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# The implications of the African Continental Free Trade Area on South African agricultural trade: An application of the partial equilibrium mode

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**Background:** The African Continental Free Trade Area is currently a negotiated agreement that comprises 54 African countries and aims at eliminating trade barriers between its member states. Advocates of the Free Trade Area point to the numerous benefits of the agreement, though less has been said about the potential implications on economic strategic sectors such as the agricultural sector.

**Aim:** The study explores the potential economic impact of a full tariff liberalisation as proposed under the African continental Free Trade Area on South African agricultural trade.

**Setting:** A 100% tariff cut on agricultural commodities was simulated among all 54 members of the African Continental Free Trade Area.

**Methods:** The study adopts the SMART partial equilibrium model to simulate the potential impact of a full tariff liberalisation as proposed under the African Continental Free Trade Area on South African agricultural trade.

**Results:** The simulation revealed that South Africa will gain a total trade value of approximately US$199 million, and the total trade diversion from third parties will stand at US$42 million. South African agricultural commodities with the greatest export potential to the African market include sugar cane, maize, citrus fruit, cigarettes and sauces. Industries that are vulnerable to the free trade area include dairy, poultry, and vegetables. The full tariff liberalisation is projected to decrease South African's export revenue.

**Conclusion:** The study recommends that South African infant industries that are vulnerable to the agreement be listed in an exclusive list and that government should enhance the competitiveness of the affected industries.

**Keywords:** African Continental Free Trade Area; trade liberalisation; SMART partial equilibrium model; regional integration; tariff; export performance.

## Introduction

After many African countries achieved liberation and decolonisation during the late 1950s, they began a rough journey towards regional integration and a united Africa. Created by the independent African states in 1963, the Organisation of African Unity (OAU) affirmed the desire of achieving regional integration in Africa (ed. Mkandawire 2005). In the early 1980s, the first executive secretary of the United Nations Economic Commission of Africa (UNECA), Adebayo Adedeji, provided substantive meaning and programmatic guidance to achieving regional integration in Africa (Adebajo 2014). His leadership played an important role in establishing and launching the Lagos Charter, as well as the Lagos Plan of Action in the late 1970s. The OAU endorsed the Lagos Plan of Action which supported integration based upon 'self-reliance, endogenous development as well as industrialization' of African member states. Even though Adedeji's approach to integration was based upon the idea of 'developmental regionalism', the Lagos Plan of Action was criticised for lacking a comprehensive implementation approach (Bach 2016).

Ten years after the inception of the Lagos Plan of Action, the OAU tackled this gap in its regional integration framework by endorsing the Abuja Treaty which set out a step-by-step method of how regional integration in Africa should be implemented. In addition, a path towards the creation of Regional Economic Communities (RECs) and an African Economic Community by 2028 was set forth. The initial step in this particular pathway was the development of Free Trade Areas (FTAs) in every region, followed by customs unions, monetary unions, and common markets. According to Bach (2016), advancements towards establishing RECs began in

the early 2000s. As it stands, only eight RECs are recognised by the African Union (AU), namely: EAC (East African Community); SADC (Southern African Development Community); AMU (Arab Maghreb Union); COMESA (Common Market for Southern and Eastern Africa); ECOWAS (Economic Commission of Western African States); ECCAS (Economic Community of Central African States); IGAD (Inter-Governmental Authority on Development); and CEN-SAD (Community of Sahel Saharan States).

Economic progression in each regional economic community subsequently led to the aspiration of creating and forming continental FTAs. The aspiration of forming a continental FTA was also motivated by low intra-African trade as compared to intra-regional trade in other continents. According to UNECA (2015), intra-African trade is approximately 15%, while intra-regional trade is 68% in Europe, 55 in America, and 59 in Asia. The low level of trade between African countries resulted in policy initiatives that attempt to enhance intra-African trade, the construction of local value chains, as well as the diversification of African economies (UNCTAD 2010). In 2012, the African heads of states and government endorsed the action plan and a pathway in establishing the African Continental Free Trade Area (AfCFTA), which would bring together 54 African countries by an indicative date of 2017 (DTI 2010).

Due to delays and divergences in trade negotiations, the implementation of the AfCTA by the proposed date was not achieved. One of the reasons for this delay is associated with the rules of origin to be adopted in the FTA. The African Tripartite Free Trade Area (COMESA, EAC, and SADC) is advocating specific rules of origin, while other RECs are proposing a general rule of origin. Moreover, some African member states like Eritrea and Nigeria were sceptical about the potential economic implications of the proposed FTA for their domestic industry, which led to a lack of commitment and poor participation in general meetings of the AfCFTA.

Nevertheless, the establishment of the AfCFTA is among the paramount projects on the AU's Agenda 2063, which typically strives to produce one continental market for goods and services in Africa. Proponents of this agreement support the idea that it is going to benefit the African continent to address dilemmas of food security, unemployment, poor infrastructure, industrialisation, and institutional development (UNECA 2015).

On 30 May 2019, 24 member states of the AU deposited their instruments of ratification with the African Union Commission (AUC), and the AfCFTA entered into force. This particular date marked 30 days after 22 nations had deposited their instruments of ratification to reach the minimum legal threshold for the AfCFTA to enter into force. As of June 2021, 36 countries have both signed and deposited their instruments of AfCFTA ratification. Only 29 African member states have either signed or ratified the agreement. Among the 55 AU member states forming, only Eritrea has not signed yet. It was proposed that operations and business under this agreement will commence on the 1st of July 2020. Due to the impact of the national lockdown caused by COVID-19, operations of the AfCFTA were further delayed, and the agreement eventually came into force on the 1st of January 2021.

South Africa is also a member of the AfCFTA and has expressed its commitment to the agreement since depositing its instrument of ratification in January 2019. The AfCFTA presents perhaps the greatest opportunity for South Africa, in terms of diversifying its export basket, enhancing food security and agricultural development. Despite the positive intent of the AfCFTA, which stems from liberalising trade by reducing and ultimately eliminating tariff barriers between AU member states, its socio-economic consequences at the national and local level should not be overlooked.

Indeed, trade liberalisation does not benefit all countries (Abbott, Bentzena & Tarp 2008; Chang, Kaltani & Loayza 2009; Nicita 2004). Scholars in both developed and developing countries argue that trade liberalisation is harmful to less-developed nations because it forces domestic industries to compete with international markets and may further lead to the liquidation of domestic businesses and the loss of jobs (Chang et al. 2009; Rodriguez & Rodrik 2001; Stiglitz & Charlton 2005). On the contrary, mainstream economic thought claims that trade liberalisation increases economic growth and leads to export diversification for both developed and developing countries (Balassa 1965; Chandran & Munusamy 2009; Chang et al. 2009; Krugman & Obstfeld 2006). The potential impact posed by the AfCFTA is not clear, because the agreement has not been operational yet. In addition, proponents of the proposed FTA only point to numerous potential benefits, while less has been said about the potential cost of the agreement on strategic economic sectors like the agricultural sector. This study contributes to this debate by revealing the potential impact of trade liberalisation as proposed under the AfCFTA on South African agricultural trade.

This study attempts to model the potential impact of a 100% tariff liberalisation as proposed under the AfCFTA on South African agricultural trade. To the best of my knowledge, this is the first study of its kind to explore the potential implications of the AfCFTA tariff liberalisation on the South African agricultural sector.

## Theoretical literature

The first economist to study the relationship between international trade and economic growth was Adam Smith. He developed the concept of comparative advantage and absolute advantage to explain why countries trade with each other. This has been followed by a number of research endeavours also in the pursuit to explain how free trade policies affect the economic development of both developed and developing economies. Smith (1776) explained that both the specialisation and the division of labour are one of the

main drivers of economic growth. Ricardo (1987) shared the same sentiments adding that countries trading with each other could mutually benefit from specialisation, leading to a win-win situation. Compelling findings from literature claim that international trade increases production output and consumption efficiency, resulting in welfare gains to trading regions or countries (Bhorat & Hodge 1999; Birdi, Dunne & Watson 2002; Edwards & Golub 2003; Fedderke et al. 2003).

To the contrary, numerous researchers oppose these sentiments pointing that there is little evidence providing a positive relationship between trade liberalisation and economic growth. The main determinant of long-run economic growth in both developed and developing countries are technological advancements (Abbott et al. 2008). This means that long-run economic growth is independent of the level of trade integration amongst regions, and highly dependent on the level of technological advancement in a region. Thus, trade liberalisation influences total trade creation and consumer welfare but not the national economy (Birdi et al. 2002).

Findings by Anderson (2004) suggest that traditional trade theory is highly associated with the reallocation of scarce resources, determined by differences in factor endowment between nations. The efficient allocation of resources increases welfare gains and enhances the overall GDP of nations. Equally, economic growth theories suggest that openness to international trade leads to higher economic growth, resulting from the increased production in major strategic sectors of the economy (Heijman 1998). Countries can also benefit from trade liberalisation if they take advantage of the opportunities presented by globalisation, such as technological and skills transfer, foreign direct investment, and increased export market. This does not translate into openness to trade benefits for all countries. In some instances, it has been found that trade liberalisation leads to an opposite effect, as cited above, that it distorts domestic industries in most developing countries (Aghion et al 2005).

Consequently, opponents of trade liberalisation point to numerous examples of how openness to trade can harm domestic markets. For example, the failure of the cotton production project in Zimbabwe and the decrease in maize farming in Zambia are evidence of local farmers forced to abandon their farms due to unfair competition from international markets (Alan 2002). The situation gets worse in countries where there are weak institutional structures in place and less financial support for farmers, as compared to farmers in developed countries. South Africa is a member of various trade agreements including the proposed AfCFTA. Contradicting views about the impact of trade liberalisation has led the researcher to ask questions like, 'How will the Free Trade Area affect the South African agricultural sector?'and 'Is there a relationship between agricultural development and trade liberalisation'?

Theoretical literature suggests that there is no consensus on the impact of trade liberalisation on economic growth and perhaps the agricultural sector. International trade-related studies conducted specifically on the South Africa market are also mixed in results showing different outcomes (Bhorat & Hodge 1999; Birdi et al. 2002; Edwards & Golub 2003; Fedderke et al. 2003). In general, some studies indicate that a reduction in and removal of tariff duties resulted in increased trade creation, leading to improvements in the gross domestic product. On the other hand, other scholars argue that trade liberalisations lead to trade diversion in which efficient countries are replaced by inefficient countries, arising from the free trade area (Achterbosch et al. 2013; Baier & Bergstrand 2007; Bhagwati, Krishna & Panagariya 1999).

Adam Smith and various scholars provide evidence of long-term benefits arising from the relationship between trade and economic growth. A study conducted by Anderson (2004) shows that openness to trade enhances sustainable development in the long run by encouraging foreign direct investment, knowledge transfer, and the dissemination of technology. Contrary findings by Redding (1999) contested that trade liberalisation poses a threat to economic growth by dismantling infant industries that cannot compete with their foreign counterparts. Moreover, Rodriguez and Rodrik (2001) agree to the ideas contested by Redding. They argued that trade liberalisation increases inequality by driving small industries out of business and benefiting commercial businesses through subsidies and farm support. The arguments above clearly show that openness to trade does not benefit all countries. The section below provides empirical evidence of the impact of trade in both developed and developing countries.

The conclusion drawn from the above theoretical and empirical literature is that trade openness has no clear-cut conclusion whether it increases economic growth or distorts domestic industries. This means that an FTA has a dual consequence, firstly, it has the potential to boost a country's national economy, and secondly, it has the potential to harm domestic production. Thus this gap calls for prior research to fully investigate empirically the potential implications of the AfCFTA on the agricultural sector. To achieve this, a comprehensive methodology is carefully selected and summarised in the following sections.

## Empirical literature

Does trade liberalisation benefit or harm local businesses? This is still an ongoing question providing an opportunity for researchers to explore the gap. Numerous attempts have been made in the past to gauge the impact of free trade areas and the results found are still unconvincing.

Robinson and Thierfelder (2002) investigated a vast body of empirical literature that analysed the welfare effect of trade liberalisation in developing countries using the SMART partial equilibrium (PE) model. Two general conclusions were found to be prevalent: (1) Trade liberalisation increased

the welfare of Member States at the expense of domestic production, and (2) the total trade creation is much greater than the trade diversion.

Makochekanwa (2012) applied a PE model to assess the welfare implications of the Tripartite FTA to its member states. The results of the study indicated that trade creation will increase the amount to $2 billion, benefiting countries such as DRC and Angola. Once import duties are eliminated, tariff revenue is expected to decrease by $1 billion.

Spence (2013) estimated the economic implications of tariff liberalisation in Uganda, using the SMART PE model. The study revealed that trade openness presented Uganda with welfare gains of only $3 million, and a tariff revenue of $24 million. The losses in tariff revenue are balanced by a significant increase in exports to the Democratic Republic of Congo, equally to $112 million.

Chiunjira (2020) investigated the trade liberalisation implications proposed under the AfCFTA on exports from the Common Market for Eastern and Southern Africa (COMESA). Results of the study showed an increase in exports from COMESA to African member states due to a full tariff liberalisation. Most efficient exports will be affected due to trade diversion benefiting the COMESA trading bloc. The study revealed considerable losses in tariff revenue and recommended that the AfCFTA should allow for special and differential treatment (SDT) provisions.

Saygili et al. (2018) focused on the costs and benefits of a full tariff liberalisation under the AfCFTA using a computable general equilibrium (CGE) model of trade. The study revealed growth in intra-African trade and a substantial increase in welfare, employment and output in the long run. Trade creation is not dispersed evenly amongst trading partners. In the short run, member states are projected to experience tariff revenue losses and adjustment costs which may not be distributed equally across trading partners. The study concluded that costs and benefits can only be minimised if sensitive products are exempted from trade liberalisation.

## South Africa's trade relation with African markets

South Africa has signed several preferential trade relationships with African countries both as regional and bilateral trade agreements (Daya et al. 2006). The agreements provide deeper economic integration through the development of common policies on industry, investment, agriculture, and competition. Some of the trade agreements include the South African Customs Union (SACU), SADC-FTA. It is not clear whether South Africa benefits from these trade arrangements or not. A study looking deeply into the implications of each agreement to South Africa could deliver interesting results. The following section discusses South Africa's trade performance with the rest of Africa since the inception of these trade agreements.

Figure 1 indicates South Africa's major agricultural exports and imports from Africa between the years (2014–2018). South Africa's top three agricultural export products to Africa were beverages, paper, and cereals each contributing an average of R7.2 million, R6.4 million, and R4.8 million to the total agricultural export revenue of South Africa, respectively. The diagram also reflects the top three agricultural imports from Africa destined to South Africa which include sugar, live animals, and fish with a value of R3.4 million, R1.7 million, and R1.5 million, respectively.

Figure 2 depicts South Africa's major export destinations to the world between (2014–2018). South Africa's top three export destinations, outside Africa, for agricultural products

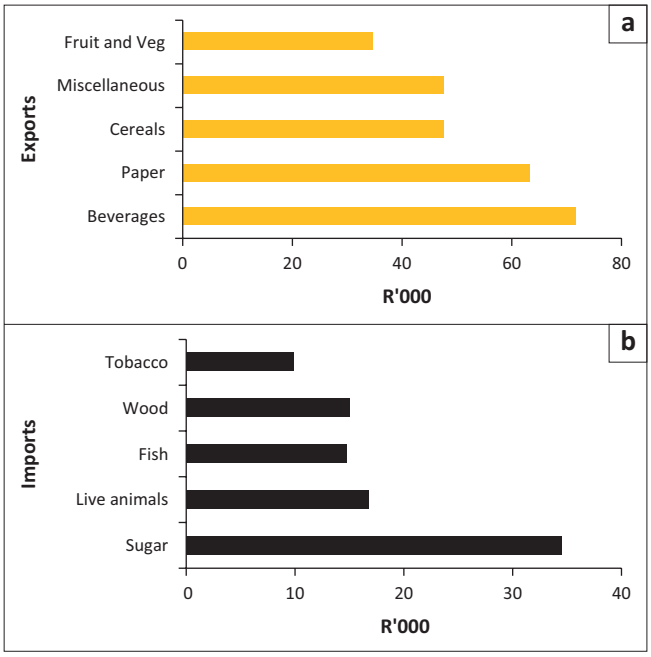


**FIGURE 1:** South Africa's major agricultural, fisheries and forestry (AFF) exports and imports from Africa (a–b) (2014–2018).

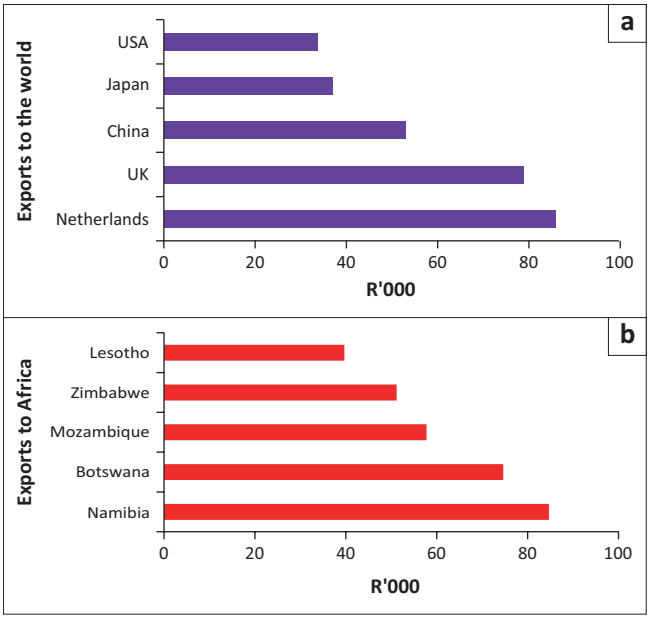


**FIGURE 2:** South Africa's major export destinations to the world (a–b) (2014–2018).

are the Netherlands, United Kingdom, and China contributing a total of R7.2 million, R6.4 million, and R4.8 million, respectively. Furthermore, South Africa's key export destinations in Africa include Namibia, Botswana, and Mozambique. The results suggest that South Africa's major export destination for agriculture is the Netherlands which accounts for almost 60% of South Africa's agricultural exports. This means South Africa trades more with third parties outside the region than its neighbouring countries in Africa do. The results also suggest that South Africa's major export destinations are concentrated in the Southern African region. This trend could motivate the need for South Africa to diversify its export basket to other parts of the African continent.

Figure 3 below indicates the trade balance of agricultural products between South Africa and the rest of Africa over five years (2014–2018). South Africa has been having a trade surplus over the five-year period (2014–2018). South Africa's export of agricultural products to Africa increased from R45 million in 2014 to R50 million in 2016 and decreased to R45 million in 2017. This decline is attributed to the prevalent drought in Southern Africa, distressing agricultural production and productivity.

Conclusively, the section above leveraged the International Trade Centre (trade map) database tools to investigate South Africa's trade performance with African countries. The results showed that South Africa's major agricultural exports to the African market include citrus fruit, cereals, beverages, fruit and vegetable, maize, sugar, and paper. South Africa's major agricultural imports from the African market include tobacco, livestock, fish, wood and bananas. South Africa's top export destinations for agricultural products include Namibia, Botswana, Zimbabwe, Lesotho, and Mozambique. These findings suggest that South Africa's agricultural exports are concentrated in the Southern African region and that trade with other regional blocks in North, East, and West Africa is very minimal. Given these findings, the study attempts to identity major factors influencing South Africa's agricultural exports to the rest of the African continent.

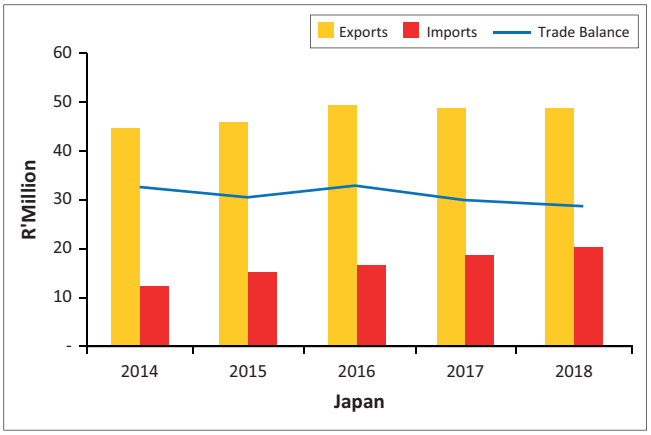


**FIGURE 3:** South Africa's AFF trade balance with Africa (2014–2018).

# Methodology

This study adopts the SMART PE model to simulate the impact of a full tariff liberalisation under the AfCFTA. The United Nations Conference on Trade and Development (UNCTAD), together with the World Bank, developed the SMART PE model as a basic methodology for quantifying the impact of changes in trade policy on international trade. The term 'partial equilibrium' refers to an analysis that only evaluates the consequences of a policy change in the market that is directly impacted. In other words, the SMART PE framework ignores the macroeconomic relationship that exists between different markets in a single economy. This is contrary to a general equilibrium model framework, in which all markets are modelled concurrently, and the relationship that exists between the markets is considered.

The key benefit of applying the SMART PE model is that it requires very minimal data. Trade flows, tariff values, and behavioural parameters are the only data required to run the model. As a result, the model can take advantage of the extensive World Integrated Trade Solutions (WITS) database, which contains all these data requirements. Another advantage of using this model is that it permits analysis at a disaggregated level, a degree of aggregation that is difficult and impossible to acquire using the general equilibrium model or any other models used in international trade.

Nevertheless, it can be argued that the main strength of the SMART PE model seems also to be its major limitation. The application of the SMART PE model in the current study is limited by the following constraints. Firstly, the SMART PE model is static and only operational under rigorous ceteris paribus assumptions. Secondly, the model offers a narrow overview of the anticipated impact of tariff liberalisation and does not take into account any indirect consequences that accompany the tariff change. Secondly, the study is limited to trade flow projections, while ignoring changes in general prices and other macroeconomic factors. Despite the limitations highlighted above, the SMART framework was adopted by many scholars (Chang et al. 2009), focusing on trade policy and several nations, including the United States, to prepare their negotiation stance during the Uruguay Round. Thus, the SMART PE model is still a useful tool in providing the implication of changes in trade policy. A derivation of the model from its theoretical framework is provided on appendix 1.

## Data requirements

Trade data required for simulation in the SMART PE model include:

1. Trade values by an exporting country which are regarded as trade quantity.
2. Tariff values, faced by each exporting partner, allowing for calculating domestic price, and
3. Elasticity parameters reflecting consumer and exporter behaviour, such as import supply elasticity, export supply elasticity, and substitution elasticity.

The SMART PE model is contained in the WITS software which holds various trade information databases, such as the UNCTAD COMTRADE, WTO-IDB, and TRAINS. The model, therefore, uses the TRAINS database for tariffs (applied tariffs). For trade values, TRAINS and COMTRADE databases are used. The PE model also incorporates the three kinds of elasticities needed to calibrate the simulation, and the study utilises the 'default' elasticity parameters, which the literature suggests are a statistically significant estimate. It is also important to note that the availability of data on WITS software varies across years and countries. Thus, some of the West, East, and North African countries are not included in the analysis due to a lack of data. These countries include Sierra Leone, Liberia, Guinea, and Cabo Verde.

## Results of the SMART simulation

This section provides the results of the SMART PE model simulating a full tariff liberalisation of agricultural tariff lines in the African market. The results of the study commence by presenting the possible effect of a 90% tariff cut. Given the 90% tariff cut, trade creation will stand at US$24 million in value, tariff revenue will decrease by US$3 million and welfare gain will stand at US$10 million. These results are interesting for policy makers, given the 90% level of ambition (Category A) provided under the AfCFTA modalities. In the long run (5 years and 10 years) member states are aiming to liberalise category B (7% sensitive list) and category C (3% exclusive list), subject to a review, implying that it will be fully liberalised if trading parties agree. Against this background, a detail of the benefits and challenges of a full tariff liberalisation are discussed in the following sections.

### Total trade creation on the South African market

This part of the study explores the implications of a potential increase in exports enjoyed by the AU on the South African market. For negotiation purposes, it is interesting to look at which African countries are bound to benefit the most from the full tariff elimination by South Africa. In total, 39 (excluding SADC) AU member states could gain more than US$1.87 million of increased exports to the South African market. The root of this gain is two-sided. Firstly, AU member states will gain from total trade creation arising from the South African market (the elimination of import tariffs on agricultural products make them affordable, leading to an increase in demand). Secondly, agricultural imports from the AU will benefit from preferential treatment, a principle that is mandatory to all negotiating parties of the AfCFTA. This special treatment will result in efficient industries outside the FTA being replaced by inefficient industries inside the FTA (a scenario called the trade diversion effect). The net growth in AU exports to the South Africa market is equal to the sum of added trade creation and trade diversion.

Table 1 shows clearly that agricultural exports from Egypt will increase by 56%, equating to a value of US$26 million, followed by export from Kenya with 33% of the total export gain. Together, these two countries plus Benin (24%), Nigeria (22%), Ethiopia (12%), and Tunisia (11%) will gain more than 50% of increased exports to the South African market.

The highest export gains by both Egypt and Kenya reflect the large market size of these economies and relatively high tariff lines imposed by these markets before liberalisation. Other member states that are not listed in Table 1 will also see an increase in their exports to the South African market, just below 5%.

### Trade creation and trade diversion on the South Africa market

One of the most significant features of the SMART PE model is the ability to simulate the trade creation effect stemming from changes in trade policy. Traditionally, total trade creation was perceived beneficial to consumers as it reflects extra amounts of agricultural products that consumers will be able to afford because of trade liberalisation.

Table 2 shows the top six leading countries that stand to gain from the South African market in terms of total trade effect. Egypt is set to enjoy the highest total trade effect, recording a US$9 million increase in total trade. Two other noticeable AU member states that stand to gain on the South African market are Kenya and Benin, recording a US$3 million and US$1 million increase in total trade, respectively.

### Trade creation on the African Union market

Table 3 depicts the total trade creation gained by South Africa on the AU market when a full tariff liberalisation is implemented on all agricultural imports. The results of the SMART model indicate that South Africa stands to gain most from Cameroon, recording a total trade creation of about US$74 million. The model also returned results pertaining to the impact of the agreement on trade diversion.

**TABLE 1:** Increase in African Union export to South Africa after the Free Trade Area (US$).

| Country | AU exports before the tariff change | AU exports after the tariff change | Export increase in % |
|---|---|---|---|
| Egypt | 16 904 730 | 26 361 042 | 56 |
| Kenya | 9 934 390 | 13 173 184 | 33 |
| Benin | 5 199 178 | 6 453 023 | 24 |
| Nigeria | 1 959 165 | 2 388 908 | 22 |
| Ethiopia | 6 122 862 | 6 880 985 | 12 |
| Tunisia | 2 672 109 | 2 952 898 | 11 |

AU, African Union.

**TABLE 2:** Total trade creation in the South African market (US$).

| Country | Total trade effect | Trade creation | Trade diversion |
|---|---|---|---|
| Egypt | 9 456 312 | 6 333 058 | 3 123 254 |
| Kenya | 3 238 794 | 2 706 961 | 531 833 |
| Benin | 1 253 844 | 950 497 | 303 347 |
| Nigeria | 429 743 | 192 996 | 236 747 |
| Ethiopia | 758 123 | 418 442 | 339 682 |
| Morocco | 454 621 | 306 413 | 148 208 |
| **Total** | **15 591 437** | **10 908 367** | **4 683 071** |

In the context of this study, trade diversion is represented as the quantity of exports from non-members of the AfCFTA that will be replaced by SA agricultural products. South Africa records a total trade diversion of about US$42 million, and the highest trade diversion of about US$8 million is set to take place in Uganda, Kenya, and Nigeria.

Traditionally, trade diversion was deemed detrimental to global well-being as less productive industries are replaced by more productive industries. South Africa is also set to benefit more from the growing markets in Kenya and Nigeria, gaining a total trade of about US$25 million and US$26 million, respectively. South Africa stands to gain more than US$199 million in total trade from the AfCFTA.

For export diversification purposes, it is often vital to examine the implications of the trade creation effect at the product level. The SMART PE model allows for an observation of the impact of a tariff change at the HS-6 level (harmonised system). This is one of the reasons why the SMART PE model was adopted in this study. Table 4 below reveals the products for which trade creation is largest and the markets that have the highest export potential for the identified products.

The SMART simulation revealed South African products that have the highest trade potential on the AU market after full liberalisation. Table 4 shows that South African exports of cigarettes, maize (corn), maize flour, apples, wood, cereal and cane sugar stand to gain more from the FTA. The smart model also identified AU markets that South Africa will need to exploit in relation to the products highlighted.

**TABLE 3:** Total trade creation for South Africa on the African Union market (US$).

| Country | Trade creation | Trade diversion | Total trade created |
|---|---|---|---|
| Cameroon | 68 640 332 | 4 962 642 | 73 602 974 |
| Nigeria | 17 868 350 | 8 457 799 | 26 326 149 |
| Kenya | 15 555 650 | 9 246 873 | 24 802 523 |
| Ghana | 12 896 062 | 6 981 799 | 19 877 861 |
| Uganda | 8 912 145 | 7 964 079 | 16 876 224 |
| Rwanda | 15 524 299 | 1 155 959 | 16 680 258 |
| Togo | 9 101 882 | 259 772 | 9 361 654 |
| Gabon | 5 395 550 | 1 813 129 | 7 208 679 |
| Senegal | 3 161 550 | 1 265 623 | 4 427 173 |
| **Total** | **157 055 820** | **42 107 675** | **199 163 495** |

**TABLE 4:** South African products with the highest export potential.

| HS code | SA products with high export potential on the AU market | AU markets with high demand for SA exports |
|---|---|---|
| 240220 | Cigarettes containing tobacco | Cameroon |
| 220710 | Undenatured ethyl alcohol | Rwanda |
| 110220 | Maize (corn) flour | Togo |
| 100510 | Maize (corn) | Ghana |
| 080810 | Apples | Nigeria |
| 170111 | Cane or beet sugar | Uganda |
| 441011 | Wood and articles of wood; wood charcoal | Kenya |
| 190410 | Prepared foods obtained from cereal products | Nigeria |
| 210310 | Sauces and preparations | Nigeria |

SA, South Africa; AU, African Union.

Cameroon conveys the strongest demand for South African cigarettes, followed by Togo and Ghana showing the strongest demand for South African maize exports. Nigeria, Kenya, and Uganda showed the strongest demand for cereal, wood, and sugar cane, respectively.

## Impact in terms of revenues and welfare

The proposed tariff liberalisation under the AfCFTA is revealed to harm the South African agricultural sector. In terms of other member states, the extent of revenue shortfall will vary across countries depending on the phase-down tariff approach as provided in the FTA. As indicated in Table 5, the results of the SMART simulation suggest that South Africa would experience a 7% decline in tariff revenue.

The SMART model also revealed the welfare impact of the tariff shock. Welfare effects are beneficial material impacts on the domestic nation's (importing) consumer sector as a result of the cheaper imported goods. The results of the simulation model project a welfare effect of about US$1 million to South African consumers. The welfare effect in this context is known as 'consumers surplus' and refers to the additional consumption possible by South African consumers.

## Vulnerable agriculture, forestry, and fisheries products at the regional level

Using the results of the model, the study isolates South African agricultural products that may be exposed to the high influx of imports from the AU market. This analysis will enable the South African negotiating team to consult with the private sector and formulate strategies that aim to reduce the potential harm of the tariff liberalisation and possibly to set up a list of products to be included under the exclusion list. Table 6 below depicts South African products that stand to be highly vulnerable to imports from the AU market. The table also conveys AU markets that are responsible for the influx of imports to the South Africa domestic market.

It is evident from Table 6 that the domestic production of cereal groats, onions, peas and roses are vulnerable to imports from the AU market. The SMART model shows a 96% increase in onion exports from Kenya to South Africa and a 90% export increase in cereal groats from Nigeria. The import increase in all the products above, will mostly benefit consumers from the reduction in commodity prices. South African consumers, especially those of cereal, roses, malt beer and peas will enjoy the benefit of reduced prices and greater quantities. On the other hand, domestic producers will be left out of business if they are unable to compete.

**TABLE 5:** Revenue and welfare impacts on South African market after liberalisation (US$).

| Country | Revenue before FTA | Revenue after FTA | Revenue loss in % | Welfare effect |
|---|---|---|---|---|
| South Africa | 316 037 070 | 295 619 925 | 7 | 1 035 955 |

FTA, Free Trade Area.

**TABLE 6:** South African vulnerable products from the Free Trade Area.

| Product description | Exporting country | Exports before FTA | Exports after FTA | Export increase in % |
|---|---|---|---|---|
| Cotton seeds | Benin | 5 031 210 | 6 285 055 | 20 |
| Paper; banknotes | Kenya | 4 058 125 | 4 485 838 | 10 |
| Roses | Kenya | 1 683 892 | 2 937 156 | 43 |
| Toilet or facial tissue stock | Tunisia | 2 407 752 | 2 574 499 | 6 |
| Peas (Pisum sativum) | Kenya | 464 838 | 973 741 | 52 |
| Crushed ginger | Nigeria | 763 899 | 892 046 | 14 |
| Onions and shallots | Kenya | 32 120 | 803 822 | 96 |
| Plants used in perfumery | Morocco | 344 989 | 576 441 | 40 |
| Cut flowers | Kenya | 319 832 | 422 521 | 24 |
| Edible vegetables | Nigeria | 174 202 | 221 315 | 21 |
| Palm nuts or kernels | Nigeria | 175 955 | 189 164 | 7 |
| Beer made from malt | Nigeria | 108 910 | 118 945 | 8 |
| Pasta, whether or not cooked | Nigeria | 61 349 | 100 235 | 39 |
| Cereal groats, meal, and pellets | Nigeria | 5 677 | 55 112 | 90 |

FTA, Free Trade Area.

# Conclusion

The study aimed to investigate the implications of a full tariff liberalisation as proposed under the AfCFTA. It adopted a SMART PE model to explore the impact of the FTA on South African agricultural trade. The model's results showed that the proposed FTA's impact on bilateral trade flows would most likely be unequal, indicating relatively large economic gains for developing economies like South Africa and less gains for small economies. The magnitude of this anticipated imbalance will be determined by the actual details of the agreements, which are still being discussed at the time this study is completed. Provided a full tariff liberalisation of agricultural tariff lines occurs, South Africa is set to benefit a total trade creation of about US$199 million. The South African agricultural industry will enjoy an increased export market access and be able to diversify its export basket on the African continent.

While enjoying the preferential access to the African market, South African farmers – particularly of edible vegetables, malt beer, peas, sugar cane, wood, and apples – are set to compete with exports coming from different regions of the continent such as Kenya and Nigeria. This will leave less competitive industries out of business and those that are competitive will become more efficient. South African consumers of most agricultural goods will reap the benefits of the FTA through reduced commodity prices. This could translate into better food security for low-income and rural households who heavily rely on agricultural products for survival.

To ensure that the benefits of the FTA do not overweigh losses, the study recommends that the government should in the short run exempt the identified products from full liberalisation and list them under its exclusion list. In the long run, the government and businesses need to promote competitiveness in these industries. The South African government can improve competitiveness by reducing restrictive regulations, promoting innovation and technology, and providing tax incentives to encourage product expansion. Lastly, the study recommends additional research on the overall impact of the FTA in all sectors and sub-industries that this paper did not attempt to analyse. The application of the CGE model would be most appropriate for such an analysis, because it measures not only the impact of tariff liberalisation on trade flows but also the indirect consequences in general prices and other macroeconomic factors.

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## Competing interests

The authors have declared that no competing interest exists.

## Authors' contributions

T.M.S. is the supervisor of O.D.D. He mentored the entire research project and contributed significantly to the completion of the research study.

## Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

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## Data availability

All of the data used in the model were accessed through the WITS database. Please see the link below to access the database. https://wits.worldbank.org/simulationtool.html

## Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliation of these authors.


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Appendix starts on the next page →

# Appendix 1

## The SMART Partial Equilibrium model framework

The research offers a thorough analysis of the SMART partial equilibrium model contained in the WITS software. The SMART PE model is selected because it incorporates an advanced trade analysis framework that allows for multilateral tariff reforms and preferential trade liberalisation. A static partial equilibrium technique is applied, which allows the researcher to analyse the impact of changes in trade policy in a single country. As the focus of this study is based on a single market (South Africa), the application of the SMART PE model framework to this study is relevant. The research study emulates the methodology applied by Abdelkmalki, Jallab and Sandretto (2007), who applied the SMART PE model to explore the implications of trade liberalisation between the United States and Morocco.

It is generally accepted that when import tariffs are abolished in post-AfCFTA negotiations, commodity prices will fall, leading to trade creation. Trade creation involves stimulating trade levels after the tariff liberalisation, leading to unproductive companies being outcompeted by more productive rivals. Laird and Yeats (1986) strictly developed an equation, necessary to predict trade creation, trade diversion, consumer welfare, and tariff revenue. The derivation of the equation commences with the following basic trade model, which involves changes in import demand and supply:

A generalised import demand function of product $i$ from nation $k$ for nation j is given as:

$$\mathrm{M}\_ijk = f"("Y\_j, \mathrm{P}\_ij, \mathrm{P}\_ik) \quad \text{[Eqn 1]}$$

On the other hand, the export supply function of product i of nation k is expressed as:

$$X_{ijk} = f\left(\mathrm{P}_{ijk}\right) \quad \text{[Eqn 2]}$$

Given free trade conditions, with adjustments to ad valorem tariff, the domestic price of product $i$ in country $j$ from country $k$ will change as follows:

$$P_{ijk} = P_{ijk}\left(1 + t_{ijk}\right) \quad \text{[Eqn 3]}$$

As suggested by Laird and Yeats (1986), to get the total trade creation formula, the commodity price formula (3) is completely differentiated to derive:

$$dP_{ijk} = P_{ijk}\,dt_{ijk} + \left(1 + t_{ijk}\right)dP_{ijk} \quad \text{[Eqn 4]}$$

To get Equation (5) below, Equations (3) and (4) are replaced into the elasticity of import demand function:

$$\frac{dM_{ijk}}{M_{ijk}} = \eta_i^m\left(\frac{dt_{ijk}}{1 + t_{ijk}} + \frac{dP_{ijk}}{P_{ijk}}\right) \quad \text{[Eqn 5]}$$

From the expression in Equation (5), $\frac{dM_{ijk}}{M_{ijk}} = \frac{dX_{ijk}}{X_{ijk}}$ may be used to calculate the elasticity of export supply as follows:

$$\frac{dP_{ijk}}{P_{ijk}} = \frac{1}{Y_i^e}\frac{dM_{ijk}}{M_{ijk}} \quad \text{[Eqn 6]}$$

The elasticity export function allows for accurate calculation of the trade creation effect when applied in Equation (6). Counting from Equation (3), the total trade effect is equal to the welfare gains of the exporting nation $k$ of product $i$ to nation $j$:

$$TC_{ijk} = M_{ijk}\eta_i^m \frac{dt_{ijk}}{\left(\left(1 + t_{ijk}\right)\left(1 - \frac{\eta_i^m}{Y_i^e}\right)\right)} \quad \text{[Eqn 7]}$$

If $Y_i^e \to \infty$, Equation (8) below is a simplified version of Equation (7):

$$TC_{ijk} = \eta_i^m M_{ijk}\frac{\left(1 + t_{ijk}^1\right) - \left(1 + t_{ijk}^0\right)}{\left(1 + t_{ijk}^0\right)} \quad \text{[Eqn 8]}$$

where $TC_{ijk}$ is the total value of trade generated in millions of dollars after product $i$ has been affected by the tariff adjustment; $\eta_i^m$ is the import demand function for product $i$ from the related trading partner; $M_{ijk}$ is the normal rate of import demand of the given products $t_{ijk}^0$ and $t_{ijk}^1$ and reflects tariff rates for product $i$ at the initial and end periods, respectively. The prevailing volume of imports, the import demand function, and the relative change in tariff all influence the total trade creation.

Trade diversion has the potential to increase or decrease trade internationally, as opposed to trading creation. Trade diversion is a process that happens in a free trade area when competitive industries from outside the free trade market are replaced in the preferential area by less efficient industries. Laird and Yeats (1986) developed the theory behind the estimation of trade diversion under the SMART framework. To understand the derivation of the theory clearly, the elasticity of the substitution ($\sigma_M$) variable is first provided. The elasticity of the substitution function can be represented as a percentage difference in the relative shares of imports from two separate sources attributable to a 1% change in the relative prices of the same commodity from the following sources:

$$\sigma_M = \frac{\frac{\Delta\left(\sum_k \frac{M_{ijk}}{\sum_k M_{ijK}}\right)}{\sum_k \frac{M_{ijk}}{\sum_k M_{ijK}}}}{\frac{\Delta\left(\frac{P_{ijk}}{P_{ijK}}\right)}{\frac{P_{ijk}}{P_{ijK}}}} \quad \text{[Eqn 9]}$$

where $K$ denotes imports from other African countries in the free trade zone, and $k$ symbolises imports from the rest of the world (ROTW). Equation (9) can be extended and modified according to Laird and Yeats (1986) to obtain the trade diversion formula as provided below:

$$TD_{ijk} = \frac{M_{ijk}}{\sum_k M_{ijk}} \frac{\sum_k M_{ijk} \sum_K M_{ijk} \frac{\Delta\left(\frac{P_{ijk}}{P_{ijk}}\right)}{\frac{P_{ijk}}{P_{ijk}}} \delta_M}{\sum_k M_{ijk} + \sum_k M_{ijk} + \sum_k M_{ijk} \frac{\Delta\left(\frac{P_{ijk}}{P_{ijk}}\right)}{\frac{P_{ijk}}{P_{ijk}}}} \quad \text{[Eqn 10]}$$

As a result of Equation (10), the total trade diverted to other African nations within the FTA can be described as follows:

$$TD^{FTA} = \frac{M^{AFR} M^{ROTW} \left(\frac{1+ t^1_{AFR}}{1+ t^0_{AFR}} - 1\right) \delta_m}{M^{AFR} + M^{ROTW} + \left(\frac{1+ t^1_{AFR}}{1+ t^0_{AFR}} m - 1\right) \delta_m} \quad \text{[Eqn 11]}$$

where $M^{AFR}$ denotes the current imports into South Africa from African nations; $M^{ROTW}$ represents imports from the rest of the world; $t^0_{AFR}$ and $t^1_{AFR}$, respectively, denote the initial and end periods of import tariffs levied on agricultural products from African nations exported to South Africa with $t^0_{AFR} > t^1_{AFR}$. An important observation from the equation is that $TD^{FTA}$ increases with the value of $\sigma_M$. Therefore, the addition of trade creation and trade diversion is equal to the total trade effect.

Without a doubt, trade liberalisation under the AfCFTA will have revenue implications, as tariff revenue is calculated by multiplying the tariff rate by the tax base, which is the value of imported goods. As a result, the tariff revenue prior to the introduction of the AfCFTA is represented as:

$$R_0 = \sum_i \sum_k t^0_{ijk} P_{ijk} M_{ijk}$$

Following the change in tariff rate, the current revenue collection will be provided by:

$$R_1 = \sum_i \sum_k t^0_{ijk} P_{ijk} M_{ijk}$$

Considering this perspective, the tariff revenue loss to South Africa as a result of the AfCFTA will be calculated as follows:

$$RL = \sum_i \sum_k \Delta t^0_{ijk} P_{ijk} M_{ijk} \quad \text{[Eqn 12]}$$

Although the AfCFTA will lead to trade creation and trade diversion, there is no doubt that the free trade area is expected to benefit South African consumers through lower market prices. The free trade area will encourage consumers to replace expensive agricultural products with cheaper ones as a result of the tariff liberalisation on agricultural imports. Thus, trade liberalisation will lead to gains in consumer welfare, which can be explained in the equation below:

$$W_{ijk} = 0.5 \left(\Delta t_{ijk} \Delta M_{ijk}\right) \quad \text{[Eqn 13]}$$

Where $W_{ijk}$ denotes consumer welfare and 0.5 denotes the average difference in tariffs before and after their removal. Import prices in South Africa will decline less than they would if markets were fully liberalised, assuming an unlimited elasticity of export supply.