

## Potential Economic Impact of the African Continental Free Trade Area (AfCFTA) on Chad: A Partial Equilibrium Analysis

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### ABSTRACT

This study estimates the potential implications of the implementation of AfCFTA Agreement for Chad in terms of trade, welfare and revenue effects. By applying the WITS-SMART simulation model on 2018 disaggregated trade data, we find that trade effects in Chad are likely to surge by US\$ 13.33 million while promoting consumers' welfare by US\$ 1.13 million. However, revenue losses are imminent as the country might experience a drop in tariff revenue of US\$ 11.11 million. Overall, AfCFTA is expected to improve the country's trade balance as exports are envisaged to outweigh imports. To mitigate the revenue loses, we recommend that the country keep substantial portion of tariff lines for sensitive and excluded products over a longer period during the liberalisation.

**Keywords:** Trade; Revenue; Welfare; AfCFTA; WITS-SMART simulation model; Chad.

**JEL Classification:** F12; F13; F14; F17; I31; O55.

## 1. INTRODUCTION

In July 2018, Chad deposited its African Continental Free Trade Area (AfCFTA) instrument of ratification with the African Union Commission (AUC) Chairperson (Trade Law Centre -TRALAC, 2020). Indeed, the AfCFTA is the largest trade agreement, which provides a charter for trade liberalisation in goods and services is expected to cover all the 55 African countries [AUC, 2018; Economic Commission for Africa (ECA), 2019]. According to Article 3 (a) of the AfCFTA agreement that was signed on 21 March 2018 in Kigali by

44 Member States of the African Union (AU), the first phase of the implementation of AfCFTA aims to create a single continental market for goods and services by reducing the trade costs and increasing access to diversified products and services (ECA, 2019; AUC, 2018). The principal underlying idea is that the AfCFTA is expected to improve the competitiveness of downstream industries that can access cheaper raw materials and intermediate inputs, in line with the vision of the Agenda 2063 (Bayale *et al.*, 2020; ECA, 2019). Hence, firms will access broader continental markets and gain from economies of scale in the long run (ECA, 2019).

In fact, the AfCFTA is envisaged to raise Africa's income levels and reduce poverty by raising productivity and boosting investment (Wonyra and Bayale, 2020; Abrego *et al.*, 2019; Masya, 2019). The AfCFTA is also expected to promote competitiveness at all value chains in production processes at the industry and enterprise levels through exploitation of opportunities for scale production and improved resource reallocation (Bayale *et al.*, 2020; Arizala *et al.*, 2019). Undeniably, AfCFTA seeks to build on the level of integration attained by existing regional economic communities (RECs) to consolidate Africa's trade functions at the continental level (ECA, 2019).

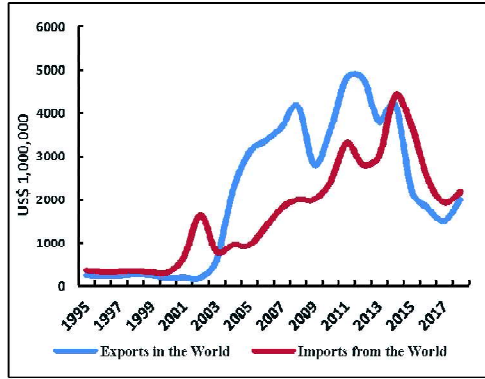
Economic literature has strongly demonstrated that a free trade area or agreement (FTA) is an important step for achieving economic integration among groups of countries (Viner, 1950; Balassa, 1962; 2013; Schiff and Winters, 2002). For most part, FTA calls for the liberalisation of tariffs (Bayale *et al.*, 2020). Theory on integration shows in these conditions that trade effects (trade creation and trade diversion) would occur. The different actors (consumers, producers and governments) and sectors of the economy would be obviously impacted (Schiff and Winters, 2002; Wonyra and Bayale, 2020). Hence, understanding of the magnitude and direction of these effects is important for countries such as Chad. This study therefore aims at engaging the literature by examining the implications of the AfCFTA for Chad. Like most of African countries, Chad is a net importer and its customs duties are the most important part of country's government revenue (IMF, 2019; Bayale, 2020). Based on this fact, we estimate the potential effect of the AfCFTA on Chad's revenue, consumers' welfare and more generally on the country's trade. In this endeavour, we contribute significantly to the existing literature in three ways at least. First, we provide a pioneering empirical estimate of the potential welfare effect and trade changes of AfCFTA for Chad. Indeed, such estimates permit the determination of the absolute potential welfare and trade changes as well as their sources in order to better

situate the expectations of the country. Second, beyond providing the estimates, this study also unearths the products that contribute more to trade creation and diversion in addition to revealing Chad's trade (export and import) changes with the rest of the African countries. Third, relying on our findings, the study proffers useful and practical policies options for Chad when defining his tariff offer and negotiations with other African countries.

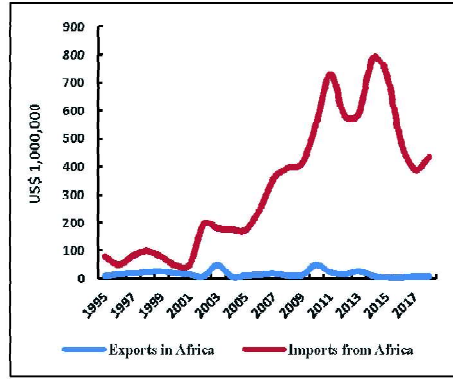
By applying the World Integrated Trade Solution–Single Market Partial Equilibrium Simulation Tool (WITS–SMART) based on 2018 disaggregated international trade data, we find that, total trade effects in Chad are likely to surge by US\$ 13.33 million whereas increasing consumers' welfare by 1.13 million. While the country might experience a revenue loss following the removal of tariffs, Chad's exports and imports to the other African countries are expected to respectively increase by 36.41% and 2.14%. The remainder of this paper is organised as follows. Section 2 presents an overview on Chad's trade performances. A brief literature review on the effects of FTAs on countries is presented in Section 3. In Section 4, we present the methodology adopted in this paper while Section 5 discusses the findings. Finally, we conclude the paper in Section 6 with key policy implications.

## **2. CHAD ECONOMY'S TRADE PERFORMANCES: AN OVERVIEW**

In this section, we focus on the Chad's participation in international trade. To do this, The United Nations Conference on Trade and Development (UNCTAD) database is used to highlight Chad's foreign trade figures. Thus, it can be observed though Figure 1 that, Chad has experienced a considerable increase in its exports and imports from the World since 1995. Between 2003 and 2014, exports are above imports from the world. After 2014, Chad's exports and imports from the world deceased implying negative trade balance within the period. The high level of exports was observed in 2012 with US\$ 4,800 million, whereas the highest value of imports is observed in 2014 with US\$ 4,400 million (Figure 1). These figures can be explained by the oil boom that the country experiences shortly before these years. Chad exports towards Africa is insignificant compare to its imports from Africa regardless of the year considered. Imports from Africa followed the almost the same trend with the imports from the world (Figure 2). The drop in Chad's participation in international trade could be explained by the economic crisis coupled with the security crisis that the country has experienced since 2014.



**Figure 1: Chad's exports and imports trend from the World, 1995-2018**



**Figure 2: Chad's exports and imports trend from Africa, 1995-2018**

Data source : UNCTAD, 2020

The distribution of world exports from Chad over the 2010-2018 period indicates that the country exported more to the American continent (68.39%) than Asia (24.34%), Europe (6.69%) and African continent (0.53%). By considering imports over the same period, Chad imports more from Europe (53.95%) and Africa (20.16%) than from America (13.79%) and Asia (11.87%). These stylised facts highlight Chad's trade competitiveness challenges at the African level. At the regional level, Chad exports more towards CEN-SAD (40.57%) and ECOWAS (25.85%) than with the other RECs (COMESA, ECCAS, IGAD, EAC, SADC and AMU). In terms of imports ECCAS (47.86%), CEN-SAD (23.80%) and ECOWAS (19.63%) are the most important partners (Table 1).

**Table 1: Chad's exports and imports across continents and African RECs, 2010-2018 (in %)**

Continents	Exports	Imports	RECs	Exports	Imports
Africa	0.53	20.16	AMU	11.68	2.57
America	68.39	13.79	CEN-SAD	40.57	23.80
Asia	24.34	11.87	COMESA	2.66	2.37
Europe	6.69	53.95	EAC	0.48	0.25
Oceania	0.01	0.20	ECCAS	17.60	47.86
Total	100	100	ECOWAS	25.83	19.63
-	-	-	IGAD	0.47	0.15
-	-	-	SADC	0.67	3.32
-	-	-	Total	100	100

Data source: UNCTAD, 2020

In terms of partners and specific products, the Table 2 shows that when considering exports, Chad's top 5 African partners in 2018 were Cameroon (41.14%), Nigeria (16.77%), Morocco (15.31%), Central African Republic (5.62%) and Congo (4.68%). In terms of imports, Gabon (10.6%), Senegal (8.31%) and South Africa (3.75%) were considered after Cameroon (54.31%), Nigeria (11.35%) in the top 5. Moreover, the main products that Chad have exports towards other African countries are cotton (16.56%); other plastics in primary forms (13.44%); oil seeds and oleaginous fruits (5.99%); motor vehicles for transport of goods (4.97%) and crude vegetable materials (4.82%), while petroleum oils or bituminous minerals (26.05%); tobacco manufactured (12.03%); lime, cement, fabrication of construction materials (excluding glass, clay) at 8.8%; sugar, molasses and honey(5.67%) and soaps cleansing and polishing preparations (5.26%) are top5 products imported from Africa in 2018 (Table 2).

**Table 2: Chad's main partners and products in Africa in terms of exports and imports, 2018**

<i>Top 5 African partners 2018 (Exports, in % total)</i>		<i>Top 5 African partners 2018 (Imports, in % of total)</i>	
1. Cameroon	41.14	1. Cameroon	54.31
2. Morocco	16.77	2. Nigeria	11.35
3. Nigeria	15.31	3. Gabon	10.6
4. Centra Afric Rep	5.62	4. Senegal	8.31
5. Congo	4.68	5. South Africa	3.75
<i>Top 5 products to Africa 2018 (Exports, in % of total)</i>		<i>Top 5 products from Africa 2018 (Imports, in % of total)</i>	
1. Cotton	16.56	1. Petroleum oils or bituminous minerals	26.05
2. Other plastics in primary forms	13.44	2. Tobacco manufactured	12.03
3. Oil seeds and oleaginous fruits	5.99	3. Lime, cement, fabrication of construction materials	8.80
4. Motor vehicles for transport of goods	4.97	4. Sugar, molasses and honey	5.67
5. Crude vegetable materials.	4.82	5. Sugar, molasses and honey	5.26

*Data source:* UNCTAD, 2020

### 3. LITERATURE REVIEW

Theoretically, the creation of relevant trade blocks can raise efficiency, economic growth and well-being among its members (Viner, 1950). This understanding has been relayed by authors like Schiff and Winters (2002) who have argued that Free Trade Areas (FTAs) change the prices of imports for partner states as a result of reduction or phasing of tariffs. Hence, the effective reduction of price changes the patterns of demand which may lead to adjustment of output and trade flows (trade creation and diversion). Moreover, when barriers are dropped, markets enlarge giving more efficient producers' entry into countries where prices are artificially high as a result of duties and other trade barriers (Othieno and Shinyekwa, 2011).

Empirically, we can note that several studies have examined the overall effects of trade liberalisation on an economy or a region. Some of those studies have analysed the revenue implication (Masiya, 2019) whereas others have examined the effect on trade creation and diversion (Bayale *et al.*, 2020; Wonyra and Bayale, 2020; Lang, 2006). Still others have examined its effect on consumer welfare (Abrego *et al.*, 2019; ECA, 2019). For instance, Lang (2006) analysed the impact of the full liberalisation of imports from the EU to the Economic Community of West African States (ECOWAS) using World Integrated Trade Solution–Single Market Partial Equilibrium Simulation Tool (WITS-SMART) model. The result has shown that trade creation by far outweighs trade diversion. Total EU exports to the ECOWAS surged by US\$ 1.8 billion. However, more than US\$ 365 million was diverted in favour of less efficient EU producers. Also, tariff revenues were reduced by the agreement, specifically in Ghana and Guinea-Bissau.

Following the coming into force of the AfCFTA, a recent work of ECA (2019) on the empirical assessment of AfCFTA modalities on goods relying on CGE modeling found that the implementation of the AfCFTA by African countries would be beneficial in terms of the increase of GDP, trade and welfare. More specifically, the preference and the application a double qualification approach to liberalise trade in goods under the AfCFTA offers greater opportunities to industrialise through trade. In line with ECA's (2019) study, Abrego *et al.* (2019), estimated the welfare gain of AfCFTA on Africa by applying a general equilibrium model. Abrego *et al.*'s (2019) results revealed significant potential welfare gains from trade liberalisation in Africa. They further argued that as intra-regional import tariffs in the continent are already low, the bulk of these gains would come clearly from lowering Non-Tariff Barriers (NTBs).

At the country level, Guei *et al.* (2017) have evaluated the impact of a Free Trade Agreement (FTA) with the European Union (EU) and South Africa using international trade data for 2012 available in the WITS-SMART model to assess bilateral trade agreement between the European Union and South Africa. The findings of the study revealed that total trade effects in South Africa are likely to surge by US\$ 1.04 billion with a total welfare valued at US\$ 134 million. Elimination tariffs on all EU goods would be beneficial to consumers through net trade creation. Moreover, total trade creation would be US\$ 782 million. However, South African producers are likely to contribute a trade diversion of US\$ 254 million which has a negative impact on consumer welfare. Moreover, results revealed that the country might experience a revenue loss amounting to US\$ 562 million because of the removal of tariffs.

In Uganda, Othieno and Shinyekwa (2011) investigated the effects of the East African Community Customs Union Principle of Asymmetry on the country with regard to trade, welfare and revenue effect since 2005. The end of tariff reduction increased trade creation and welfare effects. This effect was reflected in consumer surplus in terms of reduced prices. Tariff reduction implies government revenue loss. In addition, the diversion effect that resulted from the Common External Tariff (CET) on respective products such as woven cotton fabric, soap products and paints vanished. A similar result was found by Mugano *et al.* (2013). They conducted a study on the impact of a South African Development Community (SADC) Customs Union on Zimbabwe. The WITS-SMART model was used for the study. The findings reported that trade expansion valued at US\$ 39 million and consumer welfare at US\$ 7 million. In trade, Zimbabwe's exports were expected to fall by 0.94%, while imports were expected to surge by 2.05%. However, the country lost revenue amounted to US\$ 42 million.

Masiya (2019) analysed the potential revenue implications of AfCFTA in Malawi using SMART model. The author observed that Malawi is likely to benefit from joining the AfCFTA through trade creation. However, revenue losses were imminent and more pronounced for capital goods. These findings are in line with those of Bayale *et al.* (2020) and Wonyra and Bayale (2020). These authors examined the AfCFTA impact on Ghana and Togo, respectively. Findings showed that the FTA within Africa countries would result in both trade creation and trade expansion effects as well as wellbeing improving. However, countries might also experience a revenue loss.

It clearly emerges from the literature review that the studies have revealed mixed findings on the trade, revenue and welfare implications of trade liberalisation in Africa. In Chad, an empirical evaluation of the subject seems to be non-existent even though the country has already signed and ratified the AfCFTA. This study attempts to draw lessons from the data to simulate the potential impact such an agreement would have on trade creation, trade diversion, revenue implications and welfare effects resulting from the implementation of the AfCFTA.

## **4. METHODOLOGY**

### **4.1. Data and simulation scenario**

In this paper, we rely on the 2018 World Integrated Trade Solution–Single Market Partial Equilibrium Simulation Tool (WITS–SMART) dataset for Chad as it harmonises the schedule nomenclature. Our choice for 2018 is based on the fact that it is the most recent period where data is available. The trade data are the actual reported figures (in US\$) as captured at customs given the different product levels. This data has information on various merchandise trade and tariffs. Its compiled by the World Bank in collaboration with the United Nations Conference on Trade and Development (UNCTAD) through the Trade Analysis Information System (TRAINS), International Trade Center (ITC), United Nations Statistical Division (UNSD) and World Trade Organization (WTO) through the Integrated Data Base (IDB) which provides data on the consolidated tariff schedule. To the extent that the AfCFTA aims to fully liberalise the African market, we invoke a 100% tariff reduction for all products at the HS–6 level. It imperative to note that findings would not necessarily reflect the exact outcome of the AfCFTA, but allow one to distinguish the products and sectors where the impact is greatest. This may help Chad to finalise its tariff offer by distinguishing the most sensitive products from which country may want to benefit by receiving a special and differentiated treatment in the AfCFTA process.

### **4.2. WITS-SMART simulation model**

To achieve the aim of this study, we follow Zafar (2005), Jallab *et al.* (2007) and Bayale *et al.* (2020) who employed the World Integrated Trade Solution - Single Market Partial Equilibrium Simulation Tool (WITS-SMART) model to analyze the FTAs implications for Niger, Morocco and Ghana, respectively. We use a



partial equilibrium (PE) model instead of a general equilibrium model (CGE) because it allows detailed trade analysis involving multilateral tariff changes and preferential trade liberalization. It relies on relatively few assumptions and can provide very detailed results, at the individual product level and for each country with data. Moreover, the data requirements for PE are less demanding than for CGE. However, a PE represents only the immediate short-run impact of trade liberalization and does not model macroeconomic adjustments, such as changes to the exchange rate.

The derivation of the model begins with a basic trade model composed of simplified import demand, export supply functions and an equilibrating identity. Indeed, a simplified import demand function for country  $j$  from country  $k$  of commodity  $i$ :

$$M_{ijk} = f(Y_j, P_{ij}, P_{ik}) \quad (\text{i})$$

The export supply function of commodity of country can be simplified as:

$$X_{ijk} = f(P_{ijk}) \quad (\text{ii})$$

The equilibrium in the trade between the countries is the standard partial equilibrium equation:

$$M_{ijk} = X_{ijk} \quad (\text{iii})$$

In a free trade environment, the domestic price of the commodity in country from country would change with the change in an ad valorem tariff as follows:

$$P_{ijk} = P_{ikj} (1 + t_{ikj}) \quad (\text{iv})$$

In order to get the price equation, differentiating we obtain:

$$dP_{ijk} = P_{ikj} dt_{ikj} + (1 + t_{ikj}) dP_{ikj} \quad (\text{v})$$

Equations (iv) and (v) are substituted into the elasticity of import demand function:

$$\Delta M_{ijk} = \alpha_i^m \left[ \frac{\Delta P_{ijk}}{\Delta P_{ijk}} \right] \quad (\text{vi})$$

Using this, one obtains:

$$\frac{\Delta M_{ijk}}{M_{ijk}} = \alpha_i^m \left[ \frac{dt_{ijk}}{(1+t_{ijk})} + \frac{dP_{ijk}}{P_{ijk}} \right] \quad (\text{vii})$$

Using this, one can arrive at the trade creation equation:

$$TC_{ijk} = M_{ijk} \alpha_i^m \frac{dt_{ijk}}{(1+t_{ijk})[1 - (\alpha_i^m / \gamma_i^m)]} \quad (\text{viii})$$

where  $TC_{ijk}$  is the sum of trade created in millions of dollars over  $i$  commodities affected by tariff change and  $\alpha_i^m$  is the elasticity of import demand for commodity  $i$  in the importing country (Chad in this case) from the relevant trading partner.

$M_{ijk}$  is the current level of import demand of the given commodity  $i$ , while  $t_{ijk}^0$  and  $t_{ijk}^1$  represent tariff rates for commodity  $i$  at the initial and end periods, respectively.

According to the SMART model, trade creation depends on the current level of imports, the import demand elasticity, and the relative tariff change and occurs when there is a shift from higher cost producer to lower cost producer as a result of elimination of tariffs on imports from the partner. Conceptually, the trade creation effect is caused by the extra output produced by Chad due to an increase in imports from Africa (the other African countries). If  $\gamma$  approaches infinity, then equation (viii) can be simplified as follows:

$$TC_{ijk} = \alpha_i^m M_{ijk} = \frac{(1+t_{ijk}^1) - (1+t_{ijk}^0)}{(1+t_{ijk}^1)} \quad (\text{vii})$$

The elasticity of substitution is expressed as the percentage change in relative shares of imports from two different sources due to a 1 % change in the relative prices of the same product from the two sources. Conceptually, the elasticity of substitution is a measurement of the ease with which various imports can be substituted for one another. Technically, it is measured as the slope of the import isoquant:

$$\sigma_M = \frac{\Delta(\Sigma(M_{ijk} / M_{ijk}) / \Sigma(M_{ijk} / M_{ijk}))}{\Delta(P_{ijk} / P_{ijk})(P_{ijk} / P_{ijk})} \quad (\text{x})$$

In this equation, denotes imports from Africa and denotes imports from the rest of the world (ROW). Trade diversion occurs when an efficient producer

from outside the FTA is displaced by less efficient producers in the preferential area. Essentially, trade diversion depends on the current level of imports from Africa and the ROW ( $M^{AFRI}$  and  $M^{ROW}$ ), the percentage change of tariffs ( $t_{AFRI}^0$  and  $t_{AFRI}^1$ ) facing other African countries' imports with those from ROW remaining unchanged, and the elasticity of substitution of the imports between the Africa and ROW into the concerned country. In the SMART framework, the trade diverted to the other African countries in the FTA can be expressed as:

$$TD^{AfCFTA} = \frac{M^{AFRI} M^{ROW} [(1 + t_{AFRI}^1 / 1 + t_{AFRI}^0) - 1] \sigma_m}{M^{AFRI} + M^{ROW} + M^{AFRI} [(1 + t_{AFRI}^1 / 1 + t_{AFRI}^0) - 1] \sigma_m} \quad (xi)$$

The strength of trade diversion depends on whether one assumes that goods are perfectly substitutable or whether goods are imperfectly substituted and whether calculations are made at official rates or on actual collected rates (Stern *et al.*, 1976; Wonyra and Bayale, 2020).

With regard to revenue effects as result of AfCFTA, it imperative to note that the tariff revenue is the product of the tariff rate and the tariff base (value of imports). Thus, before the change in the ad valorem incidence of trade barriers, the revenue is given as  $R_0$  :

$$R_0 = \sum_i \sum_k t_{ijk}^0, P_{ijk}, M_{ijk} \quad (xii)$$

After the change in tariff rate, the new revenue collection will be given by  $R_1$ :

$$R_1 = \sum_i \sum_k t_{ijk}^1, P_{ijk}, M_{ijk} \quad (xiii)$$

The revenue loss (RL) as a result of the implementation of an AfCFTA is difference between  $R_1$  and  $R_0$  which is:

$$RL = \sum_i \sum_k \Delta t_{ijk}^0, P_{ijk}, M_{ijk} \quad (xiv)$$

Beyond the trade and revenue effects, the AfCFTA is also expected to have welfare gains where consumers in Chad enjoy as a result of lower import prices. The FTA allows consumers to substitute relatively expensive domestic or imported commodities with cheaper ones that are affected by the tariff reductions. Thus, the higher imports potentially leads to a gain in consumer welfare which can be summarized as:

$$W_{ijk} = 0.5 (\Delta t_{ijk} \Delta M_{ijk}) \quad (xv)$$

where  $W_{ijk}$  is the consumer welfare while the 0.5 measures the average difference of the tariff before and after their elimination. By assuming an infinite elasticity of export supply (Bayale *et al.*, 2020; Wonyra and Bayale, 2020), import prices in Chad will fall by less than that of the full liberalization of the markets.

## 5. FINDINGS AND DISCUSSIONS

This section presents and discusses the findings from the study based on the WITS-SMART model. We examine the economic impact of the AfCFTA on trade in Chad. More specifically, we focus on the determination of the trade creation and trade diversion (trade effects), imports, exports, revenue and welfare effects of the implementation of the AfCFTA.

### 5.1. Trade effects

As explained in the methodology, in the context of the FTA, trade creation occurs when the removal of tariffs changes the prices of imported goods, such that less efficient domestic production is replaced by imports from members of the FTA whose products are now cheaper with the tariff's removal. Regarding trade diversion, it occurs after the formation of a free trade area, the elimination of tariffs leads to a substitution of goods from countries that are not part of the FTA but are more efficient than the goods from countries that form the free trade area (Milner *et al.*, 2005; Guei *et al.*, 2017; Wonyra and Bayale, 2020). In the case of this study, it can be seen from Table 3 that the net trade effect of US\$ 13.33 million from other African countries is expected in Chad. Trade creation which is 83.31% of the total trade effect is expected to outweigh trade diversion which is 16.69% of the total trade effect (Table 3). Undeniably, the AfCFTA would have a positive total trade effect. This would be welfare improving in Chad, because consumers of the imports whose prices fall would enjoy the goods at a lower cost. These findings are in line with the research of Guei *et al.* (2017) on the impact of FTA between EU and South Africa. They find very positive trade effects for South Africa in this Agreement. Similar results were found by Bayale *et al.* (2020) when assessing the AfCFTA impact in Ghana. Authors have found that Ghana is likely to benefit from joining the AfCFTA in terms of consumers' welfare.

The top 15 products with highest potential trade creation in Chad are presented in Table 3. As it can be seen, trade creation that is spread across tariff

**Table 3: Potential trade creation and trade diversion effects of the African Continental Free Trade area AfCFTA Agreement on Chad (US\$ 000)**

<i>Trading partner</i>	<i>Trade creation</i>	<i>Trade diversion</i>	<i>Trade effects</i>
African countries	11,105.485	2,224.853	13,330.328

*Source:* Output from WITS-SMART model

lines is not identical due to the level of disaggregation of products. The products that bear the largest trade creation varies and includes tobacco and partly or wholly stemmed or stripped, furnishing articles, cement clinkers, fish preparations, sardines, sardinella and brisling or sprats (prepared or preserved) and Iron or steel valued at 6.51% of total trade creation, followed by footwear, vegetable oils, oils and their fractions and bulldozers and angledozers, petroleum oils and oils from bituminous minerals, plastics and vegetable saps and extracts (Table 4). These findings are not only consistent with Geui *et al.* (2017), but also akin to the study of Lang (2006) on the impact of an FTA with the EU on ECOWAS countries. Lang (2006) also finds that the products that bore the highest trade creation in the ECOWAS countries included vehicles and parts, and clothes. For

**Table 4: Top 15 products with highest potential trade creation effects for Chad (US\$ 000)**

<i>HS-6</i>	<i>Product description</i>	<i>Trade total effects</i>	<i>Trade creation</i>
240120	Tobacco; partly or wholly stemmed or stripped	2,916.312	2,916.312
630491	Furnishing articles	2,189.482	2,184.262
252310	Cement clinkers (whether or not coloured)	1,846.59	1,846.25
160413	Fish preparations; sardines, sardinella and brisling	353.284	353.118
730661	Iron or steel (excluding cast iron); tubes, pipes	229.464	196.875
640351	Footwear; n.e.c. in heading no. 6403	198.734	196.505
151000	Vegetable oils; oils and their fractions	199.133	187.65
842919	Bulldozers and angledozers; self-propelled	228.367	181.644
271019	Petroleum oils and oils from bituminous minerals	344.652	180.202
391723	Plastics; tubes, pipes and hoses thereof, rigid	223.084	170.522
130219	Vegetable saps and extracts	141.151	140.274
330290	Odoriferous substances and mixtures	227.766	123.162
200990	Juices; mixtures of fruits or vegetables	274.876	113.941
830241	Mountings, fittings and similar articles	119.442	104.69
842951	Front-end shovel loaders	62.903	55.778

*Source:* Output from WITS-SMART model

Wonyra and Bayale (2020), the products that bore the highest trade creation in Togo as part of the implementation of the AfCFTA included paper, paperboard, aluminium, vehicles, coal, fertilisers, petroleum, propylene and food.

Regarding trade diversion effect, the study presents the top 15 most vulnerable products to trade diversion in Table 3. We realised that the most sensitive products to trade diversion are petroleum oils and oils from bituminous minerals, juices and mixtures of fruits or vegetables, odoriferous substances, mixtures and insulated electric conductors. These products are about 33.93% of the total trade diversion (Table 5). This information is of great importance to Chad in their negotiation process. Chad would be importing from higher-cost producers within Africa. These results seem to be in line with the study of Lang (2006) on the ECOWAS-EU FTA, where most trade diversion loss in ECOWAS was because of petroleum and oil products. Our findings are also consistent with Wonyra and Bayale (2020) whose studies highlight odoriferous substances, coal, vehicles, petroleum oils and oils as one of the top products with the highest trade diversion for Togo when the country will implement the AfCFTA.

**Table 5: Top 15 most vulnerable products to potential trade diversion for Chad (US\$ 000)**

<i>HS-6</i>	<i>Product description</i>	<i>Trade total effect</i>	<i>Trade diversion</i>
271019	Petroleum oils and oils from bituminous minerals	518.487	248.391
200990	Juices; mixtures of fruits or vegetables	274.876	160.936
330290	Odoriferous substances and mixtures	227.766	104.604
854449	Insulated electric conductors; for a voltage	123.025	83.516
640399	Footwear; n.e.c. in heading no. 6403	109.819	54.614
391723	Plastics; tubes, pipes and hoses thereof, rigid	223.084	52.562
330499	Cosmetic and toilet preparations	83.221	51.758
190219	Food preparations; pasta, uncooked, not stuffed	71.536	50.558
842919	Bulldozers and angledozers; self-propelled	228.367	46.722
110100	Wheat or meslin flour	73.374	43.175
848180	Taps, cocks, valves and similar appliances	61.535	32.77
730661	Iron or steel (excluding cast iron)	229.464	32.589
640419	Footwear (other than sportswear) materials	36.574	25.38
852871	Reception apparatus for television	40.952	22.94
940360	Furniture; wooden, other than for office	33.437	21.842

*Source:* Output from WITS-SMART model

*Note:* In this table, only the last column (Trade diversion) is interpreted. The products are ranked in descending order with respect to their ability to increase trade diversion. The total trade effect column is just indicative.

## 5.2. Revenue implication

Given the import–dependent nature of Chad, import tariffs constitute a major source of government revenue. The international trade revenue plays a key role in government domestic revenue mobilisation. However, the implementation of the AfCFTA implies the removal of import tariffs as countries aim for full liberalisation of their markets. Thus, while the FTA promises to create trade, there are also potential revenue losses. The Table 4 exhibits the top 15 largest potential losses in Chad products revenue after the AfCFTA with other African countries. It can be observed from that table that, after the full implementation of the AfCFTA, Chad would see revenue (import tariff revenues) fall by US\$ 6.12 million. Furnishing articles, tobacco, juices and mixtures of fruits or vegetables, petroleum oils and cement clinkers would account for most of the government revenue loss when Chad fully commits to this Agreement (Table 6). This evidence is consistent with existing studies (see for instance, Othieno and Shinyekwa, 2011; Mugano *et al.*, 2013; Guei *et al.*, 2017). Similar findings are also observed in studies of Masiya (2019), Bayale *et al.* (2020) and Wonyra and Bayale (2020) using Malawi, Ghana and Togo,

**Table 6: Top 15 largest potential losses in Chad products revenue after the AfCFTA Agreement with Africa (US\$ 000)**

<i>HS-6</i>	<i>Product description</i>	<i>Revenue loss</i>	<i>% of total loss</i>
630491	Furnishing articles	-1,053.097	17.211
240120	Tobacco; partly or wholly stemmed or stripped	-763.668	12.481
200990	Juices; mixtures of fruits or vegetables	-289.005	4.723
271019	Petroleum oils and oils from bituminous minerals	-247.094	4.038
160413	Fish preparations; sardines, sardinella and brisling	-209.386	3.422
252310	Cement clinkers (whether or not coloured)	-140.019	2.288
640399	Footwear; n.e.c. in heading no. 6403, outer soles	-137.295	2.244
330290	Odoriferous substances and mixtures	-130.165	2.127
391723	Plastics; tubes, pipes and hoses thereof, rigid	-117.179	1.915
130219	Vegetable saps and extracts	-107.347	1.754
854449	Insulated electric conductors; for a voltage	-102.957	1.683
190219	Food preparations; pasta, uncooked, not stuffed	-98.882	1.616
330499	Cosmetic and toilet preparations	-78.091	1.276
730890	Iron or steel; structures and parts thereof	-76.462	1.249
842920	Graders and levellers	-70.285	1.148
Other	Other products not specified above	-2497.95	40.823
Total	-	-6,118.882	100

*Source:* Output from WITS-SMART model

respectively as cases. Beyond the impact on revenue, what are the possible effect of the AfCFTA on consumer welfare? We address this question in the next subsection.

### 5.3. Welfare effects

One of the key arguments of the proponents of AfCFTA is that, by removing tariff as a barrier to free trade, the free flow of goods results in lower prices which is welfare-enhancing. However, FTA spurs welfare if trade creation is sufficiently higher than trade diversion. Results based on Table 7 shows a higher trade creation relative to trade diversion suggesting that, implementation of the AfCFTA will potentially improve consumer welfare. In Table 7, we presented the top 15 products with highest potential consumer welfare in Chad after the AfCFTA. The total consumer surplus in Chad would be estimated at US\$ 1.13 million. It is assumed that other African countries' exporters and Chad importers

**Table 7: Top 15 products with largest potential consumer welfare after the AfCFTA Agreement with Africa (US\$ 000)**

<i>HS-6</i>	<i>Product description</i>	<i>Welfare</i>	<i>% of total welfare</i>
630491	Furnishing articles	328.258	29.078
240120	Tobacco; partly or wholly stemmed or stripped	145.816	12.917
252310	Cement clinkers (whether or not coloured)	92.375	8.1828
160413	Fish preparations; sardines, sardinella and brisling	52.985	4.694
391723	Plastics; tubes, pipes and hoses thereof, rigid	32.528	2.881
151000	Vegetable oils; oils and their fractions	31.963	2.831
640351	Footwear; n.e.c. in heading no. 6403	29.731	2.634
830241	Mountings, fittings and similar articles	26.568	2.353
730661	Iron or steel (excluding cast iron	24.518	2.172
200990	Juices; mixtures of fruits or vegetables	23.696	2.099
271019	Petroleum oils and oils from bituminous minerals	23.492	2.081
842919	Bulldozers and angledozers; self-propelled	14.055	1.245
330290	Odoriferous substances and mixtures	9.734	0.862
190219	Food preparations; pasta, uncooked, not stuffed	9.509	0.842
854449	Insulated electric conductors	8.227	0.729
Other	Other products not specified above	275.438	24.399
Total	-	1,128.893	100

*Source:* Output from WITS-SMART model



would pass the benefit of tariff reduction. Hence, the impact of full liberalisation on Chad would lead to the estimated consumer surplus. Chad consumers would be able to purchase other African countries goods at cheaper prices, thus obtaining an improvement in their standard of living. These results are consistent with those of Jallab *et al.* (2007), on the impact of FTA between the US and Morocco. Authors have found that the agreement led to a total welfare gain by Moroccan consumers because they had access to goods at lower prices. According to Table 7, the group of products that would induce the highest potential welfare gains are furnishing articles (29.08%), tobacco (12.92%), cement clinkers (8.18%), fish preparations (4.69%), followed by plastics, vegetable oils, footwear, mountings, fittings and similar articles and Iron or steel. Bayale *et al.* (2020) find a similar result when analysing the potential impact of the AfCFTA in Ghana. In this specific case, the authors find that the group of products yielding the highest welfare gains include cement clinkers and fish preparations.

#### 5.4. The impact of AfCFTA Agreement on Chad exports

One of the research questions answered in this paper is related to how much will increase Chad exports after the implementation of the AfCFTA. In table 8 below, we exhibit the potential effect of the AfCFTA on Chad exports. It can be observed that Chad exports are expected to increase by US\$ 13.33 million after the implementation of AfCFTA.

**Table 8: The potential impact of the African Continental Free Trade Area Agreement on Chad exports (US\$ 000)**

<i>Trading partner</i>	<i>Exports before AfCFTA</i>	<i>Exports after AfCFTA</i>	<i>Export change in revenue</i>
African countries	36,604.252	49,934.582	13,330.328

*Source:* Output from WITS-SMART model

Beyond these results, we look at the effect of exports on the individual other African countries because, for negotiation purposes, it is interesting to look at how these countries would benefit from the implementation of AfCFTA by Chad. Thus, the increase in exports of individual other African countries is presented in Table 9. Therefore, it can be seen from that table that the positive gain is recorded in all African countries (Chad African partners). However, some countries such as Senegal, Tunisia, Morocco, Egypt, Tanzania and Nigeria would benefit more than Rwanda, Zimbabwe or Namibia.

**Table 9: Potential increase in exports of individual African countries after AfCFTA Agreement implemented by Chad (US\$ 000)**

N°	Partner countries	Exports before AfCFTA	Exports after AfCFTA	Exports change in revenue
1	Senegal	13,635.709	17,348.775	3,713.065
2	Tunisia	6,878.377	8,964.299	2,085.922
3	Morocco	4,186.185	7,122.966	2,936.78
4	Egypt, Arab Rep	5,352.332	6,563.166	1,210.834
5	Tanzania	3,510.084	5,702.189	2,192.105
6	Nigeria	3,448.991	5,332.612	1,883.621
7	Cameroon	3,007.214	4,601.336	1,594.122
8	Congo	2,894.005	3791.309	897.304
9	Togo	1,009.454	1,410.522	401.068
10	Gabon	987.251	1,296.479	309.228
11	South Africa	935.917	1,226.208	290.283
12	Central African Rep.	871.325	1,772.164	300.839
13	Benin	723.307	1,083.28	359.973
14	Ghana	131.053	217.041	85.988
15	Ethiopia	138.018	151.622	13.604
16	Mauritius	61.676	96.256	34.58
17	Niger	23.527	26.271	2.744
18	Algeria	15.886	18.514	2.628
19	Rwanda	1.575	1.965	0.39
20	Zimbabwe	1.151	1.514	0.363
21	Namibia	0.001	0.002	0.001

*Source:* Output from WITS-SMART model

*Note:* Trade data that quantifies 2018 trade relations between Chad and countries like Cote d'Ivoire, Mauritania, Burkina Faso, Guinée-Bissau, Mozambique, Congo. Dem. Rep, Equatorial Guinea, Liberia, Kenya, Angola, Mali, Guinea, Libya, Uganda, Gambia, Sudan, Madagascar, Botswana, Burundi, Cabo Verde, Comoros, Djibouti, Eritrea, Eswatini, Lesotho, Malawi, Sahara Republic, Sao Tomé and Príncipe, Seychelles, Sierra Leone, Somalia, South Sudan and Zambia is not available.

### 5.5. The impact of AfCFTA agreement on Chad imports

Turning to imports, we find that, while imports before AfCFTA measured at US\$ 519,699.16 billion, the liberalisation of the African markets owing to the AfCFTA will lead to an increase in imports of about US\$ 11.105 million. For most part, the increase in imports is as a result of trade creation. By juxtaposing

the changes in exports and imports on account of the free trade, we observe that the value of exports (Table 8) is sufficiently higher than that of imports. Thus, the implementation of the AfCFTA will by far improve Chad's trade balance.

**Table 10: The potential impact of the African Continental Free Trade Area Agreement on Chad imports (US\$ 000)**

<i>Trading partner</i>	<i>Imports before AfCFTA</i>	<i>Imports after AfCFTA</i>	<i>Change in Imports</i>
African countries	519,699.166	530,804.651	11,105.485

*Source:* Output from WITS-SMART model

While Table 10 presents evidence on the potential changes in imports, in Table 11 below, we exhibit Chad's top 15 import products. From the Table, we find that among the top 15 potential imports from the other African countries after the AfCFTA, medicaments (US\$ 32.99 million), wheat or meslin flour (US\$ 16.45 million), Zinc (US\$ 14.71 million), plastics (US\$ 13.49 million), food preparations (US\$ 12.50 million), vaccines for human medicine (US\$ 12.23 million), footwear (US\$ 11.14 million), petroleum oils and oils from bituminous minerals (US\$ 10.25 million), vehicles for transport of persons (US\$ 10.17 million), tobacco (US\$ 7.64 million).

**Table 11: Chad's top 15 potential imports from the AfCFTA Agreement (US\$ 000)**

<i>HS-6</i>	<i>Product description</i>	<i>Value</i>
300490	Medicaments; consisting of mixed or unmixed products	32,994.332
110100	Wheat or meslin flour	16,449.857
790700	Zinc; articles n.e.c. in chapter 79	14,708.892
392690	Plastics; other articles n.e.c. in chapter 39	13,492.118
210690	Food preparations; n.e.c. in item no. 2106.10	12,500.424
300220	Vaccines; for human medicine	12,229.086
640299	Footwear; n.e.c. in heading no uppers of rubber or plastics	11,139.113
271019	Petroleum oils and oils from bituminous minerals	10,252.191
870390	Vehicles; for transport of persons n.e.c. in heading no. 8703	10,146.623
240120	Tobacco; partly or wholly stemmed or stripped	7,636.679
310520	Fertilizers, mineral or chemical	7,125.623
380891	Insecticides; other than containing goods	6,633.114
620443	Dresses; women's or girls', of synthetic fibres	5,270.999
401110	Rubber; new pneumatic tyres, of a kind used on motor cars	5,258.431
630900	Clothing; worn, and other worn articles	4,587.03
Other	Other products not specified above	349,274.654
Chad	Imports	519,699.166

*Source:* Output from WITS-SMART model

The results that are presented and explained below were obtained under the assumption that the elasticity of supply is considered infinite as much as the market partners are price-takers, and changes in demand are met with adjustments in quantities. The value considered for the elasticity of substitution, which determines the degree of substitution between different varieties of goods, according to the exports partner is 1.5 for each product. The supply elasticities are deemed to be infinite (equal to 99) because Chad is a small market and some of the exporters (other African countries) consist of little more industrialised economies. Hence, an increase in demand for a given good will always be matched by the producers and exporters of that good without any impact on the price of the good. However, Stern *et al.* (1976) revealed that in WITS-SMART analysis, the import demand elasticity can vary at the HS-6 level. That is why, we evaluate the robustness of the results by using the lower, upper- and worst-case scenarios, as shown in the next section.

### 5.6. Further sensitivity and robustness checks

In this subsection, we conduct some sensitivity analysis by varying the elasticity of substitution and gauging the pattern of trade. In order to test the robustness of the results over a reasonable range, we modify the parameter values (substitution and export supply elasticities) as suggested by existing studies (Mugano, 2013; Guei *et al.*, 2017; Bayale *et al.*, 2020; Wonyra and Bayale, 2020). We first run a base case simulation using elasticities from Armington. We rerun the simulation under varying assumptions. For this purpose, lower and upper bound limits were established for different elasticities (Table 12).

**Table 12: Elasticities used for sensitivity and robustness checks.**

<i>Elasticities</i>	<i>Base case</i>	<i>Worst case</i>	<i>Lower bound</i>	<i>Upper bound</i>
Substitution	1.5	6	1	2.5
Export supply	99	99	87	99

*Source:* Based on WITS-SMART model calibration

The results of these robustness and sensitivity analyses of the implementation of AfCFTA on trade creation, tariff revenue, welfare, imports and exports in Chad are exhibited in Table 13. By reducing elasticity of substitution from 1.5 to 1<sup>1</sup> (World Bank, 2010), changes occur in the trade creation from the base case. For instance, trade creation increases by 30.51%<sup>2</sup>. However, when elasticity of substitution is increased to 2.5 and 6, trade creation

reduces by 92.07% and 84.77% respectively (Table 13). Interestingly, Chad's total imports do not change significantly given the 2.09% change.

**Table 13: Robustness and sensibility analysis of the AfCFTA Agreement on trade creation, revenue, welfare, exports and imports (US\$ 000 & % of change)**

<i>Effects</i>	<i>Base case</i>	<i>Worst case</i>	<i>Lower bound</i>	<i>Upper bound</i>
Trade creation	11,105.485	880.665	14,493.768	1,691.365
Revenue loss	-6,118.882	-7,900.701	-3,744.756	-7,345.106
Welfare	1,128.893	1,040.387	1,174.162	1,097.848
Exports (%)	36.417	72.199	7.083	-5.008
Imports (%)	2.136	2.897	2.094	2.991

*Source:* Output from WITS-SMART model

It is imperative to note that, the reduction of trade elasticity value to 1 has a positive effect on revenue as revenue loss reduces by 3.88%. On the contrary, if the elasticity of substitution is increased to 2.5 and 6, revenue losses would increase by 20.04% and 29.12% respectively, showing that the deviations from the middle ground are important. Hence, the middle ground estimates seem to be very close to the potential sizes. If the substitution and export supply elasticities are reduced to 1 and 87 respectively, welfare increased 3.27 %. By fixing that elasticity to 2.5 and 6, welfare would reduce by 2.75% and 7.84% (Table 13). Moreover, it is expected an increasing in exports by 7.08% from base case. In the upper bound, exports would decrease by 5.01% and in the worst case, exports would increase by 72.19% (Table 13). Accordingly, the middle ground estimates again resemble potential sizes. Regarding Chad's imports sensitivity analysis, the table shows that there is almost no change in imports from the base case (Table 13). Similar to the earlier finding, Chad's total change in imports remain almost the same in value, going from 2.89% to 2.99%.

## 6. CONCLUSION AND POLICY IMPLICATIONS

In this paper, we applied a partial equilibrium simulation with disaggregated trade data for 2018 to analyse implications of the implementation of the AfCFTA on Chad in terms of trade, revenue and welfare. Our findings have shown that the FTA within Africa countries would result in both trade creation and trade expansion effects. Trade creation effects represent 83.31% of the overall trade effect, largely exceeding trade diversion effects (16.69%).

Particularly, the trade creation is spread across a large variety of goods or groups of products such as tobacco and partly or wholly stemmed or stripped, furnishing articles, cement clinkers, fish preparations; sardines, sardinella and brisling or sprats (prepared or preserved) and Iron or steel. Footwear, vegetable oils, oils and their fractions and bulldozers and angledozers, petroleum oils and oils from bituminous minerals, plastics and vegetable saps and extracts are also part of these products. With regards to trade diversion effects, it seems relatively insignificant. It is 17% of the whole trade total effect. However, Chad has to take these particular products into account when defining his tariff offer and when negotiating with its partners in Africa. This notwithstanding, it is imperative to note that imports from other African countries to Chad would increase by approximately US\$ 11.11 million. Moreover, exports of Chad partners in Africa would increase (Table 9). These findings are in line with the intention of the AfCFTA which is to expand trade in Africa.

In terms of government revenue, the implementation of the AfCFTA by Chad would result in a government revenue loss of US\$ 6.12 million and a welfare gain of US\$ 1.13 million. It appears that consumer surplus would be largely improved by the lowering of the prices of Furnishing articles, tobacco, cement clinkers, fish preparations, plastics and tubes, vegetable oils, footwear, mountings, fittings and similar articles, iron or steel, juices, mixtures of fruits or vegetables, petroleum oils and oils from bituminous minerals, bulldozers and angledozers, odoriferous substances and mixtures, food preparations and insulated electric conductors. Clearly, although the AfCFTA may have some negative effects on Chad's economy in terms of tariff revenue, its implementation is welfare-enhancing stemming from improved consumer surplus. As presented, Chad exports are expected to increase by US\$ 13.33 million. Therefore, the net gain resulting from the implementation of the AfCFTA will be positive for Chad.

However, based on revenue loss findings, the study recommends that, in AfCFTA negotiations, and when defining and finalizing its tariff offer, Chad should be given a longer period of liberalisation in addition to keeping some reasonable percentage of tariff lines for sensitive and excluded products, obtainable by a small group of least developing countries like Chad (ECA, 2018). Doing this can help Chad to mitigate revenue loss occurred on some products such as furnishing articles, tobacco, juices, mixtures of fruits or vegetables, petroleum oils, fish preparations and cement clinkers.

The method employed in this study has a limitation. The partial equilibrium model used ignores the second-round effects. In particular, it does not consider impacts of policy reforms on the wider economy, as well as intersectoral implications and exchange rate effects. Dynamic linkages and market feedbacks can be captured in general equilibrium models. Hence, exploring the impact of the AfCFTA on Chad's economy using the general equilibrium model should be an important avenue for future research, and help with more precise and comprehensive policy prescriptions.

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### ***Notes***

1. Substitution elasticity is the substitution elasticity value between partners. SMART uses 1.5 as the default value. The value can be changed but is unique for a given product. Substitution elasticity is irrespective of the partner (World Bank, 2010).
2. The changes are calculated with reference to the base case simulation results. For instance, this change in trade creation is computed as  $\frac{(14,493.768 - 11,105.485)}{11,105.485} * 100$ .

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