAs lead to trade creation and diversion effects [16]. The former refers to a scenario in which trade shifts from inefficient producers to efficient suppliers who are part of the new trade agreement, while the latter refers to a situation in which member countries shift their trade from efficient non-member countries to inefficient member countries, who simply because they are now part of the new agreement, their products would have become cheaper because tariffs are no longer being applied to their products. Thus, trade creation is viewed as welfare enhancing whilst trade diversion is welfare reducing [20–22]. According to Viner (1950), the process of trade creation and diversion occurs simultaneously, since several member countries will be trading concurrently with different member and non-member countries [16]. Thus, there is need to empirically establish the net welfare effects to conclude whether or not a particular trade agreement is beneficial. This was because, in his short run theoretical model, results were inconclusive since it would be difficult to determine prior to the agreement whether trade creation would outweigh trade diversion.

The arguments developed by Viner are particularly important to the discussion of food sustainability in Africa because it is one thing for trade agreements such as AfCFTA to be signed and agreed upon but a different matter altogether having the intended benefits transmuted to actual economic benefits for every African citizen. This is because in most cases, these multi-country and regional trade agreements are signed by high level politicians who have little consideration of economic feasibility [19]. The popularised notion when establishing such agreements is usually anchored on the generally accepted hypothesis that regional economic integration and international trade is mutually beneficial. Some of the proponents of this hypothesis include Adam Smith's absolute advantage theory [23], David Ricardo's comparative advantage theory [24], the factor endowment theory by Bertil Ohlin and Eli Hecksher [25]; the Stolper Samuelson theory and the Gravity model of trade [26–28]. However, as Viner clearly noted, regional trade agreements are not welfare enhancing and there is therefore a need for a specific prognosis for each particular case for both countries and products to obtain better and meaningful results and conclusions. In other words, arguments should not be generalised. Thus, from this perspective, it is important to clearly understand how the AfCFTA will influence the sustainability of food security in the SADC region. This will help policy makers understand the economic value brought about by joining free trade agreements (FTAs).

Empirically, there are few studies on TC and TD effects in Africa. However, there are some studies which employed general equilibrium models to show the potential effects of FTAs. Jensen and Sandrey (2011) employed the Global Trade Analysis Project (GTAP) model across 26 African countries of the Tripartite Free Trade Agreement (TFTA), while Makochekanwa (2012) and Pasara and Dunga (2019) employed the World Integrated Trade Solution, Software for Market Analysis and Restrictions on Trade (WITS-SMART) across the TFTA members [3,10,14,29]. Jensen and Sandrey (2011) observed that there were overall benefits to be derived in the region due to economic integration [14]. More specifically, South Africa and Mozambique were among the top beneficiaries, with an estimated welfare increase of USD 1321 and USD 57 million, respectively. However, countries in the South African Customs Union (SACU) experienced a loss amounting to USD 100 million. Investigating for COMESA, EAC and SADC; Karingi and Fekadu (2009) observed that significant results would accrue towards SADC followed by the AC and then COMESA.

In general, a majority of empirical studies analysed the regional economic integration effects in SADC at a macro level [3,5,14,30]. There are a few earlier studies which attempted to analyse economic integration impacts at the micro or sectoral level. For instance, Karim and Ismail (2007) attempted to quantify the potential of intra-regional agricultural trade in COMESA [31]. A plethora of trade related indices were also developed and used such as the comparative production performance index, production similarity index, export similarity index and instability index, which revealed comparative

advantage. They also found positive potential in agricultural trade. More specifically, instability indices in roots and tubers, pulses and cereals were stable across regional economic communities as compared to national levels. Perhaps this is due to the "law of averages". The production similarity index reflected variances in patterns of production between the three countries. As revealed by the export similarity index, the export patterns of countries were dissimilar. The indices of comparative advantage revealed for each country were higher for dominant export commodities, indicating that countries differ in their specialisation patterns. Thus, according to economic theory, these dissimilarities give rise to the rationale for intra-regional trade. However, the weakness of the paper was that it only used Sudan, Egypt and Kenya as case studies, and the authors of this study deemed the three countries to not be representative enough of the whole COMESA region. Therefore, when African governments pay more attention and emphasis to the stimulation of regional markets, they will benefit from the potential comparative and regional trade advantages which exist in the continent.

4. Methodology

This paper employs the WITS-SMART simulation model, which was developed by the World Bank and is extensively used in quantifying the static effects of FTAs. The simulation model is able to separate trade creation and diversion effects. Viner (1950) as quoted in Pasara and Dunga (2019) postulated that the formulation of FTAs implies changes in tariffs, which in turn changes the price of imports to an extent that less efficient products developed by domestic industries are replaced by imports from efficient FTAs members [10,16]. Thus, trade creation is welfare enhancing since there is a positive consumption effect due to price decreases. When price decreases, consumer surplus increases, leading to increased economic welfare. Trade diversion was described as a scenario where, when an FTA is formulated, tariff elimination leads to a substitution of goods from efficient economies which are not part of the FTA to less efficient, high-cost producers who are part of the FTA. The only reason why trade will divert is because the goods of less efficient members will become cheaper because there will be no tariffs imposed on them on account of being part of preferential treatment, not necessarily because they are efficient. When a trade arrangement develops, simultaneous trade creation and diversion occurs, which implies that every respective economy will experience both positive and negative effects and overall net welfare effects. The WITS-SMART simulation model is also able to capture losses in government customs revenue due to either the reduction or elimination of tariffs. The magnitude of revenue loss is dependent upon the extent of intra-trade between the respective countries, SADC in this case. Empirically, this paper utilises a partial equilibrium approach to estimate the AfCFTA effects on trade in cereals within the SADC region.

Simulations are conducted under the assumption of infinite elasticity of supply. This assumption is rational since most "if not all" African economies are too small to influence global trade by manipulating their domestic supply [13]. The paper also assumes an Armington assumption on the substitution value of 1.5, which means that products are similar but slightly differentiated [32]. For instance, under this assumption, rice from Malawi will be a close but not perfect substitute for rice from South Africa. The variances are derived from factors such as the place of origin, branding among others. Other studies, however, have used different values depending on their rationale such as the country, time, industry or sector. For instance, Hoekman, Kee and Olarega (2001) employed smaller values, whilst Francois and Reinhardt (1997) assumed a larger value of 5 [33].

The following empirical models are for trade creation, trade diversion, net trade effects, net revenue effects and net welfare effects.

$$TC_{ijk} = \eta * \frac{\Delta M_{ijk}}{\left(1 + t_{ijk}\right) * \left(1 + \frac{\eta}{\beta}\right)} \tag{1}$$

TC_{ijk} = Trade creation
M_{ijk} = Imports

t_{ijk} = Tariff

η = Import elasticity of demand

β = export supply elasticity

i = commodity

j = exporting country

k = importing country.

Equation (2) represents trade diversion, which largely depends on the substitution elasticity:

$$TD_{ijk} = \frac{M_{TFTA} * M_{RoW}\left[\left(\frac{1+t_t}{1+t_0}\right) - 1\right] * \lambda}{M_{TFTA} + M_{RoW} + M_{RoW}\left[\left(\frac{1+t_t}{1+t_0}\right) - 1\right] * \lambda} \tag{2}$$

TD_{ijk} = Trade diversion

M_{TFTA} = Imported commodities from TFTA countries

M_{RoW} = Imported commodities from rest of the world

t_t = Tariff (where t_0 and t_t represent pre and post integration levels of tariffs)

λ = elasticity of substitution.

The net trade effect (TE) is the summation of trade creation and diversion effects:

$$TE = TC + TD \tag{3}$$

The net revenue effect (RE) in Equation (4) indicates the revenue changes after a change in tariffs. It largely depends on the price and volume of imports.

$$\Delta R_{ikj} / R_{ikj} = [\Delta t_{ijk} / (1 + t_{ijk})] * \eta * [(1 + \beta) / (\beta - \eta)] \tag{4}$$

ΔR_{ikj} = The effects on revenue due to tariff changes

η = the elasticity of demand for the importing economy

t_{ijk} = Tariff

β = Elasticity of supply for the exporting economy

Equation (5) below estimates the welfare effects sums consumer and/or producer surpluses.

$$W_{ikj} = 0.5 \left(\Delta t_{ijk} * \Delta M_{ijk}\right) \tag{5}$$

The trade data used in this paper was sourced from the Harmonised Commodity Description and Coding Systems (HS) on the World Bank website, and simulations were conducted online. The HS system classifies traded goods for customs purposes in all participating economies. It is globally recognised and uses a six-digit coding system comprising of approximately 5300 products, which are grouped into 99 chapters and further huddled into 21 sections. The codes are also disintegrated into three parts. The HS-2 recognises the chapters, HS-4 categorises groupings and the HS-6 is more specific in describing the nature of the product itself. The following cereals were taken into account for simulation analysis: wheat and meslin; rye; barley; oats; maize (corn); rice; grain sorghum; and buckwheat, millet and canary seeds. Analysing AfCFTA trade effects on cereals within the SADC region using the HS coding system allows the results to be more specific involving the type of cereal for each country [34–36].

5. Results

Table 1 indicates the main trading partners for each SADC country as far as trade in cereals is concerned. As is noted in the table below, a majority of trade is conducted by economies which are outside the SADC region and even the continent itself.

Table 1. Main trading partners of SADC countries for cereals crops.

Country	Trading Partners
1. Angola	Argentina, Brazil, France, Germany, India, Namibia, Malta, Pakistan, Portugal, Russia, South Africa, Thailand, Turkey, UK, USA, Zambia
2. Botswana	India, Namibia, Pakistan, South Africa, Thailand, Zambia, Zimbabwe
3. Comoros	France, India, Mauritius, Pakistan, Thailand
4. Congo DR	Tanzania, Uganda, USA, Zambia
5. Madagascar	France, India, Indonesia, Italy, Japan, Mongolia, Myanmar, Netherlands, Pakistan, Peru, Romania, Singapore, South Africa, Thailand, Turkey, Ukraine, United Arab Emirates, USA, Vietnam
6. Malawi	Australia, Canada, China, India, Korea Republic, Lebanon, Mozambique, Pakistan, Russia, South Africa, Switzerland, Tanzania, Ukraine, United Arab Emirates, UK, USA, Zambia, Zimbabwe
7. Mauritius	Argentina, Australia, Bangladesh, Bulgaria, Canada, China, France, Germany, India, Italy, Korea Republic, Mexico, Netherlands, Pakistan, Peru, South Africa, Spain, Thailand, Turkey, Uganda, Ukraine, UAE, USA, Vietnam, Zambia
8. Mozambique	Afghanistan, Argentina, Brazil, Canada, China, Czech Republic, Denmark, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Korea Republic, Latvia, Lebanon, Lithuania, Malawi, Malta, Mauritius, Mexico, Myanmar, Pakistan, Paraguay, Philippines, Poland, Portugal, Russia, Singapore, South Africa, Spain, Thailand, UAE, USA, Vietnam, Zambia, Zimbabwe
9. Namibia	Andorra, Angola, Bahamas, Belgium, Botswana, Brazil, Cambodia, China, Faeroe Island, France, Falkland Island, France, Germany, India, Ireland, Japan, Marshall Island, Netherlands, Norway, Pakistan, Portugal, Singapore, South Africa, Spain, Taiwan, Tanzania, Thailand, UK, USA, Vietnam, Zambia, Zimbabwe
10. Seychelles	Argentina, Australia, Bahrain, Belgium, Canada, China, Egypt, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Kenya, Netherlands, Pakistan, Peru, Saudi Arabia, Singapore, South Africa, Spain, Sri Lanka, Thailand, Turkey, UAE, UK, USA, Vietnam
11. South Africa	Argentina, Australia, Austria, Bangladesh, Belgium, Botswana, Brazil, Canada, Chile, China, Denmark, Egypt, Ethiopia, France, Germany, Ghana, Greece, Hong Kong, Hungary, India, Indonesia, Iran, Israel, Italy, Japan, Kenya, Korea, Lebanon, Lesotho, Malawi, Malaysia, Mauritius, Mexico, Namibia, Netherlands, New Zealand, Nigeria, Pakistan, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Russia, Saudi Arabia, Singapore, Spain, Swaziland, Sweden, Taiwan, Tanzania, Thailand, Turkey, Uganda, Ukraine, UAE, UK, USA, Uruguay, Vietnam, Zambia, Zimbabwe
12. Swaziland	India, Myanmar, South Africa, Zambia
13. Tanzania	Argentina, Australia, Belgium, Canada, China, France Germany, India, Iran, Israel, Italy, Japan, Kenya, Kuwait, Lebanon, Malawi, Mozambique, Netherlands, Oman, Pakistan, Poland, Russia, Rwanda, South Africa, Thailand, Uganda, UAE, UK, USA, Zambia, Zimbabwe
14. Zambia	Argentina, Australia, Bermuda, Chile, China, Egypt, France, Germany, India, Italy, Japan, Korea, Lebanon, Malawi, Mexico, Mozambique, Pakistan, Poland, Russia, Slovenia, South Africa, Spain, Sri Lanka, Tanzania, Thailand, Uganda, UAE, UK, USA, Uruguay, Vietnam, Zimbabwe
15. Zimbabwe	Australia, Canada, China, Egypt, Equatorial Guinea, Germany, Hong Kong, India, Italy, Japan, Lithuania, Malawi, Mauritius, Mexico, Mozambique, Pakistan, Poland, Russia, Saudi Arabia, South Africa, Taiwan, Tanzania, Thailand, Turks and Caicos, Ukraine, UAE, UK, USA, Zambia

Source: Author's computations using SMART simulations.

Table 1 clearly indicates that all SADC countries have a majority of their trade in cereals skewed towards economies outside the region. Prior to the analysis of actual statistical figures, the table above confirms that, in general, intra-African trade is very low. What this implies is that, despite a majority of SADC economies being agrarian economies, they do not trade much with each other in this regard. There are three plausible reasons for this trend. Firstly, the shortages in cereals could be a result of droughts, which are becoming more prevalent in both frequency and intensity, possibly due to climate change. Thus, it would be likely that a majority of the countries in the region will be affected by the

same drought patterns, which in turn reduces their ability to trade and complement each other with supplies. The only feasible option would be to look beyond the continent. Secondly, low intra-regional trade could be due to historical patterns, which were basically designed in such a way that most African economies were supposed to supply advanced economies with raw materials and natural resources, leaving little room for intra-regional trade. Thirdly, intra-trade levels could be due to high tariff and non-tariff barriers. This then lowers both the value and volume of trade among SADC economies. Overall, all these factors affect the sustainability of food security in the region. The AfCFTA agreement is, to a larger extent, attempting to address the effects of the third reason by making sure that trade amongst African economies or regional economic communities is promoted in order to not only boost trade value but also to improve the living standards and economic welfare of Africans.

NB: The average values were calculated from cereals under consideration only. Values will change as more (or less goods) are taken into account.

In general, the figures in Table 2 above indicate that changes in import duties will only be experienced in some but not all of the countries, since a majority of the economies were already implementing trade instruments and policies at the FTA level or even deeper in some cases. Statistics indicate that despite all SADC economies joining the AfCFTA, there will be little change felt in the region as far as trade in cereals is concerned. The simulations reflect that of the 15 SADC countries, only 4 countries will have notable changes when trading in cereals. The rationale behind this minimal change will be explained after briefly discussing the results in the following table, which provide the economic rationale of the changes in exports and imports in the form of trade creation and trade diversion.

Table 2. Changes in import duties.

	Average Old Simple Duty Rate	Average New Simple Duty Rate
1. Angola	8.94	6.35
2. Botswana	0.075	0.075
3. Comoros	10	10
4. Congo DR	6.25	2.5
5. Madagascar	3	1.67
6. Malawi	1.82	1.82
7. Mauritius	0	0
8. Mozambique	3.33	3.33
9. Namibia	0	0
10. Seychelles	0	0
11. South Africa	0.25	0.25
12. Swaziland	0	0
13. Tanzania	15.22	15.22
14. Zambia	2.14	2.14
15. Zimbabwe	1.5	1.5

Source: Author's computations using SMART simulations.

The results for most countries are zero (Table 3), which indicates no significant change as far as trade creation and diversion is concerned because the AfCFTA did not bring about any change between the 'applied duty' and the 'new duty'. The only countries with notable changes are Angola, the Democratic Republic of Congo and Madagascar. Although there are some changes in Namibia, these changes are so small that they can be easily neglected. These results are not surprising because a majority of SADC countries were already operating at the free trade level prior to the signing of the AfCFTA in 2018. Moreover, the duties for cereals were close to if not zero among SADC economies as leaders sought to ensure regional food sustainability. However, within the SADC region itself, there were some countries such as Angola, DRC and Mozambique which were not part of an FTA. Thus, joining the FTA would then imply reducing tariffs, which explains the changes observed in the table above. Overall, the regional trade creation value for cereals outweighs the trade diversion value, which means the SADC region stand to gain from this positive effect. However, if leaders require a

significant change in SADC in particular and the continent at large, they will have to deepen the level of continental integration to common markets or even monetary unions because FTAs such as AfCFTA will not suffice. Table 4 below shows the revenue effects for SADC economies.

Table 3. Trade creation and diversion effects (USD 000).

	Total Trade Value	Trade Creation	Trade Diversion	Total Trade Effect
1. Angola	590479,6	1187,832	7,8475E-06	1187,832
2. Botswana	146271,8	0	0	0
3. Comoros	46390,76	0	0	0
4. Congo, DR	256143,0438	15262,5737	9,21014E-05	15262,57
5. Madagascar	510382,3	471,5056	−2,6E-06	471,5056
6. Malawi	159845,3	0	0	0
7. Mauritius	217863,5	0	0	0
8. Mozambique	661735,7	0	0	0
9. Namibia	91350,98	0,134524	2,08E-08	0,134524
10. Seychelles	18466,88	0	0	0
11. South Africa	1171085,333	0	0	0
12. Swaziland	88565,13	0	0	0
13. Tanzania	408537,5	0	0	0
14. Zambia	54018,57	0	0	0
15. Zimbabwe	1037132,351	0	0	0

Source: Author's computations using SMART simulations.

Table 4. Revenue Effects, Welfare Effects and Consumer Surplus (USD 000).

Country	Average Old Weighted Rate	Average New Weighted Rate	Tariff Revenue	Tariff Revenue (New)	Tariff Change in Revenue	Welfare Effects	Consumer Surplus
Angola	16,071	11,091	331,622	232,985	-98,636	32,594	2168
Botswana	0.02	0.02	0.54	0.544	0	0	0
Comoros	50	50	23,196	231,959	0	0	0
Congo DR	5578	10,625	167,323	121,436	-45,887	11,441	9357
Madagascar	5706	4179	895,604	653,550	-24,205	36,503	2511
Malawi	3086	3086	149,235	149,233	0	0	0
Mauritius	0	0	0	0	0	0	0
Mozambique	644	644	295,641	295,641	0	0	0
Namibia	064	001	1178	181	-11,604	0	0
Seychelles	0	0	0	0	0	0	0
South Africa	1246	1246	310,889	310,889	0	0	0
Swaziland	0	0				0	
Tanzania	41,674	41,674	987,873	987,873	0	0	0
Zambia	8838	8838	277,675	277,675	0	0	0
Zimbabwe	2999	2999	145,825	145,824	0	0	0

Source: Author's Computations using SMART simulations.

Similar to discussed results earlier, the SMART model clearly indicates that tariff revenue losses will be incurred by the economies which were relatively closed prior to the AfCFTA agreement. Generally, closed economies experience more revenue loss after trade liberalisation. What this also implies is that these economies were previously charging relatively high import duties when taking cereals from other SADC countries. The effect is two-fold. On the part of governments, AfCFTA means less government revenue for the government, which is a loss since this revenue could be channelled towards the provision of public and merit goods such as healthcare, schools and public roads. The other effect involves the consumer. Tariff removal for cereal products implies lower prices, which in turn means higher consumer surplus and positive economic welfare effects for those economies, as reflected

in Table 4 above. All these factors significantly contribute to increased food sustainability not only for those economies but also for the region at large due to spill over and dynamic effects.

6. Conclusions and Recommendations

The study aimed at analysing whether or not the signing of the largest continental trade agreement, the AfCFTA, will have an effect on food sustainability in the SADC region. The WITS-SMART simulation model was employed to confirm postulations of the Jacob Viner's theory and a priori expectations were met. The model indicated that in general, SADC countries trade more with other countries outside its region even for the most basic commodities such as cereals, which implies that the region is not self-sustainable. The results also indicated that significant changes will be felt, post-AfCFTA, by those economies which were generally closed and charging higher import tariffs for cereals. Similarly, those economies will also experience a greater loss of tariff revenue. However, the overall trade creation, consumer surplus and welfare effects for the region was positive though only emanating from four of the fifteen economies. It is important to note that results are likely to be higher if more agricultural products are included in the trade simulations apart from cereals.

Thus, the paper recommends that African countries should engage in much deeper economic integration levels than the free trade agreements which were the basis of the AfCFTA. This is because FTAs are the most basic forms of multilateral trade agreements and a majority of SADC economies were already operating at this level prior to the signing of the AfCFTA. Deeper integration levels such as common markets and economic unions are likely to lead to greater economic benefits due to greater dynamic effects. This is because these deeper levels allow for movement of production factors, that is, capital and labour and in the case of economic unions, even the presence of common currencies. Thus, from a trade perspective, these deeper economic arrangements allow for multiplier effects of trade multipliers to be highly significant. Factor movements allow for easy redistribution of merchandise (agricultural produce in this instance) from surplus to deficit regions. Consequently, there will be food security sustainability and improved economic welfare in the region and continent at large.

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References

1. Brookings. *Foresight Africa: Top Priorities for the Continent in 2019*; Africa Growth Initiative at Brookings; Brookings: Washington, DC, USA, 2019.
2. World Bank. *The World Bank Annual Report 2016*; The World Bank: Washington, DC, USA, 2016. [CrossRef]
3. Makochekanwa, A. *Impacts of Regional Trade Agreements on Trade in Agrifood Products: Evidence from Eastern and Southern Africa*; African Economic Conference: Kigali, Rwanda, 2012; pp. 1–28.
4. AfDB. *Regional Integration for Inclusive Growth*; AfDB: Abidjan, Cóte d'Ivoire, 2014.
5. Smart, J.; Nel, E.; Binns, T. Economic crisis and food security in Africa: Exploring the significance of urban agriculture in Zambia's Copperbelt province. *Geoforum* **2015**, *65*, 37–45. [CrossRef]
6. Shillington, L.J. Right to food, right to the city: Household urban agriculture, and socionatural metabolism in Managua, Nicaragua. *Geoforum* **2013**, *44*, 103–111. [CrossRef]
7. Kohl, T.; Brakman, S.; Garretsen, H. Do Trade Agreements Stimulate International Trade Differently? Evidence from 296 Trade Agreements. *World Econ.* **2016**, *39*, 97–131. [CrossRef]
8. Shepherd, B. Infrastructure, trade facilitation, and network connectivity in Sub-Saharan Africa. *J. Afr. Trade* **2017**, *3*, 1–22. [CrossRef]

9.　Witkowska, J. Integration Processes in the Global Economy: Current State and Prospects. The Cases of the European Union, ASEAN Economic Community, and NAFTA. *Comp. Econ. Res.* **2016**, *19*, 47–65. [CrossRef]

10.　Pasara, M.T.; Dunga, S.H. The Welfare Effects of Economic Integration in the Tripartite Free Trade Area, African. *J. Bus. Econ. Res.* **2019**, *14*, 49–67. [CrossRef]

11.　Thirwall, A.P. Trade agreements, trade liberalisation and economic growth: A selective survey. *Afr. Dev. Rev.* **2000**, *12*, 129–160. [CrossRef]

12.　Fox, E.G.; Fox, M.B.; Gilson, R.J. Economic Crisis and the Integration of Law and Finance: The Impact of Volatility Spikes. *Columb. Law Rev.* **2016**, *116*, 325–407.

13.　Mold, A.; Mukwaya, R. The Effects of the Tripartite Free Trade Area: Towards a New Economic Geography in Southern, Eastern and Northern Africa? *J. Afr. Trade* **2017**, *3*, 57–84. [CrossRef]

14.　Jensen, H.G.; Sandrey, R. The tripartite free trade agreement: A computer analysis of the impacts. In *Cape to Cairo-An Assessment of the Tripartite Free Trade Area*; Sandrey, R., Jensen, H.G., Vink, V., Fundira, T., Viljoen, W., Eds.; Trade Law Centre: Cape Town, South Africa, 2011.

15.　Tavengerwa, R. Using Trade Facilitation to Assist MSMEs in E-Commerce in Developing countries. *J. Int. Econ. Law* **2018**, *21*, 349–378. [CrossRef]

16.　Viner, J. *The Customs Union Issue*; Carnegie Endowment for International Peace: New York, NY, USA, 1950.

17.　FAO. *Towards an African Common Market for Agricultural Products*; Food and Agriculture Organisation of the United Nations: Rome, Italy, 2008.

18.　International Trade Centre. *Faster Customs, Faster Trade: Using Technology for Trade Facilitation*; International Trade Centre: Geneva, Switzerland, 2018. [CrossRef]

19.　Pasara, M.T. An overview of the obstacles to the African economic integration process in view of the African Continental Free Trade Area. *Afr. Rev.* **2019**, *12*, 1–17. [CrossRef]

20.　Endoh, M. Trade Creation and trade Diversion in the EEC, the LAFTA and the CMEA. *Appl. Econ.* **1999**, *31*, 207–216. [CrossRef]

21.　Shujiro, U.; Misa, O. Trade Creation and Diversion Effects of Regional Trade Agreements: A Product-level Analysis. *World Econ.* **2014**, *37*, 267–289. [CrossRef]

22.　Gurova, I. A Theoretical Model for Trade Integration in the CIS Region. *Problems Econ. Trans.* **2014**, *57*, 37–57. [CrossRef]

23.　Smith, A. An Inquiry into the Nature and the Causes of the Wealth of Nations. *Glasg. Edit. Works Corresp. Adam Smith* **1776**, *2*, 1–743. [CrossRef]

24.　Ricardo, D. *IOn Principles of Political Economy and Taxation*; Murray, J., III, Ed.; Batoche Books: London, UK, 1821; Kitchener, ON, Canada, 1817.

25.　Leamer, E.E. The Heckscher-Ohlin Model in Theory and Practice. *Princet. Stud. Int. Finance* **1995**, *77*.

26.　Samuelson, P. International Factor-Price Equalisation Once Again. *Econ. J.* **1949**, *59*, 181–197. [CrossRef]

27.　Tinbergen, J. *An Analysis of World Trade Flows in Shaping the World Economy*; Twentieth Century Fund: New York, NY, USA, 1962.

28.　Beyene, H.G. Trade Integration and Revealed Comparative Advantages of Sub-Saharan Africa and Latin America and Caribbean Merchandise Export. *Int. Trade J.* **2014**, *28*, 411–441. [CrossRef]

29.　World Integrated Trade Solution (WITS). *User's Manual*; World Bank: Washington, DC, USA, 2011.

30.　Karambakuwa, R.T.; Makochekanwa, A.; Kaizira, T. An empirical Application of the Gravity Model to Assess the Trade Potential of Comprehensive Economic Partnership Agreements between the European Union and Southern African Countries. *J. Econ.* **2015**, *6*, 226–237. [CrossRef]

31.　Karim, I.E.E.; Ismail, I.S. Potential for agricultural trade in COMESA region: A comparative study of Sudan, Egypt and Kenya. *Afr. J. Agric. Res.* **2007**, *2*, 481–487.

32.　Armington, P. A Theory of Demand for Products Distinguished by Place of Production. *Int. Monet. Fund Staff Papers* **1969**, *16*, 159–178. [CrossRef]

33.　Hoekman, B.; Kee, H.; Olarega, M. *Markups, Entry Regulation and Trade: Does Country Size Matter?* The World Bank: Washington, DC, USA; Mimeo: New York, NY, USA, 2001.

34.　UNECA. Assessing Regional Integration in Africa III: Towards Monetary and Financial Integration in Africa. *ECA Publ.* **2008**, *3*. [CrossRef]

35. Duede, E.; Zhorin, V. Convergence of economic growth and the Great Recession as seen from a Celestial Observatory. *EPJ Data Sci.* **2016**, *5*, 29. [CrossRef]

36. WTO. *Trade Policy Reviews: Various Countries 1996–2002*; World Trade Organisation: Geneva, Switzerland, 2002.