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African Continental Free Trade Agreement: A review of analyses of likely impacts and challenges of implementation

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Executive Summary

African Union member states decided to establish "the African Continental Free Trade Area (AfCFTA) during the 18th meeting of 2012 at Addis Ababa, Ethiopia. The AfCFTA aims at facilitating intra-African trade and improving Africa's trading position in the global market. In this study, we critically review and discuss the empirical studies on the topic at hand in general and the modeling approaches that have been implemented in those studies in particular. The study also gives special emphasis to the modeling approaches that are widely implemented in recent trade literature such as, inter alia, GTAP, MIRAGE, MAGNET, and LINKAGE-GIDD.

Concerning the potential impact, a range of studies considered here predict that the real income impact of the AfCFTA can reach up to 7 percent from the tariff, nontariff, and trade facilitation in a dynamic setting. While the range of projected intra-trade impact is about a 33 to 82 percent increase, intra-agri-food trade is expected to grow by 22 percent, and tariff revenue loss is 0.03 percent to 0.22 percent of the GDP. The findings, in general, highlight the potential impacts of policy intervention at hand are heterogeneous across regions, countries, and sectors.

This paper draws several conclusions. First, tariff reduction of the AfCFTA alone can have positive impacts. However, the gains from trade facilitation and the reduction in nontariff barriers are projected to induce greater gains. Second, studies that used scenarios of total tariff reduction, trade in goods, and static models did not consider the full potential gain of the agreement. Including trade in services in a dynamic model and taking structural non-tariff barriers needs to be addressed to tap the benefits. Third, the agreement's projected impacts are sensitive to various factors. The overwhelming tariffs (100 percent) and nontariff reductions need more attention, while nontariff trade measures are increasing globally and regionalism is coupled with trade wars between developed countries.

Member countries overlapping in different Regional Economic Communities may pose implementation difficulties at different levels of integration by complicating the policy coordination and external joint tariff determination. The implication of lacking informal trade data can have a significant impact; informal cross-border trade in some countries accounts for around 75 percent of GDP. In that trade women play a dominating role with over 70 percent, resulting in a significant transformative impact if successfully implemented.

Finally, various factors, such as public awareness of the agreement, challenges related to a person's free mobility and capital, reconciliation of domestic policies, and related adjustment costs and inequality impacts can affect the effects predicted by current models compared to the actual effects of the outcomes of the AfCFTA over time.

Keywords: Africa; continental integration; trade; nontariff barriers; agriculture

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1. Introduction

1.1. Scope of the paper

Trade has played a significant role in the global transition and coincided with dramatic poverty reduction. Apart from efforts to liberalize international trade, several regional trade agreements have been established over the last few decades to accelerate the exchange of goods and services by reducing associated transaction costs. Simultaneously, technological advances and a dramatic decline in transportation costs contributed to intensified trade and global value chains. Trade theory predicts overall gains from trade but also postulates that free trade creates winners and losers; generally, workers and owners of resources benefit in the exporting sectors, while those in the importing sectors lose. Trade liberalization sometimes results in undesirable production, employment, and environmental outcomes in the Least Developed Countries (LDCs) (Frankel and Romer, 2017; Bizuneh et al, 2014; SantosPaulino, 2012, Herz and Wagner, 2011; Krugman et al., 1995 (2008)). Not all sectors and individuals are affected equally. Complete liberalization of agriculture may increase dependence on food imports and intensify poverty in most places (George, 2010). Therefore, the extent to which trade liberalization affect the economy of the nation-state may vary depending on whether the respective country is resource-rich or resource-poor and is a coastal or landlocked country. Yet, there is also skepticism about trade in general (Devarajan et al., 2018; Nicita et al., 2014; Arkolakis et al., 2012; Martin and Messerlin, 2007), and even more so recently because of disrupted value chains by Covid-related policies, and raw material dependencies, including in food and fertilizer trade disruptions (Fusacchia et al., 2022; Balistreri et al., 2022; Glauber and Laborde, 2022; Ruta, 2022).

Regional integration to boost trade in Africa has been a significant international relations issue since the independence of most African countries in the 1960s. In the Abuja treaty of 1991, African Union (AU) member states agreed to create a single African market. The decision to establish a Free Trade Area was passed during its 18th Ordinary Session meeting of AU member states held in Addis Ababa, Ethiopia, from January 29 to 30, 2012. Meetings and preparations continued, and in February 2016, the first negotiation forum was held on the issue of the African Continental Free Trade Area (AfCFTA). After the seven negotiating principles were adopted in 2016, consecutive meetings were held until the final signing of the African Continental Free Trade Area (AfCFTA) establishment agreement in March 2018 in Kigali, Rwanda. Most countries (44 of 55) signed the agreement and launched ratification of free trade. Signing and ratification continued until April 29, 2019. The 22nd country had to ratify for operation after 30 days, as stated in the establishment agreement; however, the COVID-19 outbreak delayed the start of trade under the agreement to January 1, 2021.

African countries trade more with the outside world than within the continent, and trade in goods is very low relative to other developed and emerging countries (AATM, 2021); however, some scholars argue that this is due to measurement problems, such as informal trade, unrecorded, and unweighted trades (Mold, 2022; de Melo, 2022; Bout et al., 2021; Bouet, 2008). Africa's trade accounted for 2.8 percent and 14.4 percent of global and intra-regional trade, respectively, in 2019 (UNCTAD, 2021). Others argue that low intra-regional trade is attributed to high transaction costs due to insufficient infrastructure, weak institutions, and cross-border trade hindrances (Kornher and von Braun, 2020). African agricultural commodities trade share was limited to 13–20 percent from 2000 to 2013 relative to other regions, such as North, Central, and South American countries (40 percent), Asian countries

(63 percent) and European countries (75 percent) (AATM, 2018). Although the agri-food intra-Africa trade increased from 16 percent in 1995 to 25 percent in 2015, the nontariff trade measures (NTMs) of transportation costs, poor infrastructure and port inefficacies, and weak institutions limited intra-market access and growth (Kareem, 2019).

The rise of international trade has transformed the global economy and coincided with a dramatic reduction in global and regional poverty (World Bank, 2020). Many countries, especially in East Asia, have used trade to create jobs, integrate into global and regional value chains, and reduce poverty (Engel et al., 2021). Even though global poverty declined from 36 to 9 percent from 1990 to 2017, and developing countries increased their global exports from 16 to 30 percent, Sub-Saharan Africa's share remains the lowest (Rodrígue et al., 2020). Several Regional Economic Communities (RECs) established in Africa have the potential benefits of boosting trade, employment, industrialization, and food security; however, they are blamed for the lack of commitment to implementation.

Trade's poverty impacts take various channels, with most studies agreeing that trade boosts income and reduces poverty (McCulloch et al., 2001; Winter et al., 2004; Winter, 2004, 2005; Winter et al., 2014). Therefore, the AfCFTA has the potential to lift tens of millions out of poverty. The trade reform aspires to cut off tariffs and eliminate nontariff barriers (NTBs) through trade liberalization for goods and services and eventually for factor mobility, investment (domestic and foreign), and competition. Furthermore, AfCFTA is also expected to solve some problems in overlapping RECs in conflict resolution, rules of origin, and payment systems or currency-related problems. AfCFTA seeks to eliminate barriers to trade and investment and gradually create Africa's largest Free Trade Area and African Economic Community, with a market size of 1.3 billion people and a combined gross domestic product (GDP) of about 3.4 trillion US dollars (USD) (World Bank, 2020). As the largest free trade agreement by the number of countries (54 of 55 signed) next to the World Trade Organization (WTO) AfCFTA might lift over 30 million people out of extreme poverty and about 68 million people from moderate poverty by 2035 (World Bank, 2020); however, Africa's intra-trade is limited in volume and diversification relative to global trade and other regions. The limited complementarity of African trade or the large share and persistence of Africa's agricultural imports of food products from the rest of the world and predominantly unprocessed non-food products export suggests a low probability of gaining from intra-African trade (Bouët et al., 2020; UNCTAD, 2021). Furthermore, the share of African trade in world trade has declined steadily over the past 50 years (UNCTAD, 2021). Conversely, Mold (2022) shows that intra-Africa trade needs correction in reports and analysis arguing that intra-Africa trade has been growing while others show a declining trend, stressing the need to consider structural economic differences with other regions and the significant informal crossborder trade.

Trade under AfCFTA started on January 1, 2021, and while various negotiations are underway for expected future completion (AU, 2022; der Ven & Signé, 2021), several studies projected the agreement's impacts under different scenarios, methodologies, and spatial coverages before and after its establishment.

This paper reviews

- the existing trade models and briefly explains which models are used for AfCFTA,
- the existing studies' potential impact assessment of the AfCFTA on trade, income, poverty, inequality, etc.,
- discuss the studies' results and how they can be compared to each other and with other prior studies on regional trade agreements. Furthermore, we discuss
- how other factors not incorporated in the simulations can affect the projected outcomes, and the period of the gain (i.e., short, medium, and long run) by supplementing information from different sources.

1. 2. Pre-view of Findings

We can say up front that different modeling and scenario approaches applied in analyses of the AfCFTA lead to different results. Existing studies applied various methodologies, stretching from the gravity model to partial and global general equilibrium models. The models' heterogeneities help to anticipate the determinants of resulting differences in findings, providing mixed results for concerned bodies; however, in addition to using diverse scenarios, most studies also used narrow scenarios of tariff elimination with a static model for the trade in goods. With this approach, the models, by nature, only capture the cumulative impacts of the agreement. Other studies used a dynamic model simulating different tariffs, nontariff reductions, and trade facilitation scenarios.

The crux of all models is their assumptions regarding full employment, perfect competition market, constant returns to scale, and current account balance assumptions. The basic perfect competitive market and full employment of labor with frictionless and fixed participation are among the determinants of the simulated outcomes requiring cautious interpretations of results. Another important assumption in such kinds of analysis concerns model closure.

How AfCFTA-implementing countries proceed in their budget balance or finance the tariff revenue loss in a budget deficit, debt, insecurities, etc., also critically impacts welfare simulations. In contrast, other economic gains arise from trade balance improvement due mainly to trade reform; therefore, the assumption on the current account balance in the simulations also affects the projected outcomes.

This review concludes that the successful implementation of AfCFTA can have substantial positive welfare, inter- and intra-trade, and real income gains for Africa. The tariff revenue loss from the tariff cut is modest in all studies concerning the low effectively applied tariff rates in the intra-trade from existing regional integrations. The tariff revenue loss is predicted ranges between 0.03 to 0.22 percent of GDP, likely caused by the low share of tariff revenue from intra-African trade. Most studies used different elimination scenarios in their designs of the total tariff and wide and high NTBs elimination scenarios (35 to 100 percent) though the recent global nontariff performances show increments rather than reductions (Nicita, 2018).

The majority of studies present comparable welfare results despite using different methodologies and scenarios; however, various factors determine the agreement's implementation and outcomes. Nontariff barriers and trade facilitations are significant sources of gain as the existing regional arrangements have already reduced tariff rates. In a complete tariff elimination scenario, welfare is

predicted to increase between 0.1 and 0.5 percent, while in a combined tariff and nontariff reduction, welfare increases by 1.3–2.2 percent, intra-trade by 33 to 82 percent, and real income rise by 7 percent from the tariff, nontariff, and trade facilitation. Furthermore, studies on AfCFTA's sectoral impacts indicate some differences, while some studies projected agriculture as the most positively affected in some regions other than manufacturing.

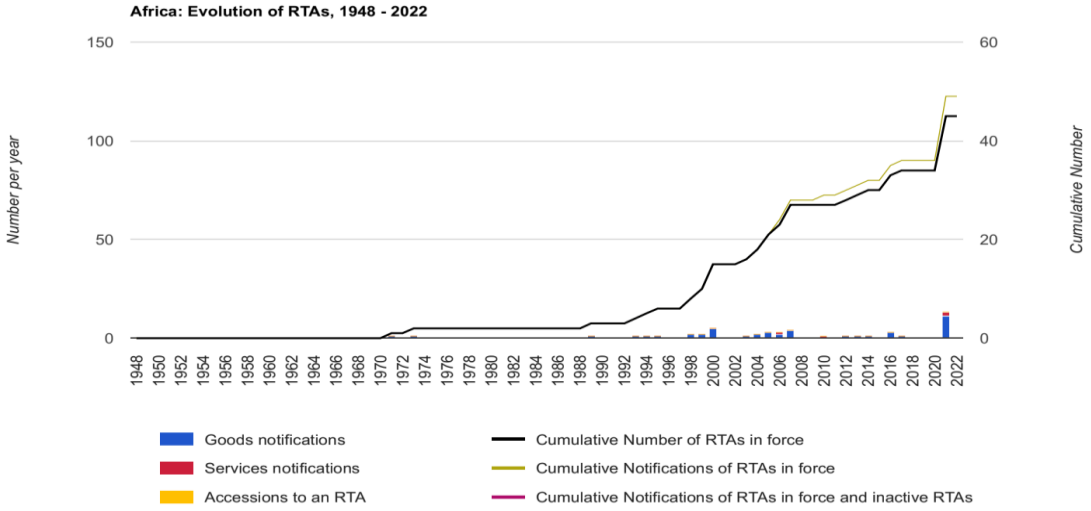
The lack of informal trade in the trade database, low public awareness, and failure to have explicit adjustment costs in the modeling makes those results uncertain in the gain's amount and timing. Existing regional trade agreements are building blocks of the AfCFTA that facilitate the implementation by sharing risks, reducing costs, especially for deeply integrated countries and negotiating and submitting the tariff offers together. Conversely, the significant integration differences among RECs pose a potential threat to the less integrated countries and RECs. Even if AfCFTA helps to bring informal traders to formal trade through different regulations and formalities (Bouet et al., 2021) by reducing trade costs, customs duties, and risks, massive public awareness must be created. For example, the Afrobarometer survey showed that 82 percent in their survey in Gabon and Mali, 81 percent in Guinea, 78 percent in Burkina Faso, and 76 percent in Côte d'Ivoire believe it is difficult to cross borders for work or to trade.

The paper is presented in five parts. Section 2 presents AfCFTA at a glance, proceeding with Section 3 approaches to measuring trade agreement outcomes, focusing on the shallow empirical models and not the theoretical developments due to time and space limitations. Section 4 presents the critical review and descriptive analysis and finally, Section 5 concludes.

2. AfCFTA at a Glance

2.1. RECs in Africa and Scopes and Objectives of AfCFTA

Regional trade agreements (RTAs) have proliferated exponentially globally and in Africa in the past few decades, and nearly all countries participate in at least one regional trade agreement (RTA) (Yang and Gupta, 2005). Notifications from RTAs to the WTO have dramatically increased from 97 between 1948 and 2000 to 482 between 2001 and 2022, with current notifications totaling 579. According to WTO (2022) database, there were only 15 RTA notifications between 1948 and 2000; from 2000 to 2022, this figure more than doubled, with an additional 34 notifications in Africa.

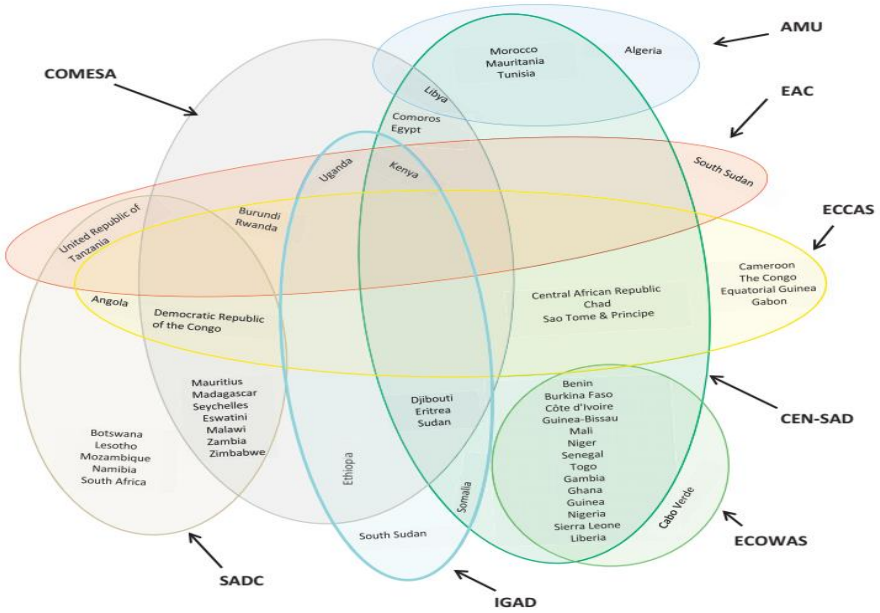


Source: WTO Regional Trade Agreements notifications, Database 2022

FIGURE 1: NOTIFICATIONS OF RTAS TO THE WTO 1948 TO 2022 (AFRICA)

The goal of regional economic agreements in Africa within so-called RECs exceeds the economic and trade objective to promote democracy, prevent regional conflicts, and harmonize institutional development (de Melo, 2013). Even though RTAs' history in Africa dates back to the beginning of the 20th century, RTAs began proliferating and flourishing during the 1990s after sluggish growth since independence. Powered and energized by historic Pan-Africanism, African trade integrations have included numerous arrangements at regional and sub-regional levels.

The Lagos Plan of Action, followed by the 1991 Abuja Treaty, established the African Economic Community (AEC) with sub-RECs envisaged as the AEC's building blocks (Yang and Gupta, 2005); however, African RTAs live less than the economic expectation in member countries due to below-potential market integration that reflects high trade barriers in the region (de Melo, 2013). Regional integration benefited more landlocked countries that are also resource-dependent in their exports (Collier and Venables, 2009). However, Africa remains highly fragmented politically and a less integrated market than other countries that had a similar feature in the 1980s (Brenton and Isik, 2012). Collier and Venables (2009) argue that even if Africa had common features of population, per capita income, and human development with South East Asia in the 1980s, Africa is geographically fragmented into more countries than the Asians which would make Africa more challenging to integrate. The cost of fragmentation has hurt Africa for three main reasons: the increasing inequality cost in the distribution of natural resources, the cost from the loss of scale economies in production, and the loss of public goods as the scale of political cooperation.



Source: UNCTAD: history of RECs, 2019

FIGURE 2: RECS AND OVERLAPPING MEMBER COUNTRIES (EIGHT AU RECOGNIZED)

The establishment of the Organisation of African Unity (OAU) and the Economic Commission for Africa (ECA) has contributed to the creation of different RTAs providing tremendous support. OAU and ECA adopted the 1980 Lagos Plan of Action to create an African Economic Community by strengthening the existing RECs and establishing a new one. Later in 1991, the Abuja treaty recognized the eight RTAs as the building blocks of the AEC and the AfCFTA. The Economic Community of West African States (ECOWAS), Arab Maghreb Union (AMU/UMA), East African Community (EAC), Intergovernmental Authority on Development (IGAD), Southern African Development Community (SADC), Common Market for Eastern and Southern Africa (COMESA), Economic Community of Central African States (ECCAS), and Community of Sahel-Saharan States (CEN-SAD) are the AU officially recognized building blocks of the AfCFTA. The extent of regional trade integration within the different RECs varies across different economic zones, and the share of trade is limited both within and between RECs. Despite the integration differences, some RECs have a common external tariff, such as the ECOWAS, COMESA, and EAC.

A few primary and agricultural commodities dominate intra-Africa trade. For example, the export values reach up to 52 percent for mineral and fuels export from the ECOWAS, copper (42 percent) from the ECCAS, mineral fuels (32 percent) from the CEN-SAD, precious stones (19 percent) from the EAC, mineral fuels (19 percent) from the AMU, copper (13 percent) from the COMESA, edible vegetables (11 percent) from IGAD, mineral fuels (8 percent) from the SADC (Tralac, 2022). Total intr-Africa trade growth from 2020 to 2021 shows an uneven pattern; AMU (+19%), SADC (+18%), COMEA (+6%), CEN-SAD (+3%), ECCAS (-19%), IGAD (-10%), ECOWAS (-8%) and EAC (-6%). The performance of the RECs' also shows a limited regional value chain but moderate non-regional and forward value chains (de Melo and Twum, 2021). EAC is the least globally integrated with forwarding and backward value chains among the four RECs (i.e., EAC, ECOWAS, COMESA,

and SADC); SADC and COMESA have the highest integrations where the forward value chains outpace backward value chains. This integration contrasts with the1990s integration in East Asia and Pacific, Europe, and Central Asia.

The free trade areas' establishment decision was passed during the 18th Ordinary Session meeting of AU member states held in Addis Ababa, Ethiopia, from January 29 to 30, 2012. The Summit also endorsed the Action Plan on Boosting Intra-Africa Trade, which identified seven priority action clusters: trade policy, trade facilitation and productive capacity, trade-related infrastructure, trade finance, trade information, and factor market integration (AUC, 2012). After many negotiations and several engagements, the AfCFTA was established to enhance the continent's intra-trade and inclusive growth. AfCFTA came into force on March 30, 2019; however, due to COVID-19 and negotiation issues, trade started in January 2021. The AfCFTA is governed by five operational instruments of the Rules of Origin: an online negotiating forum, monitoring and eliminating NTBs, a digital payments system, and the African Trade Observatory.

The agreement's scope is much larger than previous sub-RTAs regarding the number of countries, area coverage, and objectives. AfCFTA is the largest next to the WTO, with 54 signatory countries. The agreement aspires to eliminate tariffs and NTBs to trade in goods and services, trade facilitation, investment, intellectual property rights protection, dispute settlement, and e-commerce areas as a continent-wide Free Trade Area.

Three phases of implementation set the fundamental objectives of the agreement. African countries are members of many RECs, some of which overlap more than once, such as Burkina Faso, Mali, and Niger belonging to UEMOA, ECOWAS, CENSAD, and CILSS5. AfCFTA can help to achieve policy coherence, including relationships with African parties or different African countries, by resolving the challenges of multiple and overlapping trade arrangements. The founding document of AfCFTA put the agreement's objectives under article 3 as follows. (i) Create a single market for goods and services, facilitated by the movement of persons and capital to deepen the economic integration of the African continent. (ii) Create a liberalized market for goods and services through successive rounds of negotiations. (iii) Contribute to the movement of capital and natural persons. (iv) Lay the foundation for establishing a Continental Customs Union at a later stage. (v) Promote and attain sustainable and inclusive socio-economic development, gender equality, and structural transformation and enhance the competitiveness of the economies of State Parties. (vi) Promote industrial development through diversification and regional value chain development, agricultural development, and food security by resolving the challenges of multiple and overlapping memberships.

In pursuance of the stated objectives, the negotiations have undergone three phases. Phase one includes trade on goods and services by eliminating tariff barriers and NTBs, phase two includes the intellectual property rights, investment, and competition policy, while phase three covers e-commerce.

2.2. Modalities of Implementation

AU's eight officially accepted RECs are the building bloc of the agreement, which came into force on May 30, 2019, after the 22nd country deposited the rectification instrument; trade in goods started on January 1, 2021. The AfCFTA agreement is the founding document, providing the details of the implementations, protocols, and stakeholders; however, negotiations on the detailed schedules of tariff concessions or rules of origin started only after the first implementation phase, despite that phase's protocols. The general modalities for tariff reductions and the actual shares of tariff lines for sensitive and excluded products were defined at the 3rd Meeting of the AU Ministers of Trade in 2017 and the 32nd AU Ordinary Session in 2019 (Troster, 2021).

Single-state parties (i.e., the AU Member States that have ratified the AfCFTA Agreement or acceded to it and for which the AfCFTA Agreement is in force) or RECs were supposed to report the detailed schedules by tariff lines in 2020 (Troster, 2021). The AU member states are the negotiating parties. Furthermore, the AfCFTA establishing Agreement states that "State Parties that are members of other RECs, regional trading arrangements, and customs unions, which have attained among themselves higher levels of regional integration than under this Agreement, shall maintain such higher levels among themselves" (in Article 19[2]) (AU, 2018).

The negotiations on modalities contain decisions about the level of ambition, treatment of sensitive and excluded products, and time frames for tariff phase-downs. The tariff offers should comply with the tariff negotiation modalities; they are as follows.

I. On 90 percent of tariff lines, tariffs are to be eliminated on non-sensitive goods. Eliminate over 5 years for Non-Least Developed Countries and over 10 years for LDCs.
II. Seven percent of tariff lines can be sensitive goods. Non-Least Developed Countries liberalize tariffs of sensitive goods over ten years and LDCs over 13 years.
III. Three percent of tariff lines can be excluded from liberalization. The value of these imports may not exceed 10 percent of total intra-Africa imports.

Despite using an anti-concentration rule or the allegation of not excluding an entire sector from the tariff cut in the establishment agreement, the 90 percent tariff line cut is ambiguous. This is because of the absence of information if the 90 percent tariff line refers only to the tariff line or includes both trade value and tariff line. This complicates defining simulation scenarios. For the excluded products, both the tariff line and values (3 percent of the tariff line that does not exceed 10 percent of the trade value) are determined; however, there is no determination for the sensitive products that affect the outcomes of the implementation and the products under implementation or trade reform. The trade reform sequencing issue highly depends on the type and number of commodities presented to the liberalization. In this regard, in a retrospective analysis, the European Union (EU), WTO, and East Asia have somewhat similar sequences during their respective integration in manufacturing goods, with liberalization preceding the service, agriculture, and investment (Evenett, 2004; Bond, 2005). The most important question concerns whether manufacturing goods should precede agricultural goods or whether simultaneous liberalization can ensure Africa's success.

The negotiations are in three phases (I, II & III);

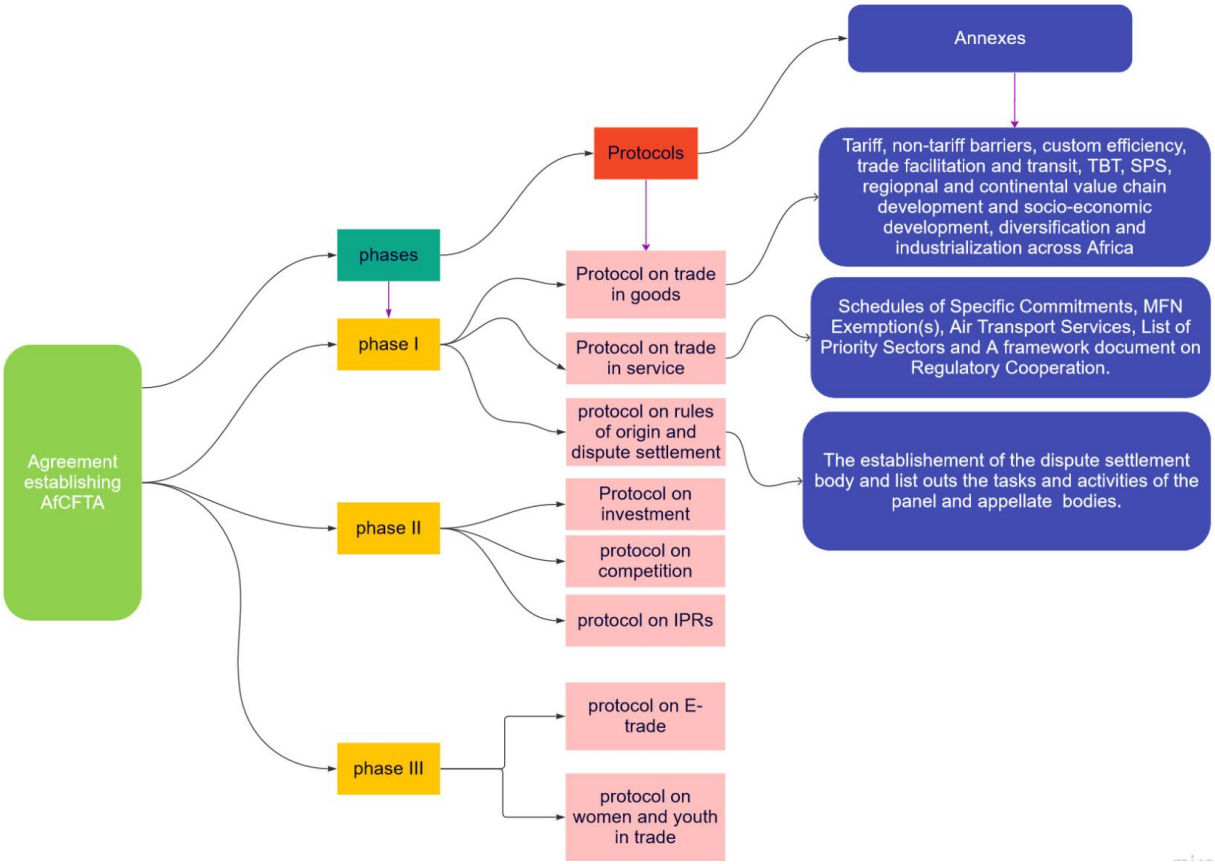


FIGURE 3: AFCFTA NEGOTIATION PHASES

Africa is a much-diversified continent; therefore, countries need domestic policies that adhere to their physical and political geography, such as landlocked vs. coastal and resource-rich vs. resource-poor countries (Collier, 2007). The success of AfCFTA depends highly on each country's reforms and commitments to implement the agreement; however, such heterogeneity may also cause some objective biases. The realization of AfCFTA in the continent is also highly dependent on the unilateral free trade agreements or partnership agreements that individual countries will sign and implement. The primary gain of intra-trade in Africa arises from its significant diversification when it trades with itself rather than outsiders. Luke et al. (2020) argue that Africa has already exploited its potential benefit from trade with the EU from its prior preferential agreements. In contrast, the EU can have substantial market access as EU exporters currently face a relatively high tariff. On the other hand, nontariff barriers are trade-inhibiting for African exports to the EU. Therefore, any trade agreement between African countries and the EU comes at the expense of intra-African agreements' benefits unless it does not address the high transaction costs that African exporters face when accessing the EU market.

Luke et al. (2020) further elaborate that sequencing trade agreements and negotiations have ramifications on the African CFTA outcomes and implementations. Prioritizing AfCFTA over other agreements enhances the benefits for Africa by reinforcing the engagement power as a single rather than a fragmented entity. Currently, African countries enjoy diverse international trade preferences that complicate the integration of these rules in the AfCFTA agreement. LDCs enjoy free access to the EU market under "the everything but arms" agreement. Furthermore, several African countries have signed individual trade agreements with third countries, specifically the US, the EU, and China. Kenya negotiated an FTA agreement with the USA in 2020. From the EAC countries, Kenya and Rwanda also signed an Economic Partnership Agreement (EPA) with the EU, while other member countries are observing to follow. In contrast, Ethiopia has been suspended from its Africa Growth Opportunity Act (AGOA) trade advantage with the US because of the war in the Northern parts of the country. Still, despite the COVID-19 shock, while intra-Africa trade in the region has been declining year on year, trade of most AGOA beneficiary countries with the US has increased significantly (Tralac, 2022). Empirical studies are rare on such prioritization of trade agreements or partnership negotiations for the sequential implementations of the agreements.

3. Measuring Trade Outcomes: Methodological Approaches

The nature of international trade is complex, involving hundreds of countries with different endowments and consumer preferences, thousands of products, and a great variety of national policy instruments that complicate the choice of a single methodology of analysis for all situations (Cockburn et al. 2008; Teichmann 2016). Thus, international trade analysis involves choosing between descriptive statistics, modeling approaches, econometrics estimation and simulation, ex-ante and ex-post approaches, and partial and general equilibrium models (Bacchetta et al., 2012). Bouet (2008) groups these approaches into three primary areas: spatial and non-spatial equilibrium models, gravity equations, and single- and multi-country computable general equilibrium models. They generally fall into two major strands: ex-post and ex-ante approaches. Ex-ante studies use behavioral parameters typically drawn from various sources so that the model can reproduce precisely the data of a reference year (calibration) for later use of simulation, i.e., "what if," In contrast, ex-post analyses use historical data to analyze the effects of past trade policies.

Ex-ante trade reform analysis approaches can be presented in two broad categories of partial and general equilibrium models. Partial equilibrium analysis focuses on one or multiple specific markets or products, ignoring the link between factor incomes and demand but providing sector-specific results. In contrast, general equilibrium models explicitly account for all the links between the different sectors and output and factor markets of an economy of households, firms, governments, and the rest of the world; however, this approach sacrifices detailed sector-specific results (Bacchetta et al., 2012). Naturally, researchers can select any approach based on the nature and complexity of the research questions (Bacchetta et al., 2012; Teichmann, 2016).

Ex-ante approaches require sound baseline data, and databases, calibrated with actual economic data to different base years, can provide detailed country coverage. For instance, several models, such as the Global Biosphere Management Model or the Common Agricultural Policy Regionalised Impact model, do not allow the modeling of individual African countries except for economic heavyweights. Therefore, any analysis of the AfCFTA requires a different database. Almost all ex-ante studies sources data from the Global Trade Analysis Project (GTAP), a semi-public data and model owned by Purdue University; GTAP has been updating and expanding its data coverage by extending the number of countries and sectors since its establishment in the 1990s. The latest version of GTAP 10 contains 141 countries and 65 sectors. With greater flexibility for partial and general equilibrium analysis, GTAP also has data and models other than trade, such as for environmental and climate change analysis-GTAP-E and agro-ecological zone disaggregated land allocation-GTAP-AEZ. Another model, the Environmental Impact and Sustainability Applied General Equilibrium Model is fully designed to analyze climate change-related problems. Despite being owned and frequently used by various modelers and institutions, these and other models source their data from GTAP. An overview of major trade models is compiled in table 1.

TABLE 1: SUMMARY OF THE MAJOR TRADE ANALYSIS MODELS AND THEIR APPLICATIONS

Models and data sources	Developers/ Advanced users	Applications
GTAP (v1-v10)	Thomas W. Hertel (1997)	The main source of data for others
TASTE-Tariff analytical and simulation tool for economists	Corong, McDougall, Tsigas, and van der Mensbrugghe (2017)	The East Asian Meltdown: It's Not All Bad News
Market Access Map-MAcMAPHS6	Ianchovichina and Walmsley (2005, 2012)	China's accession to WTO and East Asia
	Mark Horridge and David Laborde (2008)	Extensively used for various trade agreements analysis
LINKAGE CGE-GIDD microsimulation	World Bank: Bourguignon, Ferreira and Lustig (2005)	Growth-distribution-poverty nexus
GTAP database	Maurizio Bussolo, Rafael E. De Hoyos, and Denis Medvedev (2008)	Global trade policy analysis World Bank used for AfCFTA

MIRAGE (2002) MIRAGE-HH MIRAGRODEP	IFPRI: Antoine Bouët, Carmen Estrades, Fabienne Féménia, David Laborde, and Marcelle Thomas AT CEPII: Yvan Decreux (2007), Cristina, Maria Priscila, Christophe Gouel, Hugo Valin, and Jean Fouré (2006, 2018) André Lemelin (2008, 2009) The African Growth and Development Policy Modeling Consortium	Trade policy analysis ECA used the static and dynamic versions for AfCFTA Special features are imperfect competition, product differentiation by variety and by quality, and FDI explicit inclusion International trade and trade policy in Africa Bouët et al., (2014) for potential evolution of international trade in Africa and Bouët et al., (2021) for the EU-SADC EPA
MAGNET (Modular Applied GeNeral Equilibrium Tool)	Joint Research Centre of the European Commission (JRC) and the Thünen Institute (TI) Woltjer, Kuiper, van Meijl, Hans, and Geert (2006, 2008, 2014) Simola, Antti, Emanuele Ferrari, Pierre Boulanger, Ole Boysen and Victor Nechifor (2021)	Agricultural, environmental, and trade policy analysis EU JRC for AfCFTA impacts on agriculture and food trade and food security
Macro-micro simulations (country-level) Partnership for Economic Policy (PEP)	Bernard Decaluwe (1988, 1999) and Andrea Lemlin, Helene Maisonnave, and Veronique Robichaud (2010, 2013, 2014) Bourguignon, Fournier, and Gurgand, (2000) and Decaluwé, Dumont, and Savard (1999) Denis Cogneau and Anne–Sophie Robilliard-Madagascar (2000) Chen and Ravallion (2003) Robilliard, Bourguignon, and Robinson (2003)	Trade liberalization and Public policy changes China WTO accession For various independent countries such as cote d'Ivoire, Madagascar, Ethiopia, and Kenya

The simulation methods for ex-ante studies have flourished in their development and application since the 1980s and 90s trade liberalizations. Table 1 summarizes some of these simulation methods, their affiliated institutions and areas, and countries of applications. Even though CGE models cover diverse areas such as tax, trade reforms, climate change, land allocation and environmental issues, and growth-poverty and inequality analysis, we include only those widely used for trade reform analysis in our review, which relates to our topic.

The most commonly used is the GTAP model, an open-access model and data source that can be used within the model or on other models. Since its establishment, GTAP has been the primary data source for various models, such as the Modeling International Relation in Applied General Equilibrium (MIRAGE) model or the Modular Applied GeNeral Equilibrium Tool (MAGNET), LINKAGE. These big models are used in either a static or dynamic version under the assumption of a perfect or in the imperfectly competitive market. The static version does not consider the full effects, focusing on the implementation (or hypothetically assumed) completion time outcomes; conversely, the dynamic models simulate the outcome/impact following the ongoing year-by-year (any assumed timeframe). The static and dynamic versions of the models are also used for various national, regional, or international issues, such as the Doha development agenda, Chines accession to the WTO, the North American Free Trade Agreement (NAFTA), the EU, and various trade agreements.

There seems to be a pattern of trade policy analyses: looking at the emphasis and timing of the analyses in table 1 suggests that trade modeling on potential policy changes is connected to events of emerging policy changes. Thus, despite there are the sheer number of studies on sub-regional trade, for instance between EU and African sub-regions, the empirical analyses for the (Pan-) African continent has been limited until the AfCFTA came about, or at least until the related political process became apparent. Policy research unfortunately lagged behind African policy making. Trade policy research could have earlier provided guidance on policy options. The choices made in the trade policy research – including maybe some of its post-colonial patterns - may warrant further study of the political economy of research.

4. Economic and Welfare Assessments and Challenges in Implementing African CFTA

This section continues the previous section with a detailed and specific empirical application review of the AfCFTA studies. Those studies' modeling and assumptions are reviewed with discussion supplemented with different information and data from various sources.

The AfCFTA can substantially grow intra-African trade flows and employment creation, GDP, and welfare, driven mainly by removing NTBs and implementing trade facilitation agreements. The positive impact of trade mainly depends on the infrastructure to support trade, nations' reforms on domestic economic policies to promote trade, and steering their youth toward jobs in industries that depend on trade, as seen in Asian countries (Engel et al., 2021).

Among the several ex-ante studies on the different impacts of AfCFTA, some used partial equilibrium or direct impacts on specific products, such as agriculture and food products (Simola et al., 2021; Fusacchia et al., 2022), cereals (Pasara and Diko, 2020), while many others used global level either static or dynamic CGE models. The partial equilibrium study by Simola et al., (2021) results corroborate that AfCFTA can improve intra-agricultural trade, food security, and Africa's regional and global trade value chain. AfCFTA can enhance Africa's agri-food export by 3.7 percent from a tariff reduction that would increase food availability and consumption; however, the tariff reduction would create a price increase that would adversely affect vulnerable groups or the poor. Mevel and Karingi's (2012) assessment of the AfCFTA impact on 16 African countries indicates that sugar and dairy products are the most positively affected sectors; however, comparing results needs cautious

interpretation that must consider the model, data use, regional or continental coverage, the type of scenarios designed, and other factors. Sub-regional studies that did not make a distinction between the rest of the world and remaining African countries would give a different result. Despite the detail prons of studying specific regions, the magnitude of the impact depends on how remaining African countries are included in the rest of the world such that if these countries are merged in one with the rest of the world, the magnitude of the trade effect, for instance, will be lower than in the case of separate representation of rest of African countries and the remaining rest of the world. For instance, below, we present the significant potential impact assessment studies for the most important indicators. Some studies assessed the impact using dynamic CGE models, whereas others used static versions.

Tariff revenue effect: Overall, the tariff revenue loss is estimated to be modest for most African countries. As the financing of welfare states or public provision and security, activities after international or regional integrations are at the center of debate (Andersen, 2003). The implication of trade integrations hinges on factors of tax base expansion or income gain after the trade agreement and the revenue loss from tariff cuts. Saygili et al. (2018) predicted a tariff revenue loss of 9.1 percent of current revenues for the AfCFTA member states. The tariff revenue loss falls from 0.03 percent to 0.22 percent of GDP, with a significantly higher gain later from the tax base expansion or import expansion; however, the short-run loss burden is undeniable for most countries that need alternative financing or budget rearrangement.

Real income and Welfare effects: The tariff cut effect on the continent's GDP growth stretches from 0.01 by Mevel & Karingi (2012) to 0.7 percent by Saygili, Peters, & Knebel (2018); however, this impact increases when including NTBs reductions and trade facilitation to 1.5 percent by Jensen & Sandrey (2015). The World Bank (2020) found an overall 2.4 percent real income increase from the 97 percent gradual tariff cut and 50 percent NTB reductions which rises to 7 percent when trade facilitation is included. Abrego et al. (2019) assessed the potential welfare gain from tariffs and 35 percent nontariff reductions at 2.6 percent and 2.1 percent using a static model, respectively, for Sub-Saharan Africa (SSA) and the continent. This welfare gain is significantly higher than the tariff-only gains of 0.07 percent for SSA and 0.05 percent for Africa. Economic Commission for Africa (ECA, 2020) predicted mixed welfare impacts and adverse welfare effects for Kenya, Tanzania, and Rwanda in the EAC analysis. These welfare effects are comparable to prior studies of trade agreements, such as NAFTA by Caliendo and Parro (2015), who found 1.31, 0.08, and –0.06 percent for Mexico, the US, and Canada, respectively. Therefore, we conclude that the real income growth impacts of the AfCFTA from the tariff cut are less economically significant but the effects from NTB reduction and trade facilitation are much stronger.

Trade effects: Even if most studies are relatively close in their findings, the intra-Africa export impacts show a larger difference in tariff only and NTM reductions. The trade gains of African CFTA are highly heterogeneous among countries where high trade influence the less pre-integrated countries (Fofack et al., 2021). The potential intra-Africa trade increase reaches up to 81 percent (World Bank, 2020; Abrego et al., 2019), and ECA predicted intra-African trade to grow by 33 percent and Africa's total trade deficit cut by half. Depetris Chauvin et al. (2017) report an uneven increase in trade across African countries. Abrego et al. (2019) found similar results in the full and partial tariff cut; however,

NTB reductions led to significant growth with substantial welfare gain variations across the countries. Despite no consensus on the level and share of internal and external trade in Africa, AfCFTA's assessment shows that tariff and nontariff cuts can boost African trade, as tariff barriers and NTBs form a substantial obstacle to African trade (Bouët et al., 2017).

Recently, intra-Africa trade concerning processed and value-added products has grown more rapidly than other agricultural goods. Bouët et al. (2021), in the Africa Agriculture Trade Monitor report, argued that this increase could indicate African potential to build regional supply chains and meet local demands if supported by regional coordination, like AfCFTA, which can contribute to Africa's food security by enhancing forward and backward linkages. A more integrated and value-added product trade in Africa can reduce the continent's external dependence and its vulnerability to shocks. Developing countries can reduce the collateral effects of trade wars among the developed countries (e.g.,., the USA and China) by deepening regional integrations that can enhance real income and GDP growth (Bouët et al., 2019; Devarajan et al., 2018). Enhancing the agricultural and food sector's forward and backward linkage through the AfCFTA integration and its direct contributions to food security can somewhat insulate Africa from external global shocks (Simola et al., 2021; Fusacchia et al., 2022).

Trade theory is ambiguous about the welfare effects of preferential trade agreements (Krugman 1991; Limao 2016) but also emphasizes that gains are heterogeneous and that producers and workers in importing sectors could experience welfare losses. Heterogenous effects need to be monitored as inequality is Africa's overarching problem next to poverty and food insecurity. Inequality in Africa has continued to grow in most countries, making Africa the second-most unequal continent; approximately 0.0001 percent of the continent's wealthiest people own around 40 percent of the total wealth (Seery et al., 2019). According to Bhorat and Naidoo (2017), the Gini coefficient measure in Africa is also higher than in the overall developing countries; Africa's estimated average Gini index is 0.43, while all other developing countries average 0.39. Heterogeneous effects could increase inequality in Africa across and withing countries.

The level of existing heterogeneity in the level of development, the economic and political fragmentation, and comparative advantages among African countries may unevenly distribute the agreement's potential benefits. In the African continent, over 60 percent of the population lives in rural areas where subsistence farming is the form of livelihood; the structural transformation has been aborted, and inequality is severe. AfCFTA's overall impact on Africa could be immense. The World Bank estimated that the resource and service sectors are the most affected, whereas agriculture will decline by 0.5 percent from the baseline by 2035. Despite the country-level heterogeneity, some countries will increase the expansion of the service sector, which is blamed for the low productivity growth contributing to the failure of African transformation. In a recent study covering 1960 to 2015, Mensah et al. (2022) showed that resources have been dragged to the slow productive service sector; however, value-added and employment are also declining in the agriculture sector, stunting the overall productivity growth of the continent and the structural change move toward the productive sectors. This result has a favorable implication for the overtime-increasing challenge of the crowding out of cities, challenges of migrations to cities and towns, and expansion of informal business participation.

As the service sector is around cities/towns, any expansion can impact the cities and towns' public service provision, administrations, and public budgets, potentially aggravating the already tightened government budget deficits and public services provision.

TABLE 2: SUMMARY OF STUDIES ON AFCFTA

Authors and year	Models and scenarios	Main Results
	Gravity model	
Fofack et al (2021)	General Equilibrium PPML Partial and dynamic GE	welfare gain or real output growth of (0.119 and 0.249), intra-African trade by 24.07 percent and 25.26 percent, and export to the RoW by 2.39 and 2.72 percent Total Africa export by 1.85 and 2.6 percent
	Partial Equilibrium models	
Simola et al. (2021)	GTAP with global, multiregional model Tariff and NTBs reduction	intra trade by 22 percent and food availability and consumption but a price increase An agri-food export rise of 3.7 percent for tariff reduction only
Fusacchia et al. (2022)	HS-GTAP 10 databases with MAcMAP tariff data, static model Full tariff only cut	3.7 percent gross Agri-food exports and 24.6 intra-agreement increase A) More change in trade cost of agriculture and food and backward intra-regional integration than on forwarding participation
Pasara and Diko (2020)	WITS-SMART simulation model for SADC member countries (15)	A minimal gain in cereals but moderate for more crops included in the model
Carrico et al., (2021)	HS6-GTAPv7 MAGNET model-Full tariff cut for vegs and fruits	Less than 1 percent GDP increase but vary across countries Most trade effects from West and South Africa
	General equilibrium models	
Mevel and Karingi (2012)	MIRAGE multi-country and multi-sector CGE dynamic model, with the GTAP database 7; 1, Full intra-tariff removal 2, Tariff + TFA	1) This comprises real income of (0.2 percent), total African export (4 percent), intra-Africa-trade 51.7 percent, the wage for unskilled non-agri 0.80 percent, agri 0.74 percent, and skilled 0.54 percent. Food and agriculture are most affected by 53.1 percent, and industrial products by 53.3 percent. In a vis-à-vis of RFTA and CFTA, the gains are much higher for CFTA, and losses are less in CFTAs. 2) Intra-Africa trade increased by 128.4 percent, doubling the share from 10.2 percent in 2004 to 21.9 percent in 2022, projected at 15.5 percent.
Zongo A. (2020)	GTAP v8 multi-country multi-sector CGE liberalizations for ECOWAS AND SADC 1) tariff +50 percent nontariff (service restriction) 2) no tariff +50 percent nontariff with service restrictions	In the long-run (in the bracket are SR) 1) GDP gain of 5.7 percent (0.11) for ECOWAS and 3.52 percent (0.07) for SADC 2) GDP increase of 3.35 percent (0.09) for ECOWAS and 1.95 percent (0.04) for SADC 3) GDP increase of 4.39 percent (0.11) for ECOWAS and 2.62 percent (0.05) for SADC

	3) 50 percent tariff +50 percent nontariff	
Oyelami and Zongo (2022)	GTAP v10 multi-country CGE 1) 90 percent tariff +50 percent nontariff for agri and industry 2) 1+50 percent NTMs in service	boosts transport and telecom services more from the ECOWAS side than SADC 1) 0.22 percent and 0.95 percent GDP in the SR and LR 2) 0.70 percent and 1.07 percent GDP in the SR and LR
Jensen and Sandrey (2015)	GTAP CGE Static model, with the GTAP database 9.2; A) full tariff removal, B) NTM –50 percent and trade transit time cost –20 percent (Agricultural trade only)	GDP A, 0.6 percent; B, 1.5 percent Welfare (EV) A, 2–57 percent; B, 7–30 percent and 2–50 percent Welfare (USD 7.3 billion), GDP (0.7 percent), export (3.11 percent)
Saygili P. and Knebel, (2018)	GTAP CGE Static model and the GTAP database; full tariff removal	Short-run welfare (4.6 billion USD), net of revenues lose long-run welfare (USD 16.1 billion), GDP (0.97 percent), Export (2.5 percent), employment 1.17 percent, intra-trade 33 percent, trade deficit –51 percent when special sensitive products include GDP 10.7 billion USD (0.3 percent), employment 0.35 percent, intra-trade 24.2 percent, and export 1.9 percent
ECA, AU & ADB. (2018). **2020**	A recursive Dynamic CGE-MIRAGE multi-country and multi-sector model, with the GTAP 9.2 and the MAcMap tariff with harmonized system 6-digit level of products (MAcMap-HS6) 1. Africa CFTA a) full tariff on goods trade b) full tariff + double trade facilitations 2. Africa continental custom union; a) full tariff on goods trade + COMESA CET; b) full tariff + double trade facilitations	1, a) real income effect 0.2 percent, African export 4 percent, by sector (agriculture 7.2 percent, industry 4.7 percent) Intra-Africa trade increase by 52.3 percent in value b) Intra-Africa trade 11.7 percent in volume, Africa exports 6.2 percent, 2, a) real income effect of 0.17 percent, African imports by 3.4 percent, export by 4.2 percent b) Intra-Africa trade by 9.6 percent Africa import by sector (total 3.4 percent, Agriculture and food 3.3 percent, industry 3.9 percent, service 1.9 percent) Total African exports (total 4.2 percent, agri and food 2.5 percent, Industry 4.2 percent, service 5.1 percent)
	PE and CGE with a static GTAP 10; full tariff removal	0.97 percent GDP, East Africa's intra-African trade 13 percent increase (737 million USD), total employment increase of 1.17 percent
Abrego et al. (2019)	I. PC[a] a) Full tariff b)Full tariff and 35 percent NTBs II. IPC[b] a) Full tariff b)Full tariff and 35 percent NTBs	i. GDP improve by 0.037 percent b) welfare or real income increase by 2.6 percent for SSA and 2.1 percent for Africa I. 2.1 percent welfare gain, intra-Africa export 82 percent, overall trade 8.4 percent II. a) 0.05 percent welfare gain, b) 1.92 percent, intra-Africa export 78 percent, overall trade 7.6 percent tariff revenue loss of 0.03 percent

ADB (2019)	GTAP model a) Full tariff b) Full tariff, NTMs C) Full tariff, NTBs, and TFA	real income: **a)** 0.1 percent, **b)** 1.25 percent, **c)** 3.5 percent Intra-Africa trade: **a)** 14.6 percent, **b)** 107 percent **b)** Africa export 44 percent, import 35.7 percent; **c)** Africa imports 40 percent, rest of the world –0.8 percent
World Bank 2020	Recursive CGE-GIDD, a) gradual 97 percent tariff reduction b) tariff 97 percent, NTBs 50 percent, and TFAs 50 percent capped at 10 percent	Overall, 7 percent of real income from full implementation A) 0.22 percent real income b) 2.4 percent real income Employment for unskilled and females, which fills the wage gap and inequality c) GDP 4.20 (413 billion USD), African trade by 29 percent, intra-exports 81 percent, extra-export by 19 percent
IFPRI (Bouet et al., 2021)	MIRAGRODEP global CGE with GTAP 10 A, full tariff cut B, 97 % tariff & 50 NTBs	GDP a, from -0.3 to 0.3 b, -0.2 to 0.3 Intratrade increase of 15% by 2035 from the baseline

Source: Author's compilation of [a] PC perfect competition [b] imperfect competition

The World Bank (2020) assessed that the AfCFTA would fill the gender and wage gap, so unskilled workers benefit more from the trade agreement than skilled male and female workers, finding significant cross-country differences. The distribution strongly depends on people's propensity to be employed and the sector that becomes competitive after opening the border. Recent studies on the impact of trade liberalization on unemployment, adjustment costs, and intra-sector compared to inter-sector mobility show significant and sometimes persistent shocks (Pavcnik, 2017). Most existing general equilibrium model studies are based on the strong assumption of full employment and perfect competition. Studies from the ECA (2018), United Nations Conference on Trade and Development (UNCTAD, 2018), and Abrego et al. (2019) at the International Monetary Fund (IMF) are the exceptions, allowing imperfect competition. UNCTAD (2018) used a static model that allows overall employment changes and predicted a long-run employment impact of 1.2 percent. Of the significant drawbacks of using a static version model that lacks the adjustment dynamics, the explicit simulation for the impact on the (un)employment is rare. For this, the World Bank used a detailed, dynamic, gender-integrated model; however, the model only captures the sectoral reallocation, not the job creation effect of AfCFTA. The reallocation of labor is mainly governed by the intensity of employment and trade cost reduction from the AfCFTA; the World Bank predicted more employment in the public sector followed by recreation-related services, whereas agricultural employment declined to 29.7 in 2035 from 35.9 percent in 2020. In addition, women's wages grow faster than men's in all regions except North Africa, mainly due to the expansion of the manufactured and sophisticated services that need skilled workers. Again, those results are based on the strong assumptions of frictionless labor mobility and fixed labor force participation that underestimate the adjustment costs and benefits.

CGE models have been a hot spot of critics; despite their improvement in many aspects of data, theoretical framing, and sector classification (Ziesmer et al., 2022; Dixon et al., 2013; Bouet, 2008). Many blamed CGE models for exaggerating the welfare gains from trade agreements; the gain for the poor, especially the small farmers, will probably be lower than predicted. Among others, the two major factors of baseline are data sources of projections and calibration methods (Ziesmer et al., 2022): low

level of trade in the baseline will underestimate the impact of the future gains from a trade agreement in dynamic simulations. Trade diversification in products and trade to different countries after the reform may be excluded in simulations, undermining the projected benefits. Furthermore, using the initial trade shares in the simulation gives a lower share of benefits or costs of the trade reform, especially in African countries, as the initial or base year trade volume is relatively low.

Furthermore, many multi-country multi-sector CGE models in the ex-ante analysis produced strikingly divergent results due to their different experiments, data, behavioral parameters, and theoretical features (Bouet, 2008). The behavioral assumptions and the methodological uses are other sources of divergence. Still, CGE models are the most commonly used tools in the ex-ante analysis of policy reforms. Gravity models are also used in trade reform analysis; however, they are less common in simulations as results are limited. Several studies have simulated the possible welfare, trade gain, poverty, and government revenue effects of AfCFTA at the country-level and for the continent or sub-regions. Many papers also analyzed the impact at the sector level, especially in agriculture.

The tariff and nontariff elimination scenarios used would significantly influence the result variations. While some studies, such as Carrico et al. (2021), used the lower harmonized system (HS) level disaggregation to apply tariff eliminations on vegetables and fruits in partial equilibrium analysis, other studies used GTAP-adapted HS6. Furthermore, whether the static or dynamic version of the model used in the analysis also takes different assumptions that produce mixed results. The model's dynamic version considers the changes throughout the implementation time (for instance, year on year), whereas static models only compute the change at the exact end of the simulation or implementation time. The time of the trade barriers (tariff and nontariff) elimination significantly affects the gain from the trade reforms. While some studies recommend complete tariff reductions (Jensen and Sandrey, 2015; Mevel and Karingi, 2012; Saygili et al., 2018), others, like the World Bank (2020), promote gradual and progressive eliminations. Furthermore, studies on the sectoral impacts of AfCFTA indicate that agriculture and food trade contribute more to the gain (Mevel and Karingi, 2012; Carrico et al., 2021) than manufacturing (World Bank, 2020; Abergo et al., 2019). Any differentials in these outcomes cannot be ignored, as these generalizations are essential for policymakers and state parties to join and implement the agreement.

In the following sub-sections, we discuss how different factors that are either directly or indirectly related to the modeling affect the projected and actual outcomes of the AfCFTA. The lack of explicit adjustment costs in the modeling, the challenges and opportunities of overlapping RECs, the policy coordination challenges of Africa, the potential impacts of informal trade on the trade, gender gap, and welfare and public awareness are discussed along with others supported by information collected from different sources.

A. Baseline development and economic adjustment costs

Recent trade policy developments not yet reflected in the current GTAP database must be considered in the baseline development. The most recent GTAP v10 has the base year of 2014 and is almost the sole data source for all AfCFTA studies; however, changes have been occurring since then that can

significantly affect the outcomes of policy change simulations. A prohibition of trade in a specific sector/country following a shock, such as disease outbreaks or pandemics, may result in zero trade record in the base year and no tariff for that commodity, which can significantly affect the simulation result in dynamic simulations (Nilsson, 2019). Therefore, such problems are prevalent in intra-African trade, which has a low level and diversification, ultimately affecting the dynamic simulation results of AfCFTA. The significant heterogeneities among African countries and RECs regarding GDP, population and cultural differences, trade among each, the distribution of free trade gain, and the distribution or concentration of some economic activities, such as manufacturing and value-added, need more attention and consideration in any AfCFTA analysis. African trade concentrates on some selected products, most from the south-SADC region and Northern Africa. This concentration of commodities in a few products and regions results in unevenly distributed gains from the AfCFTA.

Additional factors that may cause variations in the trade reform benefits among countries include the differences in data and estimation methods and times in the computations of elasticities of substitutions. The values of elasticities of substitution for the source of origin of commodities could result in different welfare measure outcomes (Mold and Mukwaya, 2017). The IMF's study used the Caliendo and Parro (2015) estimates for the elasticity of substitutions for NAFTA countries. This use of substitution measures poses at least two minor problems. First, despite the NAFTA member countries are from the LDCs and DCs categories, Africa's value would have some biases. Second, the behavioral differences in these two big groups of countries would also bias the simulation results as the substitution effect significantly affects the welfare measures in the CGE models, as corroborated in many empirical studies.

Model closure in the CGE modeling has important implications, especially concerning welfare measures. The neoclassical approach and the steady state often called the "conservative" closure, are the two most commonly used in GTAP models. The former fixes the factors of endowments and allows the market price to adjust employment, while the latter allows capital stock to adjust (endogenously) by fixing the rate of return. Thus, the current account is fixed in the second case, whereas investment adjusts to accommodate the change in total savings from an exogenously constant saving rate (saving is a constant percentage of income). In contrast, in the first closure, the global investment is responsive to the rate of return that affects the savings and current account balance. For instance, the MIRAGE model uses the fixed current account closure for regions; therefore, the real exchange rate adjusts the balance by appreciating when exports increase by more than imports or depreciating when imports increase due to trade reform exceeding exports. Not all the CGE ax-ante studies can include the current changes in Africa's socio-politics and policy environments. Shocks like COVID-19 and the Russia–Ukraine war have ramifications on trade and related policies that could have a long-lasting effect, and other alterations on the ongoing reforms should be addressed in the model scenarios and closures. For instance, tax policies may compensate for the tariff revenue cut after the tariff liberalization to balance the fiscal burden of governments, which has been increasing due to many factors.

Trade liberalization involves costly short-term macroeconomic adjustments (Faruqee et al., 2007), indicating that there are losers and winners; therefore, different compensations must be prepared and implemented for the losers (Dixit and Norman, 1980, 1986; Davidson et al., 2006). Adjustment costs are costs related to the transfer of resources from one (less productive) to the other (productive or competitive) (Cordoba et al., 2006); thus, the main challenge in this regard is whether the gain covers all losers and how the losers should be compensated. Furthermore, adjustment costs are borne before the benefits reap, making trade agreements fragile and less implementable during the early stages (Bond, 2005). Conversely, the decision of gradual or just complete liberalization depends on the cost of the resources transfer from the less competitive to the competitive.

The EU, WTO, and East Asia (to some extent) had undertaken integration in investment, service, and agriculture after a substantial integration in manufacturing goods (Bond, 2005). Although trade improves income, the fear of adjustment costs makes policymakers reluctant to implement trade reforms (Tarr and Matusz, 2005; Córdoba, 2006). Globalization (trade) has created massive efficiency gains and fueled sustained, trade-led economic growth; however, it also sometimes results in permanent losses in living standards, employment opportunities or wages, and other working conditions due mainly to governments failing to make economic adjustments (European Commission, 2021). The short and medium-term labor adjustment cost of AfCFTA is less known and has not been modeled in most previous studies; however, empirical studies corroborate that this cost would be very high. Therefore, despite the application of various models and scenarios to explore the potential benefits of the AfCFTA; there are numerous factors that can significantly affect both the projected and actual outcomes such as the quality and coverage/scope of data, model, and assumptions; the lack of explicit adjustment costs from the resource mobility and sectoral specializations.

B. Overlapping RECs memberships and AfCFTA implementation opportunities and challenges

The success of the AfCFTA depends on various political, historical, and institutional factors. Most previous studies agree on the prominent role of each nation's commitment to implementing and domestically harmonizing the AfCFTA; however, overlapping REC memberships can complicate implementation. The different integration levels that stretch from FTA to TFTA and the customs union needs customized treatments and governing rules. While the already well-integrated countries within the RECs need few adjustments for the AfCFTA, others, especially those in shallow RECs that are more protective, require more AfCFTA liberalization, resulting in a differentiated tariff elimination process among countries. For instance, how LDCs and non-LDCs countries within the same customs union will liberalize differentially as per the AfCFTA modalities remains challenging (Gumede, 2020). The sub-optimal performance of regional trade arrangements in Africa arises from the considerable cost differences among the members due mainly to an RTA having three outcomes: decreasing welfare or trade diversion; low trade complementarity among RTA members; high NTBs within the blocs (high trade costs, i.e., 'hard' infrastructure-transport costs and 'soft' infrastructure-harmonized rules

and regulations) and a high degree of diversity among RTA members (de Melo et al., 2020). The resource-abundant vs. resource-poor, landlocked vs. coastal, artificial borders, cultural, monetary, and other differences result in diverse interests among RTA members.

The low value and diversification of intra-Africa trade are also concentrated in some countries and sectors. According to Tralac (2022), South Africa alone contributed 32 percent and 13 percent intra-Africa export and import during 2019–2020. Of the 26 billion USD value of intra-Africa trade, agriculture accounts for 22 percent and 14 percent of exports and imports, respectively. SADC member states and Uganda from the EAC contribute the most to intra-trade. Intra RECs trade share also shows a highly dispersed pattern; however, Africa has a limited agricultural competitive advantage in the global market (Sithole, 2021; AATM, 2020). This heterogeneity in the share of participation in the continents' trade can make the AfCFTA gains uneven, as corroborated by the extant literature.

Another example is the AfCFTA relationship with the recently finalized Tripartite Free Trade Area, which covers three RECs (EAC, SADC, and COMESA) (Tralac, 2018). Thus, its success depends on the conditions of eliminating all barriers to trade, good governance, and infrastructure development, including information communication technologies (Moyer et al., 2021; Gumede, 2020). Lacking or diminished trade diversification and a much-diversified language and currency inspires Africans to create an AEC. Despite some efforts toward creating a single currency (Nilo) for the AEC, the debate regarding the African language remains unresolved (Gumede, 2019). Although the overlapping membership of countries at different RECs is seen as an advantage in distributing risks and benefits, the challenges related to different regulatory requirements for each REC are undeniable. African RECs' intra-trade is characterized by the lack of regulatory coherence, transparency, and the "spaghetti bowl" effect of overlapping, incompatible, and sometimes contradictory trade policies, regimes, and laws. These are some of the challenges that may significantly limit or at least make uncertain the above empirical simulation results. Thus, as the existing RECs would help the implementation of AfCFTA by sharing risks, enhancing the implementation and negotiating power of countries, the inconsistences regarding the coming up with a common currency, common external tariff determination, highly concentrated trade features in a few RECs and other existing institutional and structural hurdles poses a significant difficulty in implementation of the policy intervention at hand .

C. Africa's intra-trade tariff and non-tariffs reduction performance

Article 13 of annex 5 of the AfCFTA establishment document requires governments to prepare a national time-bound matrix, i.e., their strategies for removing NTBs categorized by the Annex. Even though the existing RTAs have significantly reduced the tariff trade barriers, other barriers, such as weak infrastructures (transport, communication, and information and exchange costs) and corruption (abusive controls and illicit payments from corridors), remain obstacles to trade in SSA (Melagne and Ehuitché, 2021). Technical barriers, customs procedures and costs, and local regulatory conditions (costs linked to local distribution and pricing policy of agri-food stuff) are other impeding factors of SSA's agri-food trade. The weak productive capacity, limited role of the private sector in regional integration initiatives, low levels of diversification of traded products, the small size of consumer

markets, and the quality of institutions are responsible for the low intra-Africa agricultural commodities trade (AATM, 2018). Almost all studies agree that although tariff reductions or gradual eliminations generate positive gains that can surpass the government revenue loss, nontariff and trade facilitation implementations are the most vital source of gain. Countries are expected to reduce NTBs as they are in the hands of individual countries (Mevel and Karingi, 2012); Jensen and Sandrey (2015; Nicita et al., 2018). UNCTAD defines NTBs as "*policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both*."

The impact of NTBs on African trade surpasses the traditional tariff barriers (Carrere and de Melo, 2011). Therefore, given that the agreement allows LDCs longer tariff phase-down periods of 13 years for sensitive products versus 10 years for non-LDCs (AU, 2018), some RECs may face difficulties in resolving tariff liberalization (Hartzenberg, 2019). As used in the ex-ante analysis in the AfCFTA case, Nontariff barriers implementation has many challenges in the data sources, measurement, and application in the models. A few studies only modeled the impact of NTBs on AfCFTA using various data sources. Those studies (ADB, 2019; Abrego et al., 2019; WB, 2020) used different nontariff reductions. Some of these scenarios are against the actual African context of global competitiveness and reduction of NTBs (as discussed above), such as a 100 percent elimination, which is less probable for developing countries that are highly fragmented and less efficient in nontariff measures reductions. Despite the global tariff reductions in the past decade, NTBs have shown incremental changes (Nicita, 2018). As reported in the World Economic Forum, most African countries' global competitiveness also deteriorated in the past few decades.

Tapping the potential benefits of AfCFTA requires urgent reforms to reduce the infrastructure deficit and other critical NTBs (Abrego et al., 2020), such as customs and administrative and document requirements, to impede the trade of goods that Africa struggles to produce. According to the World Bank's logistics performance index, African countries are not in the top 50s. From over 198 countries, South Africa's, among the best performer in Africa, overall logistics performance index value fell from 3.53 in 2007 to 3.38 in 2018, reaching an all-time high of 3.77 in 2017. In the World Economic Forum's global competitiveness index measure, a few countries, such as Mauritius, Rwanda, South Africa, and Botswana, ranked 45, 58, 61, and 63, respectively, among the 137 countries in 2018. Many countries' competitiveness ranks, such as Tunisia at 39, South Africa at 43, and Morocco at 64, fell to 59, 96, and 72 in 2018, respectively.

In a regional comparison of countries in the global rankings through time, Africa has not experienced any significant improvement; instead, some countries have lost their competitiveness. According to the Global Competitiveness measure, among the 20 less competitive countries, the number of African countries has increased from 13 in 2008 (out of 131 countries) to 17 in 2018 (out of 137 countries). While a few countries, such as Ethiopia, Uganda, and Cameroon, showed progress and escaped the least 20 performers list, countries like Mali, Chad, Burundi, Lesotho, Mauritania, Mozambique, and Zimbabwe deteriorated or showed no improvement. In general, the performance of African countries in tariff reduction through different trade arrangements showed a significant improvement while the global competitiveness, NTBs, and trade facilitation were sluggish that has some structural nature;

simulation on the impacts of AfCFTA need to be carried out under realistic scenarios. This needs efficient estimations of the NTBs and trade facilitation tariff equivalent measures of Africa as these measures are the most significant source of gains despite the common data limitations of Africa.

D. External relationship of Africa with other trade partners and policy coordination

In the last decade, the African, Caribbean, and Pacific (ACP) Preferential Trade Agreements (PTA) with the EU have been proliferating on an asymmetrical basis, meaning the EU provides better market access for ACPs on a region-to-region basis. The various regional and country-level arrangements including the PTAs' signed and ongoing negotiations concerning the West Africa-EU, the Central African-EU, the East African Community-EU, East Africa-EU, Easter and Southern Africa, and the SADC-EU. Despite the custom union formation is not the focus of AfCFTA for the time being, the determination of a common external tariff is still an outstanding issue as many argued that the use of different external tariffs by different RECs complicates the determination and implementation. Thus, those agreements at the regional and national level with other countries and regions will complicate the negotiation and agreements towards a common external tariff. Despite a few exceptions, most of the existing studies (Simola et al., 2021; World Bank, 2020; Abrego et al., 2019) did not consider the scenarios of the common external tariff that needs to be addressed in future studies.

There has been a slight improvement in African trade since the 2000s, mainly due to rising export prices, again attributed to the rise in demand for primary products by BRICS countries (Brazil, Russia, India, China, and South Africa) and investment (FDI), and the EU has remained Africa's leading trade partner (Kappel, 2021). Kappel (2021) argues that Africa has continued in the peripheral region losing its international investment share from 5.3 percent in 1967 to 2 percent in 2018. The AfCFTA has far-reaching consequences on Africa's external relationships that demand cautious model assumptions. The issue of determining the origin and common external tariffs remains unresolved, as some, like ECOWAS and ECA, have different common external tariffs. Therefore, the access to the African market and the access to foreign markets by African exporters may be different across AfCFTA members, i.e. between countries that have signed an EPA with the EU vs. countries that have not. In reality, the free movement of goods and services within Africa will make the origin of African products hardly distinguishable and could in the worst case cause significant transaction costs for African exporters.

There is a strong belief that industrialization precedes development or wealth accumulation and improving the standard of living (Peet, 1987). Africa has a very less diversified export and continuously increasing import dependence. Thus, a continental-wide trade agreement would have immense implications for macroeconomic stability (UNCTAD, 2022). Therefore, import substitution policies to protect infant industries and to increase self-sufficiency in strategic goods are commonly used among African countries. However, in free trade areas, like the AfCFTA, policy sameness can also be a potential trade integration problem in Africa and the AfCFTA (Odijie, 2019). Odijie's (2019) retrospective analysis argues that some industrial policy sameness among countries in some regional arrangements (i.e., the ECOWAS West Africa) is rendered ineffectively. For instance, a policy that

aims at improving the competitiveness of national production will not work when other countries implement similar policies, i.e. subsidization of inputs. For this reason, policy coordination among the countries of the free trade area is needed for the implementation of successful industrial and agricultural policies. CGE models, however, are not able to include this in their modeling framework. In consequence, the gains of trade liberalization could be overrated particularly for protected sectors. Thus, beyond the internal policy copying among countries that will distort the industrialization or competitiveness objectives of Africa by adversely affecting the investment and trade of Africa, inconsistent external trade arrangments also complicate the applications of the AfCFTA concessions.

E. Potential Impacts of informal trade and public awareness

AfCFTA may help to formalize informal trade, which needs multiple regulatory changes to be brought into the formal system (Bouët et al., 2021). As the current database does not contain informal trade or made any kind of adjustment, the simulated impacts may underestimate the potential impact. AfCFTA can ease legal procedures, costs, time, bureaucracy, and other challenges and improve African trade. Informal cross-border trade (ICBT), despite its heterogeneity across regions, countries, and products, accounts for a significant share of the total African trade. ICBT trade is mainly motivated by the high cost of formal trade, trade rules, and regulations, and less enforceability can have an immense role in the poverty reduction of Africa (Bouët et al., 2021). As informal traders, producers, and consumers are from the lowest income group of the population, any improvement can significantly affect Africa's poverty reduction and food security. ICBT constitutes approximately 60 percent of the regional trade of the continent, whereas it accounts for 30–40 percent of the intra-SACU trade (Olafuyi, 2019).

The share of ICBT rises in the country-level figure, reaching 20 percent of the GDP in Nigeria and 75 percent in Benin. In some other countries, ICBT exceeds official or formal trades. If AfCFTA is implemented successfully, ICBT can enhance the AfCFTA gains and reduce gender disparity. According to the Food and Agricultural Organization (FAO, 2021), 60–70 percent of cross-border traders are women, and women and youth account for 90 percent of Africa's informal workers. In Southern Africa alone, women account for 70 percent of ICBT traders (Macheng, 2021). By reducing tariffs, AfCFTA can make the formal trade system affordable, and other nontariff and trade facilitations also attract formal trade by reducing costs and enhancing efficiency. Therefore, AfCFTA's success in contributing to participatory and inclusive continental prosperity will ultimately be weighed against the hardships faced during its implementation.

Apart from the economic advantages of AfCFTA, many proponents argue that it can enhance people's political participation; however, a significant public awareness limitation exists. For instance, in Nigeria, a survey from the Centre for the Study of the Economies of Africa shows that over 60 percent of the surveyed businesses are unaware of the free trade agreement. Unless massive public awareness creation and training are provided to enable businesses to take advantage of the free trade arrangement, its costs and benefits may create unbalanced benefits and uncertain outcomes, i.e., short, medium, or long-run impacts. In other words, even if the projected outcomes are realizable, the

benefits may not be collected by the expected time. In contrast, the Afrobarometer (Sanny and Patel, 2021) survey report across different countries indicates that most countries (two-thirds) believe crossing borders for trade or work is complicated and very difficult. The figures from the report are very high, i.e., Gabon (82 percent), Mali (82 percent), Guinea (81 percent), Burkina Faso (78 percent), Côte d'Ivoire (76 percent), Botswana (41 percent), Angola (43 percent), and Namibia (52 percent). From a sample of 18 countries, an average of 66 percent of respondents felt it was (very) difficult to cross the border; only 21 percent of the sample thought it was easy.

Therefore, the successful implementation and enhancement of the impacts of AfCFTA hang on different domestic or national policies that each country could design and implement (World Bank, 2020; UNCTAD, 2019; Saygili et al., 2018). Furthermore, member countries vary significantly regarding public awareness, national implementation plans, and strategy preparation. Kenya is the pioneer in preparing the national strategic plan. The Kenyan national plan lists the objectives with its prioritized stakeholders, strategies, and institutions. For the AfCFTA to be a game changer, member countries must adopt policies that enhance consistency between trade measures, diversification of objectives, and inclusivity; otherwise, the Free Trade Area may be restricted to a trade liberalization agenda and thereby not fulfill the hopes and aspirations of African people.

5. Conclusion

This paper examined the research literature on the economic, welfare, and trade impacts of the recent implementation of the AfCFTA. We summarize the findings of existing literature but also provide a review of the methodologies and assumptions used in these simulation models. Most studies found comparable results despite the approaches, coverage, and data usage variations. The results corroborate the positive potential gains from AfCFTA; however, these gains are largely driven by the reduction NTBs and much less by tariff reduction. Moreover, the primary differences in the static and dynamic versions of the CGE model used, the market assumption, and model closure have a potential cause of result variation among the studies and the actual projected outcomes. Several studies used a static model that fails to account for the dynamics.

Overall, the projected outcomes show that the real income effect, from static-dynamic concerning tariff plus NTMs and trade facilitations (under perfect competition-imperfect competition), increases by 7 percent. Intra-Africa trade is also predicted to increase from 33 percent to 82 percent. Africa has the lowest intra-regional trade relative to other regions, such as Europe and North America, which indicates the country's potential to enhance the region's integration and trade. In partial equilibrium analysis, some studies also confirmed that AfCFTA could enhance the agri-food intra-Africa trade (by 22 percent) and the continent's food security. Conversely, the AfCFTA implementation's tariff revenue loss is modest, indicating that RECs have already effectively reduced the applied tariff rate; however, the predicted gains are from the nontariff reductions and trade facilitations. Africa has shown significant infrastructural development in the past few decades. However, its competitiveness in the global index has deteriorated in some countries or shown limited improvements, making the possibility of NTBs reductions doubtful, as the global trend also showed an increase in NTMs.

The gains from AfCFTA are heterogeneous among countries, regions, sectors, and even within countries among skill levels and gender; thus, we attempted to substantiate the effect of other factors, such as informal trade, public awareness, and readiness to trade under AfCFTA, and other model-related factors. Implementing AfCFTA could reduce informal traders' costs, customs problems, and risks to attract to formal trade, and the gain from the agreement would be much higher than the models predicted by enhancing the tariff revenues and reducing the gender gap; however, surveys from different sources revealed that public awareness and readiness to trade under AfCFTA are much low. Even if such factors and other security problems in Africa create potential threats, AfCFTA can continue as a potential regional coordinator; as its objectives aspire to surpass the trade to other political and strategic developments. Simple tariff and nontariff reductions alone cannot provide Africa's expected poverty reduction, inclusive growth, and transformation. Instead, whether Africa should prioritize industrialization, as seen in Europe, North America, and to some extent in Asia, over the agriculture sector or vice-versa remains a critical, unanswered question.

Lastly, it is apparent that even if AfCFTA has a significant positive economic impact on the African economy even from the tariff implementation only, the NTBs are the main, previous studies have some drawbacks.

First, none of the previous studies used the actual tariff offer in their scenarios which should be addressed in future studies. Despite the very diverse model applications, the static, tariff-only reduction coupled with trade in goods liberalizations could not show the full potential impacts of the AfCFTA; whereas the actual agreement is a 97 % tariff cut with the remaining 3% excluded list for the trade in goods and services. In less diversified trade like Africa, such kinds of scenarios would have significant differences in outcomes.

Second, future studies should better address the NTBs measure by estimating themselves to better estimate the impacts as the previous studies showed the main gains are from the NTB and trade facilitations. This will resolve the debate that NTBs are increasing than decreasing or difficult to assume a reduction of NTBs for the AfCFTA. Finally, several flaws of CGE projections can be addressed within the model in future studies; however, the essential cruxes of adjustment costs, informal trade, policy coordination, and public support/awareness of the agreement need either econometric or qualitative studies.

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