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The Effects of the African Continental Free Trade Agreement on Africa's Regional Economic Communities: An Empirical Analysis

Abstract

This study examines the economic effects of the African Continental Free Trade Agreement (AfCFTA) on three regional economic communities in Africa: COMESA, ECOWAS, and CEMAC. It scrutinizes the effects of the agreement on Africa's largest trading partners: the EU, China, and America. Three scenarios are modelled using the GTAP CGE model: a removal of tariffs on 97% of goods, a removal of non-tariff barriers, and a combination of the previous two scenarios. The findings show that the welfare of all African regions increases due to AfCFTA, but to varying degrees, with CEMAC benefiting the least of the three regional blocs.

Keywords

AfCFTA, Free Trade, Tariffs, Non-Tariff Barriers, Africa, COMESA, ECOWAS, CEMAC

1. Introduction

The African Continental Free Trade Agreement (AfCFTA), which came into force in May of 2019, is currently the world's largest free trade zone (based on number of countries) since the founding of the World Trade Organization in 1995. As of writing, 54 out of 55 African countries have signed the agreement, with the only non-signatory being Eritrea. The free trade area comprises 1.3 billion people, encompassing a \$3.4 trillion economic bloc. As part of the agreement, trade will be gradually liberalized through the removal of tariffs on most goods across Africa. In addition, AfCFTA seeks to progressively eliminate non-tariff barriers (NTBs) which play a significant role in hindering intra-African trade. Intra-African trade remains low despite steady increases in recent decades; intra-African exports make up 19% of total African exports, in contrast to 69% for intra-Europe trade. Furthermore, AfCFTA is predicted to massively boost trade in Africa by 15% to 25% in the medium term (UNECA, 2018). This value could double if NTBs are reduced as part of the agreement. Later in this study, NTBs are discussed more extensively, but they include regulatory and physical barriers such as poor road and rail links, excessive sanitary regulations, and corruption and civil unrest. This study focuses on sanitary and phytosanitary barriers (SPS) and technical barriers to trade (TBT), which are the most prevalent barriers hindering intra-African trade. The implementation of AfCFTA promises to create economic benefits for some African regions at the expense of others.

This study examines the economic impact of AfCFTA on three prominent regional economic communities (RECs) in Africa: the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS), and the Economic and Monetary Community of Central Africa (CEMAC). The economic effects on Africa's largest trading partners are also examined: the European Union, China, and the US. This study uses the GTAP computable general equilibrium model to simulate three scenarios under AfCFTA: first, the removal of tariffs on 97% of goods; second, the elimination of NTBs; and lastly, the removal of tariffs on 97% of goods and the elimination of NTBs.

The originality of this paper can be attributed to: new methodological findings on how to model NTBs in GTAP, a unique aggregation of African countries based on existing regional blocs, and the modelling of the best case scenario of a complete elimination of NTBs rather than a partial reduction. Additionally, the results are obtained using the GTAP 9 database.

The remainder of this paper is organized as follows: Section 2 is a review of related literature and studies pertaining to AfCFTA. Section 3 explains how the GTAP general equilibrium model is used as a quantitative framework. Section 4 provides contextual background on existing tariff and non-tariff barriers in the

regions under consideration. The results of this study under all three scenarios are analyzed in Section 5.

2. Literature Review

Most economic studies project that AfCFTA will yield vast macroeconomic benefits across Africa. Abrego, Amado, Gursoy, Nicholls, and Perez-Saiz (2019) estimate welfare gains based on a computable general equilibrium simulation (CGE) of a complete removal of intra-African tariffs and a 35% reduction in NTBs, modelled as ad valorem tariff equivalents. Their findings show that a removal of tariffs increased welfare in Africa by only 0.05%, while reducing NTBs increased welfare across the continent by 1.7%. Furthermore, all African countries experienced an increase in welfare as a result of the agreement, with nine countries reaping gains of 5% or more. UNECA (2018) models AfCFTA using the MIRAGE CGE model through a double qualification approach, where a minimum proportion of total tariff lines, representing no less than the same proportion of total imports, is liberalized. They conclude from its results that AfCFTA “will be a game changer for stimulating intra-African trade”; they project an increase in intra-African trade between 15% (\$50 billion) and 25% (\$70 billion). Their findings show that the overall GDP of the continent increases by only 1%, which can be explained by 83% of African exports directed towards foreign countries. Their model finds the increase in trade to be most pronounced in industrial sectors, increasing by 25% to 30%, with the agricultural sector bearing the second largest trade impact. The sectors of textiles, apparel, leather, wood products and paper, machinery and metals benefitted the most from AfCFTA.

As well, Kebe (2019) projects that economic growth resulting from AfCFTA is likely to attract more foreign direct investment along with intra-continental investment. The creation of a single market allows countries to negotiate prices and production levels, enhancing the continent’s appeal as a global economic partner. The agreement is projected to foster the growth of more productive and skill-intensive industries, creating higher-paying jobs. In the long run, AfCFTA allows the continent to move towards its goal of being self-sustaining.

On the other hand, Fofack (2018) indicates the challenges in successfully liberalizing intra-African trade, including institutional resistance and the large costs of infrastructure development needed to boost trade. Among other studies, he observes the large role of NTBs in hindering trade between African countries as of today, specifically border delays, multiple licensing requirements, and intensive sanitary inspections and regulations. Other challenges hindering intra-African trade include corrupt governance, supply-side constraints, and an inherited colonial model of depending on resource extraction. Another

inconvenience lies in the overlap between many regional economic communities (RECs) in Africa, presenting an unwelcoming and bureaucratic business environment. The implementation of AfCFTA works towards gradually toppling these barriers, and if successful, can contribute to a significant rise in Africa's ranking on the Global Competitiveness Index.

To add to these complications, Bello and Gass (2018) point out that tremendous income disparities across African countries could problematize continental integration, making it hard to bring win-win outcomes for all countries involved. While Egypt, Nigeria and South Africa combine to account for over 50% of Africa's GDP, the six sovereign island nations of Africa together account for only 1%. Diversified economies such as Ethiopia and Cote d'Ivoire are projected to benefit the most from AfCFTA in the short term, while economies with large manufacturing bases such as South Africa and Kenya are able to export to more destinations. On the other hand, resource-dependent economies such as Chad and the Republic of Congo risk being outcompeted by more diverse, technologically advanced economies.

3. Model Design

This paper uses the GTAP model to simulate the economic effects of a 97% removal in tariffs across goods and a complete removal of NTBs hindering intra-African trade. It examines the effects on different regional blocs in Africa (COMESA, ECOWAS, CEMAC) and its largest exporters (EU, China, US). The standard GTAP model is a Computable General Equilibrium (CGE) model with multiple regions and multiple sectors. The database used for modelling the trade agreement in this paper is GTAP 9 (2011). The following paragraphs discuss how the GTAP framework is applied to modelling AfCFTA.

3.1. The Computable General Equilibrium (CGE) Model

A CGE model is a simplified economy that represents economic relationships between different economic agents in mathematical terms. Provided with data about technologies, policies and customer preferences, it is able to forecast changes in a wide array of economic variables such as prices, outputs, and welfare. The model accomplishes this by seeking a new equilibrium at which supply equals demand in every market. The benefit of using a CGE model to simulate policies is it brings a consistent model of the economy; for example, ensuring that all consumption is covered by production or imports. Perhaps more importantly, CGE modelling provides the opportunity to capture a large range of data that is impossible to observe through only using econometric estimations. The limitations of using a CGE model involve a reliance on assumptions about the economy, meaning it is not perfectly realistic.

3.2. The GTAP Framework

The GTAP CGE model uses input-output tables as its database. GTAP is a multi-sector, multi-region computable general equilibrium framework. The model assumes perfect competition in agricultural sectors and imperfect competition in manufacturing and service sectors, while also assuming constant returns to scale. By capturing the interactions of diverse markets and sectors under both a regional and international context, it can predict how an economy reacts under policy changes or external shocks. Policy scenarios are compared to an initial equilibrium where AfCFTA has not yet been implemented.

3.3. Aggregations and Variables

The geographic aggregation consists of three main regional economic communities (RECs) in Africa, and Africa's largest trading partners. The RECs chosen for this study are COMESA, ECOWAS, and CEMAC, as previously mentioned. This accounts for a wide geographic survey of Africa, and from this, the study can examine how different geographic regions are disparately affected by AfCFTA. Additionally, members within each regional bloc share similar tariff rates internally, and often externally in the case of a customs union. Thus, it is easier to make generalizations across members of the same regional bloc given that tariffs will be reduced to a similar degree. Other regions that are aggregated separately are Africa's primary trading partners: the European Union (EU), China, and the US. All other countries fall into the Rest of the World (ROW) category.

The GTAP aggregation of the sectors was based primarily on a table by Cabot et al. (2015) showing the ad valorem tariff equivalents of non-tariff barriers (NTBs), which are introduced in **Section 4.3**. This was done to model a more accurate removal of NTBs by grouping sectors based on the table. For the sake of simplicity, some sectors presented in the table were grouped together with logical consideration. When analyzing the results of the experiment, the crops and animals sectors fall under the agricultural industry, while the plastics and chemicals, wood products and paper, textiles and clothing, and machinery and metals sectors are considered components of the manufacturing industry. Since the manufacturing and agricultural industries are projected to benefit the most from AfCFTA, the chosen aggregation focuses on breaking down and examining these areas of growth.

4. Descriptive Statistics

4.1. Existing Tariffs

Before examining the economic impacts of AfCFTA, it is important to understand the current economic situation of the continent, and Africa's relationship with its main trading partners. **Tables 1a, 1b, and 1c** display existing tariff structures (as *ad valorem* rates) on imports into COMESA, ECOWAS, and

CEMAC. The imports are from each regional bloc and the Rest of Africa (countries not part of the regional blocs under consideration), in addition to Africa's main trading partners: the EU, China, America, and the Rest of the World. To clarify, imports from a regional bloc into the same regional bloc represent tariffs on trade *within* the bloc; for example, the data from COMESA to COMESA shows the aggregate tariff rate between member countries. Given that COMESA, ECOWAS, and CEMAC are regional trade blocs, tariffs between countries that are part of the same regional bloc tend to be low. For example, tariffs between the member countries of CEMAC are close to 0 for all sectors, as shown in **Table 1c**. However, some of these regional economic communities (RECs) have failed to fully liberalize trade, which can be attributed to factors that include a lack of clear political consensus by member countries, a reliance on import tariffs as a source of government revenue, and cumbersome trade regulations (Khandelwal, 2004). Tariffs on trade within ECOWAS are especially high, venturing into 2-digit values, as shown in **Table 1b**. Tariffs between the three regional blocs are high. Of the three regional blocs, CEMAC has the highest tariffs imposed on imports from other regions, with tariff rates as high as 27% on imports from COMESA and 29% on imports from ECOWAS. Conversely, COMESA and ECOWAS have smaller tariffs on imports from CEMAC in some sectors, such as the mining and machinery sectors. This indicates that when tariffs are removed under the agreement, CEMAC is likely to benefit the least.

Table 1a. Tariffs on imports from Region X into COMESA

<i>rTMS</i>	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa	5 EU	6 China	7 US	8 Rest of World
1 Animals	1.78	32.3	19.1	17	9.07	28	4.62	8.22
2 Crops	1.3	3.61	13.8	17.2	27.7	23.1	3.92	6.65
3 Beverages and Tobacco	1.91	6.69	12.4	27.9	222	36.4	705	116
4 Mining	1.85	2.83	0.017	4.61	5.59	12.6	4.99	2.46
5 Plastics and Chemicals	1.95	7.53	0.274	5.54	18.1	9.86	4.55	15.4
6 Wood Products	1.11	5.38	10	8.25	7.64	18.1	8.66	7.75
7 Textiles and Clothing	2.68	15.5	29.4	20.8	11	20.1	12.4	11.3
8 Machinery and Metals	0.876	7.69	0.768	6.22	7.15	9.89	11.6	9.23
9 Miscellaneous	0.773	0.935	0.42	2.45	0.626	6.3	0.434	0.834

Source: Own aggregation of GTAP 9

Table 1b. Tariffs on imports from Region X into ECOWAS

<i>rTMS</i>	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa	5 EU	6 China	7 US	8 Rest of World
1 Animals	9.21	14.8	11.2	14.5	12.6	17.2	10.9	11.1
2 Crops	13.3	10.9	14.8	13.7	10.6	13.9	6.18	14.6
3 Beverages and Tobacco	16.6	16.2	15.2	20.2	19.2	18.1	12.8	17.3
4 Mining	8.92	4.15	5.59	8.69	7.79	12.3	9.95	8.5
5 PlsChm	9.14	10.8	9.3	7.38	7.35	9.3	10.3	8.14
6 Wood Products	14.2	9.87	11.1	11.2	10.9	15	6.49	9.6
7 Textiles and Clothing	14.5	16	12.2	16.1	16.8	17.4	14.4	15.9
8 Machinery and Metals	9.64	10.8	5.75	9.1	8.89	11.3	10	10.6
9 Miscellaneous	0.093	8.62	0.109	1.09	1.07	10.5	0.422	0.655

Source: Own aggregation of GTAP 9

Table 1c. Tariffs on imports from region X into CEMAC

<i>rTMS</i>	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa	5 EU	6 China	7 US	8 Rest of World
1 Animals	26.2	29	0	23.7	13.8	29.6	7.61	12.7
2 Crops	23.7	7.18	0.005	22.6	13.7	19.9	13.2	13.5
3 Beverages and Tobacco	26	25.1	0	29.3	22.6	25.4	28.6	18.9
4 Mining	19.5	10.2	0	11.5	13.8	21.7	10.8	10.7
5 Plastic and Chemicals	12.7	18.8	0	15.1	11.1	14.1	13.1	10.6
6 Wood Products	27.4	14	0	17.8	20	26.8	15.4	18.4
7 Textiles and Clothing	24.5	19.4	0	26.6	26.4	26.2	22.4	23.9
8 Machinery and Metals	15.9	15.9	0.01	13.9	13.7	15.5	13	15.6
9 Miscellaneous	4.43	6.01	0	4.62	1.47	6.18	0.331	0.443

Source: Own aggregation of GTAP 9

4.2. Modified Tariffs

This study examines the economic implications of implementing three separate scenarios in GTAP: a removal of tariffs in 97% of sectors, a complete removal of non-tariff barriers (NTBs), and a removal of 97% of tariffs combined with a complete removal of NTBs.

AfCFTA requires a complete liberalization of 90% of goods over the course of 5 to 8 years, with an elimination of tariffs on 7% of goods classified as “sensitive” over 10 to 13 years, leaving 3% of goods to be exempt from tariff liberalization (Matheson, 2019). For the sake of simplicity, this study has designated the 3% “exempt goods” to be the textiles and clothing sector, which comprises 3.5% of all 57 goods modelled in GTAP. This industry was chosen given that it was subject to the highest tariff rates imposed by the regional blocs under consideration, according to GTAP data. Given this, it can be reasonably assumed that many African countries highly value protecting domestic textiles and clothing industries from outside competition, making this industry the most likely to be exempt from tariff liberalization. The agreement also stipulates an anti-concentration clause, which ensures that no greater than 10% of the value of recent imports from AfCFTA countries can be claimed to be exempt from tariffs. Bearing this in mind, aggregate imports from the textile industry do not make up over 10% of the value of imports, as verified by the GTAP dataset. The 7% of “sensitive goods” to be gradually liberalized is grouped together with the 90% of goods to be liberalized sooner, thus this study models a removal of tariffs on 97% of goods. **Tables 2a, 2b, 2c and 2d** show that tariff rates are close to zero for all sectors and regions with the exception of textiles and clothing, being exempt goods. The 3.47% on animal imports from ECOWAS into COMESA can be attributed to a glitch in the GTAP software, but should not significantly impact results.

Table 2a. Modified Tariffs on imports from region X into COMESA under AfCFTA

	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa
1 Animals	0	3.47	0.012	0.003
2 Crops	0	0	0	0
3 Beverages and Tobacco	0	0	0	0
4 Mining	0	0	0	0
5 Plastics and Chemicals	0	0	0	0
6 Wood Products	0	0.001	0	0
7 Textiles and Clothing	2.68	15.5	29.4	20.8

8 Machinery and Metals	0	0	0	0
9 Miscellaneous	0	0	0	0
Total	2.68	18.9	29.4	20.8

Source: Own aggregation of GTAP 9

Table 2b. Modified Tariffs on imports from region X into ECOWAS under AfCFTA

	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa
1 Animals	0	0.002	0.001	0.002
2 Crops	0	0	0	0
3 Beverages and Tobacco	0	0	0	0
4 Mining	0	0	0	0
5 Plastics and Chemicals	0	0	0	0
6 Wood Products	0.001	0	0	0
7 Textiles and Clothing	14.5	16	12.2	16.1
8 Machinery and Metals	0	0	0	0
9 Miscellaneous	0	0	0	0
Total	14.5	16	12.2	16.1

Source: Own aggregation of GTAP 9

Table 2c. Modified Tariffs on imports from region X into CEMAC under AfCFTA

	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa
1 Animals	0.027	0.048	0	0.01
2 Crops	0.001	0	0	0
3 Beverages and Tobacco	0	0	0	0
4 Mining	0.006	-0.019	0	0.021
5 Plastics and Chemicals	0	0.001	0	0
6 Wood Products	0.015	0.001	0	0
7 Textiles and Clothing	24.5	19.4	0	26.6

8 Machinery and Metals	0.001	0.001	0	0
9 Miscellaneous	0	0	0	0
Total	24.6	19.4	0	26.6

Source: Own aggregation of GTAP 9

Table 2d. Modified Tariffs on imports from region X into the Rest of Africa under AfCFTA

	1 COMESA	2 ECOWAS	3 CEMAC	4 RestofAfrica
1 Animals	0	0.001	0.001	0
2 Crops	0	0	0.001	0
3 Beverages and Tobacco	0	0	0	0
4 Mining	0	0	0	0
5 Plastics and Chemicals	0	0	0	0
6 Wood Products	0	0	0	0
7 Textiles and Clothing	1.26	8.97	21.4	4.84
8 Machinery and Metals	0	0	0	0.001
9 Miscellaneous	0	0	0	0
Total	1.26	8.98	21.4	4.84

Source: Own aggregation of GTAP 9

4.3. Non-tariff Barriers in Intra-African Trade

Non-tariff barriers (NTBs) are widespread in Africa, and play a significant role in hampering intra-continental trade. Abrego et al. (2019) find that technical barriers to trade (TBT) and sanitary/phytosanitary measures (SPS) are the most prevalent NTBs in Africa by a wide margin. Gaps in infrastructure and transportation costs also hinder the efficiency of trade. Although some of these barriers are necessary, they are often used to distort trade in favour of protectionism or are unnecessarily bureaucratic and cumbersome. RECs such as COMESA, ECOWAS, and CEMAC have done little to address NTBs. This is likely a result of a combination of factors which include: an inability to reconcile the commitments of dual member states, a lack of transparency and access to information, and/or a lack of trust between African nations concerning the quality of imported goods (Viljoen, 2018).

Simulating the removal of these NTBs proved to be a challenge; in this respect, this study hopes to bring forward another method of modelling the removal of NTBs. The conventional way to model the removal of NTBs is to use the tariff ad valorem equivalents (AVE) of NTBs as theorized by previous studies. However, this would not be possible as this study plans on modelling both a 97% removal of tariffs on goods on top of an elimination of NTBs, as a third scenario of AfCFTA. Given that tariff rates for 97% of goods would already be set to zero, a further deduction in tariffs to simulate the removal of NTBs would be impossible. The other way to model the removal of NTBs is through a productivity shock, or a shock to the GTAP variable *ams*, citing Fugazza and Maur (2006). Given the limited nature of studies done on modelling a productivity shock, it is unclear how much the variable *ams* should be shocked to model the respective levels of NTBs. Provided with these limitations, this study models the removal of NTBs through deriving *ams* values that correspond to the AVE tariff equivalents in each sector. First, tariff rates between all regional blocs under consideration were increased by the AVE equivalents shown in **Table 3**¹. The percent change in import prices, as measured by the variable *pim*, was recorded. Given that the variables *ams* and *pim* are inversely proportional, an increase in *pim* entails a decrease in *ams* (productivity). By conducting various GTAP experiments, the corresponding *ams* values (negative) that yielded the same *pim* values were recorded, varying for each sector and region. Taking the positive version of the resulting *ams* values decreases *pim* by a similar proportion, mimicking a decrease in AVE tariff rates to simulate the removal of NTBs.

In modelling the removal of NTBs under AfCFTA, this study focuses solely on the TBT and SPS barriers due to their prevalence in Africa. The percentages found in **Table 3** are a combination of the ad valorem tariff equivalents of TBT and SPS barriers. This study models a complete elimination of NTBs, citing the consolidated treaty put forward by the African Union (2018) which calls for the “elimination of non-tariff barriers to trade and investment”.

The derived *ams* percentage shocks for the second and third scenarios are shown in **Tables 4a, 4b, 4c, and 4d** for imports entering each respective region. This represents an increase in productivity, meaning that given the same amount of exports, the amount of imported product available to the region increases by x percent. The *ams* shock applied to imports of the same sector entering the same region (as separated by each table) are mostly the same, with slight fluctuations to adjust for the proper *pim* value (± 0.1). Since the ad valorem tariff equivalents are different from sector to sector, the *ams* shocks varied depending on the sector.

¹ In an ideal scenario, tariffs would be decreased. However, this would be impractical given that many existing tariffs cannot be reduced by the amounts in Table 2, for example, a 1% tariff cannot be reduced further than 1%.

Most *ams* values fell between 7% to 14%, with the textiles and clothing industry being a notable outlier, with a range between 3% to 6%.

Table 3. Ad Valorem Tariff Equivalents of NTBs in Africa

	SPS + TBT (%)
Animals	13.7
Crops	16.9
Beverages and Tobacco	17.2
Mining	12.8
Plastics and Chemicals	9.8
Wood Products and Paper	10
Textiles and Clothing	6.4
Machinery and Metals	10
Miscellaneous	12.6

Source: Derived from Cabot et al. (2015)²

The derived *ams* percentage shocks for the second and third scenarios are shown in **Tables 4a, 4b, 4c, and 4d** for imports entering each respective region. This represents an increase in productivity, meaning that given the same amount of exports, the amount of imported product available to the region increases by *x* percent. The *ams* shock applied to imports of the same sector entering the same region (as separated by each table) are mostly the same, with slight fluctuations to adjust for the proper *pim* value (± 0.1). Since the ad valorem tariff equivalents are different from sector to sector, the *ams* shocks varied depending on the sector. Most *ams* values fell between 7% to 14%, with the textiles and clothing industry being a notable outlier, with a range between 3% to 6%.

² Raw data can be found in another table published by Cabot et al. (2015). The data found in Table 2 has been aggregated for the purposes of matching the GTAP sectors used in this model. For example, the chemicals sector was combined with the plastics sector, and the average AVE value was taken.

Table 4a. Applied *ams* Shocks (%) on Imports from Region X to COMESA

<i>ams</i> [**COMESA]	COMESA	ECOWAS	CEMAC	Rest of Africa
1 Animals	11.2	11.2	11.2	11.2
2 Crops	13.6	13.6	13.6	13.6
3 Beverages and Tobacco	13.2	13.2	13.2	13.2
4 Mining	11	11.1	11	11.1
5 Plastics and Chemicals	8.6	8.6	8.6	8.6
6 Wood Products	8.6	8.6	8.6	8.6
7 Textiles and Clothing	5.2	5.2	5.2	5.2
8 Machinery and Metals	8.7	8.7	8.7	8.7
9 Miscellaneous	10.5	10.5	10.5	10.5

Source: Own aggregation of GTAP 9

Table 4b. Applied *ams* Shocks on Imports from Region X to ECOWAS

<i>ams</i> [**ECOWAS]	COMESA	ECOWAS	CEMAC	Rest of Africa
1 Animals	10.6	10.6	10.6	10.6
2 Crops	13	13	13	13
3 Beverages and Tobacco	12.7	12.7	12.7	12.7
4 Mining	10.8	10.8	10.8	10.8
5 Plastics and Chemicals	8.3	8.3	8.3	8.3
6 Wood Products	8.3	8.3	8.3	8.3
7 Textiles and Clothing	5.3	5.3	5.3	5.3
8 Machinery and Metals	8.7	8.7	8.7	8.7
9 Miscellaneous	10.7	10.7	10.7	10.7

Source: Own aggregation of GTAP 9

Table 4c. Applied *ams* Shocks on Imports from Region X to CEMAC

<i>ams</i> [**CEMAC]	COMESA	ECOWAS	CEMAC	Rest of Africa
1 Animals	9.9	9.9	9.9	9.9
2 Crops	12.5	12.5	12.5	12.5

3 Beverages and Tobacco	12.1	12	12	12
4 Mining	10.3	10.3	10.2	10.2
5 Plastics and Chemicals	7.9	8	7.9	8
6 Wood Products	7.8	7.8	7.7	7.8
7 Textiles and Clothing	4.9	4.9	4.9	4.9
8 Machinery and Metals	8	8	8	8
9 Miscellaneous	10.4	10.4	10.4	10.4

Source: Own aggregation of GTAP 9

Table 4d. Applied *ams* Shocks on Imports from Region X to the Rest of Africa

<i>ams</i> [**RestofAfrica]	COMESA	ECOWAS	CEMAC	Rest of Africa
1 Animals	11.6	11.6	11.6	11.6
2 Crops	13.7	13.7	13.7	13.7
3 Beverages and Tobacco	13.3	13.3	13.3	13.3
4 Mining	11.2	11.2	11.1	11
5 Plastics and Chemicals	8.9	8.9	8.9	8.9
6 Wood Products	8.7	8.7	8.7	8.7
7 Textiles and Clothing	3.2	3.2	3.2	3.2
8 Machinery and Metals	8.9	8.9	8.9	8.9
9 Miscellaneous	11.1	11.1	11.1	11.1

Source: Own aggregation of GTAP 9

4.3. Demand Side

Of the three regional blocs, ECOWAS has the largest GDP (\$535.4 billion), marginally larger than the GDP of COMESA (\$465.9 billion), and dwarfing the GDP of CEMAC (\$89 billion) which is approximately 5 times smaller than the other regional blocs, as displayed in **Table 4**. It is worth noting that COMESA members include the large economies of Egypt (\$332.3 billion), Ethiopia (\$87.3 billion), and Kenya (\$86 billion). Similarly, Nigeria (\$460.7 billion) is a member of ECOWAS. The ratio of exports and imports to GDP (dependence on trade) in COMESA, ECOWAS, and CEMAC is 62.7%, 55.8%,

and 75% respectively. These numbers illustrate a large dependence on trade in all three regional blocs studied, meaning a continental free trade agreement of AfCFTA's scale has the potential to yield large-scale economic impacts. CEMAC is the only regional bloc with net exports exceeding imports, resulting in a higher trade balance than the other regional blocs. This can likely be explained by close-to-zero tariffs on goods being imported by member countries, decreasing the value of imports while benefiting exporting countries.

Table 4. Percent Expenditure

	1 Consumption	2 Investment	3 Government	4 Exports	5 Imports	Total GDP (USD Millions)
1 COMESA	76.50	19.36	12.83	27.00	-35.70	465856
2 ECOWAS	72.18	19.11	10.80	26.86	-28.97	535369
3 CEMAC	42.00	32.87	10.21	44.98	-30.06	89027
4 Rest of Africa	53.67	23.71	21.29	34.99	-33.66	986259

Source: Own aggregation of GTAP 9

Current household domestic purchases, as shown in **Table 5**, indicate which sectors are most in-demand by households in each regional bloc. On average, crops are the highest domestically purchased sector, with animals being the second most in-demand; this can be attributed to Africa's significant dependence on agriculture (McKinsey & Company, 2010). Total household purchases in COMESA and ECOWAS far exceed CEMAC because of its comparatively smaller size, with only 6 members and a smaller GDP.

Table 5. Percent Household Domestic Purchases by Sector In Each Region (%)

	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa
1 Animals	8.50	12.07	9.54	9.51
2 Crops	22.69	52.29	25.63	15.28
3 Beverages and Tobacco	4.97	1.75	4.66	6.43
4 Mining	4.14	0.81	2.15	2.76
5 Plastics and Chemicals	2.12	0.86	2.84	3.40
6 Wood Products	2.49	0.76	0.97	1.32
7 Textiles and Clothing	7.70	1.58	3.73	4.51

8 Machinery and Metals	2.98	2.01	2.48	3.29
9 Miscellaneous	44.41	27.86	48.01	53.50
Total (Millions of USD)	320892	305491	27291	9.51

Source: Own aggregation of GTAP 9

4.4. Supply Side

Table 6 shows industry output arranged by sector and regional bloc. The crops sector has the highest industry output in COMESA and ECOWAS, while mining has the highest output in CEMAC, comprising 22.47% of total industry output. The regional bloc with the largest overall industry output is COMESA, which can be accounted for by its size and largest combined GDP, with 19 members. The total industry output of COMESA and ECOWAS dwarf the total industry output of CEMAC, meaning they produce far more than the latter region.

Table 6. Percent Industry Output By Sector (%)

<i>qo</i>	1 COMESA	2 ECOWAS	3 CEMAC	4 Rest of Africa
1 Animals	4.72	7.18	2.54	3.80
2 Crops	15.17	26.97	7.72	6.08
3 Beverages and Tobacco	2.50	0.89	1.11	1.74
4 Mining	11.68	17.01	22.47	14.52
5 Plastics and Chemicals	2.64	1.28	1.98	4.33
6 Wood Products	2.00	0.93	2.512	2.25
7 Textiles and Clothing	5.36	0.89	1.12	2.17
8 Machinery and Metals	7.57	4.15	7.24	10.66
9 Miscellaneous	48.36	40.70	53.31	54.43
Total (Millions of USD)	892631	714016	156773	1996241

Source: Own aggregation of GTAP 9

The output measured above is produced using a combination of five factors of production: land, unskilled labour, skilled labour, capital, and natural resources. **Tables 7a, 7b and 7c** show the percentages of the income generated by sector for each factor of production. This data is taken as a sum of incomes from each region under consideration; it is representative of Africa as a whole. Capital has the largest overall contribution to the economy, with major contributions in

each sector. As of now, Africa faces widespread underinvestment in many industries; McKinsey & Company (2010) project that improving the agricultural industry in Sub-Saharan Africa alone requires annual investments of \$50 billion. Unskilled labour and skilled labour also contribute greatly to income in all sectors, with unskilled labour being of particular value to the agricultural sector (animals and crops). Land and natural resources make up significantly smaller portions of total income due to only being significant in certain sectors.

Table 7a. Percent Sources of Factor Income by Sector in COMESA (%)

<i>EVFA</i>	1 Animals	2 Crops	3 Beverages, Tobacco	4 Mining	5 Plastics, Chemicals	6 Wood Products	7 Textiles, Clothing	8 Machinery, Metals	9 Misc	Total (Millions of USD)
1 Land	12.48	87.50	0	0	0	0	0	0	0	8075
2 Unskilled Labour	6.99	34.16	1.30	3.35	1.45	1.56	3.03	4.38	43.78	111365
3 Skilled Labour	3.47	4.27	0.85	3.81	1.36	1.41	3.16	4.56	77.14	104819
4 Capital	2.60	10.70	4.59	14.16	1.77	1.58	6.02	4.60	53.98	196106
5 Natural Resources	0	0	0	87.54	0	0	0	0	12.46	15758

Source: Own aggregation of GTAP 9

Table 7b. Percent Sources of Factor Income by Sector in ECOWAS (%)

<i>EVFA</i>	1 Animals	2 Crops	3 Beverages, Tobacco	4 Mining	5 Plastics, Chemicals	6 Wood Products	7 Textiles, Clothing	8 Machinery, Metals	9 Misc	Total (Millions of USD)
1 Land	7.50	92.50	0	0	0	0	0	0	0	19423
2 Unskilled Labour	6.70	64.52	0.22	0.32	0.16	0.26	0.24	0.49	27.07	162961
3 Skilled Labour	9.25	5.90	1.19	0.90	0.71	1.47	1.38	2.84	76.38	110185
4 Capital	4.23	14.81	0.50	39.01	1.10	0.95	0.69	7.12	31.59	176417
5 Natural Resources	0	0	0	92.28	0	0	0	0	7.72	31571

Source: Own aggregation of GTAP 9

Table 7c. Percent Sources of Factor Income by Sector in CEMAC (%)

<i>EVFA</i>	1 Animals	2 Crops	3 Beverages, Tobacco	4 Mining	5 Plastics, Chemicals	6 Wood Products	7 Textiles, Clothing	8 Machinery, Metals	9 Misc	Total (Millions of USD)
1 Land	17.31	82.82	0	0	0	0	0	0	0	774
2 Unskilled Labour	4.57	19.30	0.61	11.99	2.01	1.66	1.22	3.85	54.79	19461
3 Skilled Labour	1.24	3.79	0.50	9.25	1.67	1.38	1.01	3.19	77.97	15615
4 Capital	1.34	4.33	1.25	24.02	2.07	1.79	0.97	7.50	56.74	38472
5 Natural Resources	0	0	0	94.67	0	0	0	0	5.31	7061

Source: Own aggregation of GTAP 9

6. Results

6.1. Removal of 97% Intra-African Tariffs on Goods

Tables 8a, 8b and 8c show the percent change in bilateral imports for each sector from Region X into the three respective regions (COMESA, ECOWAS, CEMAC), as well as reporting changes in import sales from non-African countries. All regions increase import purchases the most in the animals sector, with COMESA importing 631.95% more livestock-related goods from ECOWAS. This can be explained by originally high tariffs on livestock between regions (refer to **Tables 1a, 1b and 1c**). Imports within CEMAC decrease across nearly all liberalized sectors, as shown in **Table 8c**. This is likely due to its low regional tariff rates prior to the agreement (refer to **Table 1c**), bordering 0% across most sectors, meaning it has little to gain in terms of intra-CEMAC trade from the agreement. Rather, CEMAC members are likely to trade more with COMESA and ECOWAS as once-high tariff rates are now liberalized, replacing trade between CEMAC members. CEMAC also imports far less from non-African countries, with decreases in imports averaging about -20% across all sectors. Since imports from other African countries are cheaper, there is a net shift away from foreign producers. Overall, CEMAC experiences the greatest net increases in import purchases.

Table 8a. Percent Change in Bilateral Import Sales from Region X into COMESA (%)

qxs	COMESA	ECOWAS	CEMAC	Rest of Africa	EU	China	US	Rest of World
Animals	5.01	631.95	268.14	190.91	-7.02	-6.97	-6.97	-7
Crops	2.23	11.42	86.44	101.11	-3.66	-3.63	-3.63	-3.64
Beverages, Tobacco	0.32	10.71	27.59	66.9	-3.74	-3.73	-3.73	-3.74
Mining	14.14	23.1	-1.59	43.33	-2.44	-2.36	-2.45	-2.48
Plastics, Chemicals	10.22	54.92	1.65	33.5	-3.24	-3.21	-3.22	-3.26
Wood Products	3.56	30.93	79.8	53.49	-3.4	-3.38	-3.38	-3.41
Textiles, Clothing	-0.66	-3.03	1.2	-4.08	0.51	0.56	0.55	0.51
Machinery, Metals	3.53	66.27	5.43	47.53	-3.01	-2.99	-2.98	-3.03
Misc	2.75	2.24	3.13	7.58	0.34	0.36	0.36	0.33

Source: Own aggregation of GTAP 9

Table 8b. Percent Change in Bilateral Import Sales from Region X into ECOWAS (%)

qxs	COMESA	ECOWAS	CEMAC	Rest of Africa	EU	China	US	Rest of World
Animals	85.66	164.09	125.45	155.55	-4	-3.95	-3.95	-3.98
Crops	80.12	58.49	98.65	76.74	-1.71	-1.68	-1.68	-1.69
Beverages, Tobacco	35.41	33.33	33.58	43.07	-4.77	-4.75	-4.76	-4.77
Mining	100.57	32.95	54.84	94.23	-6.25	-6.17	-6.26	-6.28
Plastics, Chemicals	69.69	85.89	76.28	46.75	-5.01	-4.98	-4.99	-5.03
Wood Products	120.44	68.08	88.53	79.19	-4.83	-4.81	-4.81	-4.85
Textiles, Clothing	-0.38	-2.61	1.56	-3.79	0.82	0.88	0.87	0.83
Machinery, Metals	97.02	108.7	53.44	82.16	-2.38	-2.36	-2.34	-2.39
Misc	0.28	39.96	2.25	2.16	0.79	0.8	0.81	0.78

Source: Own aggregation of GTAP 9

Table 8c. Percent Change in Bilateral Import Sales from Region X into CEMAC (%)

qxs	COMESA	ECOWAS	CEMAC	Rest of Africa	EU	China	US	Rest of World
Animals	358.43	425.14	-18.87	276.83	-21.76	-21.72	-21.72	-21.74
Crops	126.64	10.25	-16.78	109.92	-19.18	-19.15	-19.15	-19.16
Beverages, Tobacco	52.38	48.89	-9.26	59.44	-10.26	-10.25	-10.25	-10.26
Mining	215.2	49.79	-35.48	66.87	-36.22	-36.16	-36.23	-36.25
Plastics, Chemicals	76.87	147.4	-17.42	96.42	-19.79	-19.77	-19.78	-19.81
Wood Products	273.76	79.9	-17.61	118.95	-19.1	-19.08	-19.08	-19.11
Textiles, Clothing	-1.32	-3.57	0.52	-4.67	-0.17	-0.11	-0.12	-0.16
Machinery, Metals	157.96	150.91	-14.5	115.63	-16.61	-16.6	-16.58	-16.63
Misc	18.39	24.68	0.49	16.58	-0.48	-0.46	-0.46	-0.49

Source: Own aggregation of GTAP 9

As shown in **Tables 9a and 9b**, a removal of 97% of tariffs results in a net commodity price decline in CEMAC, while the other regional blocs face price increases in nearly all sectors and factors of production. This is because, under a free trade scenario, CEMAC primarily imports goods from COMESA and ECOWAS rather than exports goods (refer to **Table 10a**). **Tables 1a, 1b and 1c** also support this hypothesis. CEMAC had originally imposed extremely high tariffs on COMESA and ECOWAS, meaning access to cheap imports was limited. Conversely, COMESA and ECOWAS originally had lower tariff rates on imports from CEMAC, meaning liberalization favours increasing the exports of the former two regions over the latter. Examining the agriculture sector, tariff liberalization drastically increases imports of agricultural products from COMESA and ECOWAS into CEMAC, as shown in **Table 8c**. Thus, the prices of animals and crops decrease in CEMAC while increasing in COMESA and ECOWAS due to greater demand for the exports of the latter two regions (refer to **Table 9a**). Similarly, the price of land decreases considerably in CEMAC while increasing in COMESA and ECOWAS due to greater demand for the production of land-intensive agricultural products.

Table 9a. Market Price of Commodities (% change)

<i>pm</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Animals	0.17	0.59	-0.52	0.78
Crops	0.06	0.57	-0.66	0.82
Beverages and Tobacco	0.08	0.38	-0.58	0.73
Mining	0.11	0.21	-0.15	0.26
Plastics and Chemicals	-0.06	0.12	-0.5	0.56
Wood products	-0.02	0.44	-0.35	0.64
Textiles and Clothing	0.15	0.48	-0.11	0.65
Machinery and Metals	0	0.35	-0.35	0.57
Miscellaneous	0.19	0.47	-0.25	0.75

Source: Own aggregation of GTAP 9

Table 9b. Market Price of Factors (% change)

<i>pm</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Land	0.38	0.68	-3.81	2.55
Unskilled Labour	0.41	0.7	-0.04	1.06
Skilled Labour	0.4	0.73	0.47	0.98
Capital	0.38	0.55	0.49	0.91
Natural Resources	0	-0.33	0.36	-1.45

Source: Own aggregation of GTAP 9

Tables 10a and 10b display macroeconomic performance indicators for each region after AfCFTA. As shown in **Table 10a**, import and export volumes increase for all African regions due to an increase in trade flows resulting from decreased tariffs. Notably, CEMAC experiences nearly twice as large of an increase in imports than exports, which suggests the region has been predominantly importing from COMESA and ECOWAS as opposed to exporting. On the other hand, non-African countries experience slight decreases or no change in import and export volumes. Though the fluctuations are small, they are predominantly negative, which can be explained by a shift by African countries from trading with global partners to trading with other African countries due to lower tariffs. In **Table 10b**, it is revealed that while GDP increases for COMESA

and ECOWAS, it decreases measurably for CEMAC, which can be attributed to a negative terms of trade for that region (as shown in table 9b). As terms of trade measures the ratio of export prices to import prices, it is a reliable predictor of changes in GDP. Higher export prices accompanied by lower import prices results in a gain in terms of trade. Since COMESA and ECOWAS experience a greater increase in export prices than in import prices, terms of trade rises in both regions. CEMAC experiences the opposite effect: a greater increase in import prices than export prices causes its terms of trade to decrease. All African regions experience considerable decreases in trade balance because the change in import volumes is greater than that of export volumes, with the exception of COMESA where there is a slight disparity. This can be attributed to import prices into the region being originally higher than export prices which offsets the larger percent change in export prices than import prices. Thus, increases in import volume would have more value than similar increases in export volume, decreasing trade balance.

Table 10a. Import and Export Volumes (% change)

	Import Volume (<i>qiwreg</i>)	Export Volume (<i>qxwreg</i>)
COMESA	1.51	1.62
ECOWAS	1.99	1.58
CEMAC	6.57	3.47
Rest of Africa	1.91	1
EU	-0.03	0
China	-0.04	-0.01
US	-0.04	0.01
Rest of the World	-0.01	0

Source: Own aggregation of GTAP 9

Table 10b. Other Macroeconomic Indicators after AfCFTA (% change)

	GDP (<i>vdgp</i>)	Terms of trade (<i>tot</i>)	Import Prices (<i>piwreg</i>)	Export Prices (<i>pxwreg</i>)	Trade balance (Millions of USD) (<i>DTBAL</i>)
COMESA	0.09	0.07	0.15	0.94	-403.45
ECOWAS	0.36	0.26	0.09	1.04	-440.77
CEMAC	-0.92	-0.27	0.27	0.24	-475.41
Rest of Africa	0.78	0.44	0.09	1.33	-1345.62
EU	-0.02	-0.01	-0.02	-0.06	855.54

China	-0.03	-0.02	-0.01	-0.07	231.57
US	-0.03	-0.02	-0.01	-0.07	811.67
Rest of the World	-0.02	0	-0.03	-0.05	766.47

Source: Own aggregation of GTAP 9

A significant increase in intra-African free trade with the implementation of AfCFTA impacts industry output differently across sectors and regions, as shown in **Table 11**. While the other regional blocs experience mixed results, CEMAC's industry output decreases in nearly all sectors. This can be explained by its smaller membership in comparison to the other regional blocs and the inclusion of less diversified economies such as the Republic of Congo and Chad, hindering the region's relative efficiency in producing a variety of goods. This makes it more likely to import from the other two regions, as backed up by previous analysis of the data. However, the textiles and clothing sector (0.09%) as well as the machinery and metals sector (2.76%) face increases in industry output in CEMAC because those goods are more efficiently produced there. The textiles and clothing sector faces a net decline in industry output across Africa due to high tariffs being maintained on intra-African trade; moreover, production efforts may be increasingly diverted to other sectors due to drastic reductions in tariff rates. Industry output in the plastics and chemicals sector decreased considerably in CEMAC as it is replaced by production in COMESA (0.99%) and ECOWAS (5.56%), with large output increases in the latter. Other sectors face similarly mixed results.

Table 11. Industry Output (% change)

<i>qo</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Animals	-0.18	0.31	-2.71	0.34
Crops	0.01	-0.02	-2.01	0.98
Beverages and Tobacco	-0.16	0.03	-1.16	0.81
Mining	-0.14	-0.3	-0.01	-0.78
Plastics and Chemicals	0.99	5.56	-3.89	0.63
Wood products	0.3	-0.35	-0.96	0.88
Textiles and Clothing	-0.27	-1.13	0.09	-1.73
Machinery and Metals	0.5	0.19	2.76	0.57
Miscellaneous	-0.01	0.04	0.33	0.02

Source: Own aggregation of GTAP 9

Table 12 shows the welfare effects of AfCFTA, which yield positive results across Africa. Total welfare increased in all African regional blocs, by a total of \$2.78 billion across the continent: \$126 million in COMESA, \$589 million in ECOWAS, \$7.34 million in CEMAC, and \$2.06 billion in the rest of Africa. CEMAC experiences a relatively smaller increase in welfare due to a substantial decline in terms of trade effect. This can be explained by the decline in terms of trade shown in **Table 10b**. Gains in allocative efficiency, particularly in ECOWAS, occur as more goods are produced by firms with a comparative advantage rather than inefficient, artificially protected domestic industries. This also lowers the prices of goods, ensuring more money is allocated towards investment and savings, contributing to total welfare.

Table 12. Decomposition of Welfare (Millions of USD)

	Allocative Efficiency	Terms of Trade Effect	Investment and Savings	Total Welfare (Millions of USD)
1 COMESA	0.746	74.4	50.8	126
2 ECOWAS	166	369	54.7	589
3 CEMAC	0.333	-103	110	7.34
4 Rest of Africa	462	1529	71.8	2062

Source: Own aggregation of GTAP 9

6.2. Removal of Non-Tariff Barriers (NTBs) - *ams* productivity shock

Table 13a shows the percent change in the market price of commodities after the removal of NTBs. Market prices of commodities increased in all sectors and regions, while market prices of factors increased for nearly all sectors and regions. Unlike the different consequences triggered by a removal of tariffs in the first scenario, all regional blocs under consideration face similar non-tariff barriers, meaning the removal of these barriers leads to a similar uptick in prices across the continent. Removing NTBs increases the value of imported goods and decreases bureaucratic costs, driving up demand for imports, and thus prices. Many African countries that formerly imported goods from foreign countries shift to importing goods from other African countries as the costs of intra-African trade decrease. **Table 13b** shows that the price of labour (unskilled and skilled) increases across all African regions. As a productivity shock increases the value of each unit exported, the wages of labourers rise as demand for labour is derived from demand for the end product, which increases. The market price of land decreases by 1.13% in CEMAC, which can be explained by agricultural activities

in that region being replaced by COMESA and ECOWAS, as established in the previous section.

Table 13a. Market Price of Commodities (% change)

<i>pm</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Animals	1.43	0.97	0.68	1.09
Crops	1.13	0.93	0.54	1.07
Beverages and Tobacco	1.11	0.69	0.55	1.09
Mining	0.37	0.6	0.37	0.4
Plastics and Chemicals	0.35	0.33	0.54	0.71
Wood Products	0.7	0.79	0.72	0.94
Textiles and Clothing	1.16	0.8	0.72	0.97
Machinery and Metals	0.62	0.63	0.61	0.77
Miscellaneous	1.31	0.77	0.71	1.14

Source: Own aggregation of GTAP 9

Table 13b. Market Price of Factors of Production

<i>pm</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Land	2.22	0.93	-1.13	1.7
Unskilled Labour	2.18	1.1	1.1	1.63
Skilled Labour	2.21	1.23	1.43	1.7
Capital	1.96	0.92	1.34	1.52
Natural Resources	-1.9	0.39	-0.7	-1.17

Source: Own aggregation of GTAP 9

Tables 14a and 14b depict data on trade flows and macroeconomic performance resulting from a removal of NTBs. **Table 14a** shows that import volumes and export volumes increased due to greater trade flows, brought about by removing physical and regulatory barriers that previously inhibited trade. Trade balance decreases for COMESA and ECOWAS while increasing for CEMAC. In this case, a greater increase in import volumes could have been outweighed by the rise in export prices, leading to an increase in trade balance. **Table 14b** displays the increase in GDP across African regions, which is larger in comparison to the first scenario. This can be attributed to a gain in terms of trade

for each region. Removing NTBs decreases unnecessary costs and efficiency losses associated with transactions, increasing the real production content of each unit exported. This means that fewer exports are needed to import a given quantity of goods. Considering this, export prices increase more than import prices in all African regions, creating an increase in terms of trade.

Table 14a. Trade Flows (% change)

	Import Volumes (<i>qiwreg</i>)	Export Volumes (<i>qxreg</i>)	Trade Balance (Millions of USD) (<i>DTBAL</i>)
COMESA	3.13	2.01	-1726.83
ECOWAS	1.94	1.11	-515.65
CEMAC	3.25	2.11	131.15
Rest of Africa	3.28	1.8	-2503.28
EU	-0.06	-0.02	1379.22
China	-0.08	-0.01	358.22
US	-0.09	-0.01	1509.82
Rest of World	-0.04	-0.01	1367.37

Source: Own aggregation of GTAP 9

Table 14b. Macroeconomic Performance (% change)

	GDP (<i>vgdp</i>)	Terms of Trade (<i>tot</i>)	Import Prices (<i>piwreg</i>)	Export Prices (<i>pxwreg</i>)
COMESA	1.88	0.76	0.07	0.84
ECOWAS	1.04	0.62	0.03	0.65
CEMAC	1.22	0.34	0.11	0.45
Rest of Africa	1.46	0.62	0.04	0.66
EU	-0.05	-0.02	-0.02	-0.04
China	-0.05	-0.03	-0.01	-0.04
US	-0.05	-0.04	-0.01	-0.04
Rest of World	-0.04	-0.01	-0.02	-0.03

Source: Own aggregation of GTAP 9

Similar to the results from a removal of 97% of tariffs, industry output shows varied results in COMESA and ECOWAS, while decreasing on net in CEMAC, as shown in **Table 15**. This can be explained by a diversion to more efficient producers as a result of lowered barriers to trade. Countries possessing more resources and larger economies are more likely to be more efficient producers. For example, CEMAC experiences a decrease in industry output in the animal sector (-0.45%) as demand is reallocated to COMESA (0.04%) and ECOWAS (0.15%). The same can be said of the machinery and metals industry, which diverts production away from ECOWAS (-1.41%), and into COMESA (0.55%) and CEMAC (2.48%). The mining industry shrinks in all African regions, which can be attributed to a demand for non-African imports. Similarly, the textiles and clothing industry shrinks across all regions.

Table 15. Industry Output (% change)

<i>qo</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Animals	0.04	0.15	-0.45	0.03
Crops	0.06	-0.09	-1.38	0.06
Beverages and Tobacco	0.49	0.16	-0.06	0.35
Mining	-1.41	-0.18	-0.61	-0.89
Plastics and Chemicals	1.33	2.34	-0.45	0.4
Wood Products	0.5	-0.66	-0.84	0.03
Textiles and Clothing	-1.48	-0.9	-0.99	-2.09
Machinery and Metals	0.55	-1.41	2.48	0.08
Miscellaneous	0.27	0.26	0.32	0.24

Source: Own aggregation of GTAP 9

Table 16 displays percentage changes in welfare and household income across regions. All African regions experience net positive results in total welfare. The overall welfare gains from a removal of NTBs are much larger than welfare gains resulting from a removal of 97% of tariffs. This is because NTBs play a larger role in hindering intra-African trade than tariffs. Removing NTBs results in lessened trade costs, border delays, and bureaucratic regulations, among other consequences. This increases intra-African trade significantly, creating large welfare gains across the continent. A majority of total welfare gains can be attributed to vast benefits to the technological component of welfare, generating welfare gains of over \$8.5 billion across Africa. This can be attributed to a reduction in the “sand in the wheels” of trade, which enhances the value of

imports. In contrast, non-African countries experience net losses in total welfare, especially in regard to the terms of trade component of welfare. This is likely the result of trade being diverted away from non-African countries to other African countries.

Table 16. Decomposition of Welfare (Millions of USD)

<i>WELFARE</i>	Allocative Efficiency	Technological Efficiency	Terms of Trade Effect	Investment and Savings	Total Welfare (Millions of USD)
1 COMESA	204	2675	930	515	4324
2 ECOWAS	511	1486	889	133	3018
3 CEMAC	198	607	156	-32.5	928
4 Rest of Africa	754	3795	2156	91.8	6797
5 EU	-464	0	-1508	-101	-2073
6 China	-104	0	-603	-180	-887
7 US	-68.9	0	-764	-222	-1054
8 Rest of World	-37.6	0	-1272	-207	-1517
Total	992	8563	-16.7	-3.42	9535

Source: Own aggregation of GTAP 9

6.3. Removal of 97% Tariffs and NTBs

The final scenario is the best illustration of the economic consequences of AfCFTA as it both simulates a removal of 97% of tariffs across goods, and a removal of NTBs. **Tables 18a** and **18b** show the percentage change in the market prices of commodities and factors of production under AfCFTA. Prices in COMESA and ECOWAS increase across all sectors, whereas in CEMAC, prices increase in all sectors except for crops and beverages and tobacco. A slight decrease in the two sectors in CEMAC is due to a reallocation of demand to producers in COMESA and ECOWAS. In most sectors, commodity prices increase in all African regions. This can be explained by the rising demand for imports due to AfCFTA.

As shown in **Table 18b**, prices of skilled labour, unskilled labour and capital rise in all regions, due to an increase in wages and production. The price of land in CEMAC decreases greatly, and can be attributed to a higher demand for land in COMESA and ECOWAS. Given that CEMAC is primarily importing

from COMESA and ECOWAS, the demand for land as a means of production decreases. Prices of natural resources decrease in all African regions; given the abundance in the supply of natural resources in Africa, a price drop is expected.

Table 18a. Market Price of Commodities (% change)

<i>pm</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Animals	1.63	1.85	0.12	2.21
Crops	1.16	1.78	-0.16	2.25
Beverages and Tobacco	1.21	1.26	-0.02	2.15
Mining	0.48	0.9	0.2	0.79
Plastics and Chemicals	0.23	0.5	0.04	1.51
Wood Products	0.65	1.44	0.41	1.87
Textiles and Clothing	1.35	1.51	0.73	1.91
Machinery and Metals	0.59	1.15	0.27	1.59
Miscellaneous	1.55	1.46	0.53	2.23

Source: Own aggregation of GTAP 9

Table 18b. Market Price of Factors

<i>pm</i>	COMESA	ECOWAS	CEMAC	RestofAfrica
Land	2.62	1.92	-5.91	5.34
Unskilled Labour	2.71	2.14	1.25	3.18
Skilled Labour	2.75	2.33	2.26	3.13
Capital	2.47	1.73	2.2	2.84
Natural Resources	-1.92	-0.13	-0.58	-3.13

Source: Own aggregation of GTAP 9

Tables 19a and 19b show changes in trade flows and macroeconomic performance after AfCFTA. Looking at **Table 19a**, import volumes and export volumes increased greatly because of reduced barriers to trade. A removal of NTBs tends to magnify the effects of trade liberalization, greatly increasing intra-African trade flows. Import volumes for all regions were greater than export volumes, resulting in respective decreases in trade balance. CEMAC experienced a 12% increase in import volumes in contrast to a 6.76% increase in export volumes, and yet faced the smallest loss in trade balance out of the three regional

blocs. The trade balance of non-African countries increased due to importing less goods from Africa.

Other macroeconomic indicators are assessed in **Table 19b**. AfCFTA causes the GDP of all African regions to rise, while slightly declining in non-African countries. This can be attributed to a net positive terms of trade in Africa, aside from a slight decrease in CEMAC. Overall GDP in Africa increases the most in this scenario, although the GDP of CEMAC increases more in the second scenario, where a removal of NTBs was modelled. This implies that CEMAC, with a considerably smaller combined GDP, is harmed by tariff liberalization while benefiting noticeably from a removal of NTBs. The percentage change in terms of trade can be understood by examining differences in changes of import and export prices. When export prices increase more than import prices, terms of trade tends to increase as fewer exports are required to purchase a given quantity of imports. COMESA and ECOWAS see export prices rising by around 1% (0.94% and 1.04% to be precise), more than the change in import prices, causing their respective terms of trade to increase. CEMAC, on the other hand, sees an increase in import prices (0.27%) that is slightly higher than the increase in export prices (0.24%), causing the terms of trade to slightly decrease. This small decrease does not have a significant effect on GDP, which increases nonetheless, but to a lesser extent than the other two regions.

Table 19a. Trade Flows (% change)

	Import Volumes (<i>qiwreg</i>)	Export Volumes (<i>qxreg</i>)	Trade Balance (Millions of USD) (<i>DTBAL</i>)
COMESA	5.27	4.39	-2284.84
ECOWAS	4.91	3.49	-1184.23
CEMAC	12	6.76	-483.57
Rest of Africa	6.12	3.3	-4494.58
EU	-0.09	-0.02	2586.5
China	-0.14	-0.02	695.87
US	-0.14	0	2681.45
Rest of the World	-0.06	-0.01	2483.41

Source: Own aggregation of GTAP 9

Table 19b. Other Macroeconomic Performance Indicators (% change)

	GDP (<i>vgdp</i>)	Terms of Trade (<i>tot</i>)	Import Prices (<i>piwreg</i>)	Export Prices (<i>pxwreg</i>)
COMESA	1.96	0.79	0.15	0.94
ECOWAS	1.56	0.96	0.09	1.04
CEMAC	0.17	-0.03	0.27	0.24
Rest of Africa	2.58	1.25	0.09	1.33
EU	-0.08	-0.04	-0.02	-0.06
China	-0.09	-0.06	-0.01	-0.07
US	-0.09	-0.06	-0.01	-0.07
Rest of World	-0.06	-0.02	-0.03	-0.05

Source: Own aggregation of GTAP 9

Table 20 shows the percentage change in industry output across sectors and regions. Similar to previous scenarios, the results are mixed, but COMESA experiences decreases in output in most sectors. Where there are decreases in output in one region and increases in another region, production is being allocated to more efficient producers. In contrast to previous scenarios, output in certain sectors fluctuates by a greater amount (both negative and positive) under a combination of tariff liberalization and the removal of NTBs. Notable increases are in manufacturing sectors, specifically, the plastics and chemicals sector in ECOWAS (10.05%), and the machinery and metals sector in CEMAC (7.01%). Output decreases in the mining sectors of all regions, implying that an increase in production from tariff liberalization is outweighed by a decrease in production from NTB removals.

Table 20. Industry Output

<i>qo</i>	COMESA	ECOWAS	CEMAC	Rest of Africa
Animals	-0.35	0.65	-4.68	0.68
Crops	0.03	-0.13	-3.87	1.36
Beverages and Tobacco	0.3	0.17	-1.27	1.24
Mining	-1.59	-0.63	-0.8	-1.97
Plastics and Chemicals	2.71	10.05	-5.66	1.02
Wood Products	0.89	-1.22	-2.23	1.09

Textiles and Clothing	-1.79	-2.57	-1.02	-4.45
Machinery and Metals	1.31	-0.95	7.01	0.98
Miscellaneous	0.27	0.32	0.76	0.27

Source: Own aggregation of GTAP 9

As observed in **Table 21**, welfare increases considerably across all African regions. The total gain in continental welfare resulting from AfCFTA is approximately \$19 billion. The technological component of welfare accounts for a majority of welfare gains across regions, with values that remain constant from the second scenario, where a removal of NTBs was modeled. Aside from a small downturn in allocative efficiency in COMESA (-51.1%), all other welfare measures increased. An increase in investment and savings are a result of strong markets and growing businesses. As African economies grow, citizens' incomes will rise accordingly whereas consumption habits may not change as quickly; as a result, citizens tend to invest remaining income in savings. Conversely, total welfare of non-African countries decreased overall, likely due to a diversion of trade towards African countries.

Table 21. Decomposition of Welfare (Millions of USD)

<i>WELFARE</i>	Allocative Efficiency	Technological Effect	Terms of Trade Effect	Investment and Savings	Total Welfare
1 COMESA	-51.1	2975	932	571	4428
2 ECOWAS	460	1799	1381	209	3849
3 CEMAC	99.8	781	25.3	104	1010
4 Rest of Africa	1132	4059	4344	210	9745
5 EU	-601	0	-2630	-160	-3390
6 China	-187	0	-1146	-255	-1588
7 US	-96.2	0	-1247	-388	-1732
8 Rest of World	22.9	0	-1708	-297	-1982
Total	779	9615	-48.8	-5.91	10339

Source: Own aggregation of GTAP 9

8. Conclusion

This study examined the economic effects of AfCFTA on different regional blocs in Africa, using the GTAP model. The results were largely positive for African regions, yielding considerable increases in total welfare and

household income. Of the three regional blocs, CEMAC benefits the least from the agreement, experiencing a decline in GDP from the implementation of a free trade zone. This can be explained by the smaller membership of the economic bloc and the inclusion of less diversified member nations, allowing it to be outcompeted by more efficient producers. CEMAC also faced smaller tariffs than COMESA and ECOWAS on its exports before AfCFTA, meaning it reaps the fewest gains from a removal of 97% of tariffs. In the third scenario, CEMAC's GDP losses were offset by the more homogenous effects of removing NTBs on the three regional blocs. Furthermore, a majority of welfare gains resulted from considerable increases in the technological component of welfare; this is attributed solely to the *ams* shock which modeled the removal of NTBs. This analysis suggests that policy-makers should place emphasis on finding ways to reduce NTBs, as this contributes to a majority of welfare gains. The elimination of NTBs is shown to have a multiplicative effect on gains from trade liberalization. Other factors explored in this study, especially industry output, have shown varied results across sectors and regions; given this, policy-makers should base decisions by examining data from various indicators. Overall, AfCFTA has the potential to greatly increase standards of living across all African regions concerned by tapping into a vast market spanning the continent.

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