

CHAPTER FIVE

The AfCFTA: The Need for Ambitious Implementation

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INTRODUCTION

Trade integration has been a priority strategy for Africa's economic development since the Abuja Treaty was adopted in 1991, and the African Union member states agreed to fast-track regional integration when they met in Kigali in 2011. To this end, the African heads of state launched the African Continental Free Trade Area (AfCFTA) in Niamey, Niger, in July 2019, and implementation of this trade reform began on January 1, 2021.

From an economic viewpoint, this initiative is justified for several reasons. First, the costs associated with intra-African trade are particularly high – these include customs duties and nontariff measures (NTMs) as well as costs related to customs procedures, transport and communication infrastructure, insurance and credit, foreign exchange risk management, security, and administrative harassment and corruption.¹ Second, intra-African trade comprises only a small share of total African trade and, more importantly, has not increased in the past 15 years. In terms of agricultural trade, the share of intra-African agricultural exports in total African agricultural exports was stable between 2005 and 2020 at 19.5 percent, but intra-African agricultural imports fell from 17.3 to 13.5 percent of total African agricultural imports over this period. Third, the product structure of African exports is heavily weighted toward unprocessed commodities. Extra-African exports, especially in the agriculture sector, are mainly unprocessed products, while Africa's imports from the rest of the world are mainly semi-processed or processed goods. However, intra-African trade shows a growing trend toward processed products, particularly in the agriculture and food sectors.² Thus, continental trade integration could support increased production of high value-added products and the emergence of regional value chains within Africa. Fourth, the creation of a continentwide free trade area could expand market access for competitive African producers beyond the country or regional economic community (REC) level, which is interesting given Africa's rapid growth in population and economic activity. At the same time, the free trade area could improve African households' access to cheaper products and to more variety.

Initial assessments of the AfCFTA have reached positive conclusions about the potential benefits of this reform, especially if the negotiations focus on NTMs, services, and trade facilitation. Studies have been conducted by the World Bank, the United Nations Economic Commission for Africa (UNECA) in collaboration with the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), the International Food Policy Research Institute (IFPRI), and the Joint Research Centre (JRC).³ These *ex ante* assessments are optimistic about the AfCFTA's potential for trade creation and its likely contribution to economic activity and African households' welfare. However, this optimism is conditioned on whether a reduction of NTMs and trade costs is effectively implemented.

In this chapter, we provide a new assessment of the potential trade and economic consequences of implementation of the AfCFTA Agreement. We use MIRAGRODEP, a dynamic multisectoral computable general equilibrium (CGE) model, to simulate five scenarios. The first one reflects the tariff liberalization plan described in official texts as closely as possible; it includes a gradual agenda of liberalization starting in 2021, a distinction made between least developed countries (LDCs) and non-LDCs in the reform's implementation, and a list of sensitive and excluded products. The second scenario considers a complete tariff liberalization among African economies. The third builds on the first scenario with a gradual linear reduction of

1 See Bouët, Cosnard, and Laborde (2017) and Bouët et al. (2021a).

2 Evidence for the assertions in this paragraph can be found in Dedehouanou, Dimaranan, and Laborde (2019) or Bouët and Sall (2021).

3 UNECA is located in Addis-Ababa; CEPII in Paris; IFPRI in Washington, DC; and JRC in Brussels.

NTMs⁴ by 25 percent and the fourth scenario increases the reduction of NTMs to 80 percent, both over a 10-year period. These two NTM-reduction scenarios were chosen to estimate the consequences of a “low ambition” scenario (25 percent) and a “high ambition” scenario (80 percent). The fifth scenario is the most ambitious: it combines complete elimination of tariffs on intra-African trade with an 80 percent reduction in NTMs. These scenarios were designed to measure how ambition or a lack of ambition in implementation could alter the economic and commercial impact of the AfCFTA.

The new evaluation of the AfCFTA we offer here is interesting because of the special attention it gives to the treatment of tariff data and its assessment of the restrictive impact of NTMs. The economic literature has shown that the use of consistent tariff aggregators is a crucial issue for measuring their impact (Anderson and Neary 1994; Anderson 2009). For this study, we first use optimal tariff aggregators (Laborde, Martin, and van der Mensbrugghe 2017). In addition, because the lists of sensitive and excluded products from liberalization are not yet known, we create a list of such products using a political economy model recognized by the theoretical literature (Jean, Laborde, and Martin 2010). Second, we use an estimate of the restrictive impact of NTMs (ad valorem equivalents, AVEs) that corrects for a statistical bias present in previous estimates.⁵ Third, we incorporate the NTMs in the MIRAGRODEP model in a more realistic way by modeling them as costs borne by firms when they export, instead of fictitious customs duties.

Our analysis shows that the AfCFTA can benefit African economies, but the benefits are expected to be significant only if the agreement is implemented ambitiously. In this regard, excluding products from liberalization and reducing the effectiveness of the planned NTM liberalization could significantly reduce the welfare and trade gains from the free trade area.

The next section of this chapter provides a comprehensive overview of the status of the AfCFTA negotiations and progress in implementation. In the following section, we review the literature on previous evaluations of the AfCFTA. We then present our five scenarios, followed by the results of this evaluation. The conclusion discusses Africa’s informal cross-border trade – a crucial element missing from all these evaluations – and identifies the economic mechanisms through which this omission affects our study results.

STATUS OF AfCFTA IMPLEMENTATION

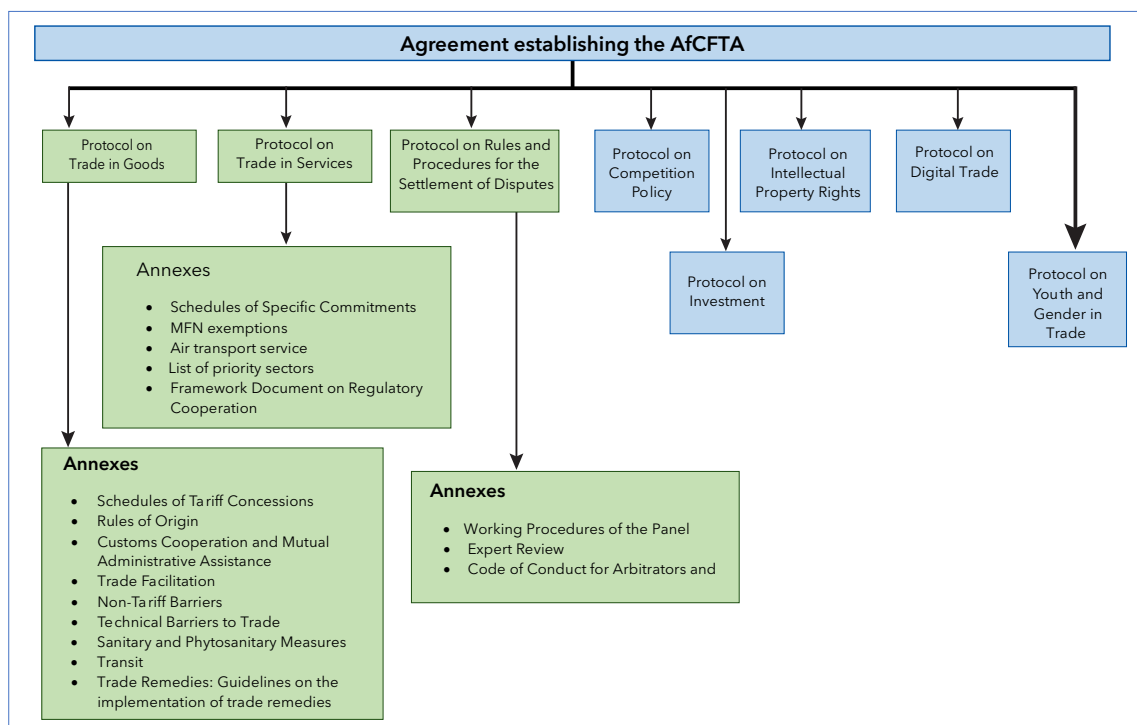
Global perspective on the AfCFTA

The AfCFTA is an ambitious project – it aims to create the world’s largest free trade area in terms of the number of member states. The AfCFTA Agreement establishes three implementation phases and includes a series of protocols and annexes. Phase I negotiations cover trade in goods, trade in services, and the procedures for dispute settlement. Phase II includes investment policy, competition policy, and intellectual property rights. Phase III addresses e-commerce. Negotiations officially started in June 2015, and involved a dedicated Continental Task Force, the Negotiating Forum, the Senior Trade Officials, and the African Union Ministers of Trade. These institutions were supported by technical working groups on the topics covered in the Agreement annexes (rules of origin, sanitary and phytosanitary measures, and so on). Figure 5.1 presents the architecture of the AfCFTA Agreement as well as the main phases.

⁴ We consider only sanitary and phytosanitary measures and technical barriers to trade, whether these measures are considered as actionable or not. The reduction of these NTMs is linear from 2021 to 2030.

⁵ In all the studies evaluating the ad valorem equivalent (AVE) of NTMs based on a gravity equation and conducted before Bao, Bouët, and Traoré (2020), Jensen’s inequality is not considered. This omission leads to a significant underestimation (or sometimes an overestimation, depending on the standard error of the coefficient) of the restrictive impact of NTMs and can even change the sign of the AVE.

Figure 5.1 Architecture of the AfCFTA agreement



Source: Adapted by the authors from TRALAC (2021).

Note: Green boxes correspond to Phase I; blue boxes correspond to Phase II (previously Phases II and III).

While significant progress has been made in the Phase I negotiations, its operationalization and Phase II talks both suffered a major delay, due partly to the COVID-19 pandemic. To make up for the lost time, it was decided to merge the Phase II and Phase III negotiations. The AfCFTA entered into force on May 30, 2019. As of May 2022, 54 countries⁶ had signed the agreement and 43 had deposited their instruments of ratification with the Chairperson of the African Union Commission (AUC).⁷ Soon thereafter, the operational phase of the agreement was launched at the 12th Extraordinary Session of the Assembly of the African Union in Niamey, Niger, on July 7, 2019. The operational phase comprises five initiatives and operational instruments: (1) the product-specific rules of origin covering 90 percent of tariff lines; (2) the online negotiating forum; (3) the monitoring and reduction of NTMs; (4) the digital Pan-African Payments and Settlement System; and (5) the African Trade Observatory. The Secretariat in charge of the implementation is hosted by Ghana: the headquarters were officially inaugurated in August 2020. Although the Secretary-General was sworn in during March 2020, the Secretariat is not yet fully operational. There are also outstanding budgetary issues that need to be resolved. As to the Trade Observatory, which is intended to be the main repository of African trade data, only the beta version of the dashboard has been released (in December 2020), with technical support from the International Trade Center and funding from the European Union.

The schedule for liberalization is presented in Table 5.1. There are two groups of countries: LDCs and non-LDCs. Non-LDCs have five years to liberalize 90 percent of their tariff lines and 10 years for sensitive products, which can constitute up to 7 percent of tariff lines. Each country can exclude up to 3 percent of its tariff lines provided that this does not represent more than 10

⁶ With the signatures of Nigeria and Benin at the 12th Extraordinary Summit of Heads of State and Government of the African Union in Niamey on July 7–8, 2019. Eritrea is the only country yet to sign the agreement.

⁷ The agreement was set to enter into force 30 days after the twenty-fourth country had deposited its instrument of ratification. This happened on April 29, 2019.

percent of intra-African import value.⁸ LDCs are allowed a longer period for dismantling their tariffs: 10 years for the first phase (90 percent of tariff lines) and 13 years to liberalize sensitive products. It is worth noting that, during the negotiations, a group of six countries (the so-called G6) consisting of five LDCs (Ethiopia, Madagascar, Malawi, Sudan, and Zambia) plus Zimbabwe called for differential treatment, primarily a 15-year period for the first phase of liberalization, due to specific development challenges they face. However, these countries withdrew their reservations in 2020 and joined the rest of the parties in implementing the tariff liberalization process.⁹

Table 5.1 Schedule of liberalization

	LDCs	Non-LDCs
Full liberalization	90% of tariff lines 10-year phase down	90% of tariff lines 5-year phase down
Sensitive products	7% of tariff lines 13-year phase down	7% of tariff lines 10-year phase down
Excluded products	3% of tariff lines	3% of tariff lines

Source: UNECA and TRALAC.

Current state of negotiations

Details of the tariff negotiation

As of May 1, 2022, 43 countries have deposited their instruments of ratification with the AUC Chairperson, but only 29 tariff offers are in line with the agreed modalities, according to the Secretariat.¹⁰ Countries that have already submitted their market access offers include those of the Economic Community of Western African States (ECOWAS), East African Community (EAC), Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC, the Economic and Monetary Community of Central Africa), and the Southern African Customs Union (SACU), as well as Malawi and Mauritius. In the initial plan, trade under the rules of the AfCFTA should have begun on July 1, 2020. However, this step was postponed because of the COVID-19 pandemic. Eventually, at the 13th Extraordinary Session, held in Johannesburg on December 5, 2020, the African Union decided to start trading under the AfCFTA on January 1, 2021, based on the approved schedules of tariff concessions, with agreed rules of origin and customs documentation. However, negotiations are still ongoing for rules of origin. According to the Secretariat, as of January 1, 2022, member countries have agreed on 87.8 percent of tariff lines. Outstanding issues remained for dairy products, automotive products, clothing and textiles, sugar, and edible oils. As of June 2022, the rules of origin issue for edible oils had been resolved. For sugar, the only outstanding issue concerns sugar confectionery. Issues concerning manufactured tobacco have now largely been resolved. However, as of May 3, 2022, "no trade has as yet taken place under the AfCFTA regime."¹¹ The next important step expected is the publication of the AfCFTA tariff book. This book will allow traders to identify the associated tariffs and the rules of origin that apply to each product.

⁸ These two criteria are referred to as "the double qualification approach."

⁹ In February 2020, at the Assembly of the African Union, the G6 heads of state withdrew their reservations. Special and differential treatment no longer features in the tariff regime (TRALAC 2021), but "variable geometry" does: differential treatment is treated as an exception, and not as a rule, and it consists in recognizing that some African countries may have special circumstances that make implementation difficult or even impossible. Under such circumstances, African countries may be allowed to implement a particular decision at a "suitable certain future time or simply at a different speed" (Erasmus 2021).

¹⁰ As of May 1, 2022, the countries that have not ratified are Benin, Botswana, Comoros, Guinea Bissau, Liberia, Libya, Madagascar, Mozambique, South Sudan, and Sudan, and Eritrea has not signed the agreement.

¹¹ [https://www.tralac.org/resources/infographic/13795-status-of-afcta-ratification.html#:~:text=Ghana%2C%20Kenya%2C%20Rwanda%2C%20Niger,Guinea%2C%20Gabon%2C%20Mauritius%2C%20Central](https://www.tralac.org/resources/infographic/13795-status-of-afcta-ratification.html#:~:text=Ghana%2C%20Kenya%2C%20Rwanda%2C%20Niger,Guinea%2C%20Gabon%2C%20Mauritius%2C%20Central;); accessed July 19, 2022.

Details of the NTM negotiations

In addition to removing tariffs, one of the main objectives of the AfCFTA is to reduce nontariff barriers among countries. These barriers are primarily regulatory measures that often hinder trade more than tariffs do in Africa, as elsewhere. Seven categories of NTMs have been defined under the AfCFTA: government participation in trade and restrictive practices tolerated by government; customs and administrative entry procedures; technical barriers to trade (TBTs); sanitary and phytosanitary (SPS) measures; specific limitations; charges on imports; and others. The AfCFTA objective regarding NTMs is twofold: reduce existing barriers and do not introduce new ones. To meet these goals, an online reporting, monitoring, and eliminating mechanism has been put in place. With this facility (available at <https://tradebarriers.africa/home>), both the formal private sector and informal traders are encouraged to report any obstacle they may encounter when trading goods, such as excessive delays, illegal fees, and document requirements. Countries are expected to establish plans (matrices) for the elimination of NTMs, prioritized based on their impact on intra-African trade. Negotiations are also ongoing for services, though also with a delay. Five priority sectors have been defined: transport, communications, tourism, financial services, and business services. As of April 30, 2022, 46 countries had submitted their initial offers on trade in services.

LITERATURE REVIEW

We now give a rapid *tour d'horizon* of the previous economic studies that have assessed the potential impact of the AfCFTA. To the best of our knowledge, eight ex ante assessments have already been conducted using CGE models. Table 5.2 compares the results of four of these assessments – conducted at the World Bank (World Bank 2020), by UNECA and CEPII (UNECA 2021), by IFPRI (Bouët et al. 2021b), and by JRC (Simola et al. 2021). We have excluded those assessments that did not incorporate sufficient details of the final agreements: UNECA (2012), Jensen and Sandrey (2015), Saygili et al. (2018), and Abrego et al. (2019) are worth mentioning, but they evaluate the complete removal of import tariffs on intra-African trade, as the details of the reform were not known at the time of their study design.

It is important to understand the similarities and differences among the assessments in Table 5.2. The four CGE models, especially MIRAGE and MIRAGRODEP, are similar on the production side: competition is perfect, returns to scale are constant, and production is modeled based on a nest of constant elasticity of substitution (CES) functions. However, they differ on the functional forms adopted to represent the consumer's utility,¹² the labor market assumptions,¹³ the public closure, and the baseline. In ENVISAGE, the value added in crop production includes a capital-energy-fertilizer-land bundle that is a distinctive feature of this model. The behavioral parameters adopted in these models are close if not identical.¹⁴

MIRAGRODEP is distinguished by its careful treatment of tariff information. In ENVISAGE and MAGNET, tariffs are aggregated from the HS6 lines to the model disaggregation according to a trade-weighted scheme. This significantly underestimates the true cost of the average tariff, but the procedure is consistent with tariff revenues. The MIRAGE model adopts a better weighting

¹² MIRAGE and MIRAGRODEP are based on a linear expenditure system–constant elasticity of substitution (LES-CES) utility function, ENVISAGE on an extended linear expenditure system (ELES) function, and MAGNET, which is an extension of the GTAP model, on a constant difference in elasticity (CDE) function.

¹³ Within a given region or country, in MIRAGE and MIRAGRODEP, skilled labor is perfectly mobile whereas unskilled labor is imperfectly mobile between urban and rural activities based on a constant elasticity of transformation (CET) function; in ENVISAGE, there is a migration function from rural activities to urban activities and labor is perfectly mobile within each set of activities; MAGNET includes three types of factor markets – unsegmented with perfect mobility, segmented with imperfect mobility according to a CET function, and segmented with a dynamic migration function.

¹⁴ In ENVISAGE, MIRAGE, and MIRAGRODEP, key elasticities are drawn from the GTAP database. A distinctive feature of MAGNET is that substitution elasticities of the production nesting tree are recalculated after each run depending on the value of cost shares. On the demand side, in MIRAGRODEP and MAGNET, income and price elasticities are recalibrated to account for the long-term evolution of real GDP per capita.

scheme for evaluating average protection and its distortive impact; the aggregation is based on reference groups' trade weights, which reduces the endogeneity bias. In this regard, MIRAGRODEP is even better as it implements a consistent aggregator approach (Laborde, Martin, and van der Mensbrugge 2017).

Table 5.2 Four CGE assessments of the AfCFTA

	World Bank	UNECA-CEPII	IFPRI	JRC
Model	ENVISAGE	MIRAGE	MIRAGRODEP	MAGNET
Institution	World Bank	CEPII	IFPRI	LEI (Wageningen)
Geographic and sector disaggregation	34 countries/regions and 28 sectors	29 countries/regions and 30 sectors	29 countries/regions and 40 sectors	36 countries/regions and 40 sectors
Tariff aggregator	Trade-weighted	Reference groups' trade weights	Consistent aggregator	Trade-weighted
Share of excluded products	3% of tariff lines and less than 10% of imports with LDCs clause	3% of tariff lines and less than 10% of imports with LDCs clause	3% of tariff lines and less than 10% of imports with LDCs clause	3% of tariff lines and less than 10% of imports with LDCs clause
Criteria for selection of excluded products	Minimize tariff revenue losses	Political economy approach + Promotion of industrialization + Green industrialization	Political economy approach	Minimize tariff revenue losses
Degree of ambition	Tariffs + NTMs + Services + TFA	Tariffs + NTMs + Services	Tariffs + NTMs	Tariffs + NTMs + Services
Impact in 2035				
African trade	+29%	+4.9% (2045)	+1.3%	+3.7%
Intra-African trade	+81%	+33.8% (2045)	+15.3%	+22%
African welfare	+7%	+0.4% and 1% (GDP) (2045)	+0.1%	+0.3%/+0.6% (GDP)
African tariff revenue	-0.5%	-7.8%	-1.1%/+0.3%	-8.2%

Source: Authors' own elaboration.

In MIRAGRODEP, the careful treatment of tariff information also extends to the selection of excluded and sensitive products. Whereas ENVISAGE and MAGNET identify these products based on minimization of tariff revenue losses, MIRAGRODEP selects sensitive and excluded products using a political economy approach that assumes a government considers both the lobbying activities of interest groups and national welfare in the selection process. The MIRAGE study combines three approaches: political economy, promotion of industrialization, and green industrialization.

At first glance, the results of these four evaluations appear to differ significantly. The World Bank model predicts a welfare gain of 7 percent for Africa;¹⁵ the IFPRI model predicts a 0.1 percent welfare gain; for UNECA, Africa's GDP would increase by 1 percent; for JRC, Africa's GDP increases by 0.42 percent, ranging from 0.33 to 0.59 percent across the RECs. Regarding trade, the World Bank's study concludes that the AfCFTA would significantly boost intraregional trade, particularly in manufacturing, estimating that total exports would increase by 29 percent by 2035 relative to the baseline and intra-African exports would increase by 81 percent. At the sectoral level, intra-African trade in manufactured products would increase by 110 percent, while agricultural trade would increase by 49 percent. For services, the gains would be limited: total trade would increase by 4 percent while intra-African trade would increase by 14 percent.

¹⁵ According to the World Bank, by 2035, the agreement would contribute to lifting an additional 30 million people from extreme poverty and 68 million people from moderate poverty. When fully implemented, the AfCFTA would lead to real income gains of 7 percent, or nearly US\$450 billion. The maximum gains are observed in Côte d'Ivoire and Zimbabwe (14 percent). The biggest gains come from the reduction in NTMs and the implementation of the trade facilitation agreement.

The three studies by UNECA-CEPII, IFPRI, and JRC give relatively similar results: intra-African trade grows by 15.3 percent in the IFPRI study in 2035, and by 22 percent for JRC. For UNECA-CEPII, the increase is 33.8 percent, but this is by 2045. Tariff revenue losses are very close for UNECA-CEPII and JRC, and a bit less for IFPRI, though still comparable. The World Bank finds that the impact on tax revenues would be small: for 49 of the 54 countries included in the analysis, the short-term impact would be less than 1.5 percent, and at the level of the continent, total tax revenues would decline by less than 0.5 percent. The significant divergence in these results stems from the fact that they assess different shocks. Although tariff reforms are relatively comparable in the four studies,¹⁶ they include different reforms for the remaining elements of the agreement.

Results of the World Bank evaluation are significantly different because it includes: tariff liberalization, removal of trade barriers resulting from NTMs, liberalization of measures adopted in the services sector, and an efficient trade facilitation agreement (TFA). The reduction in NTMs within Africa modeled by the World Bank facilitates African exports to the rest of the world, which is equivalent to some multilateral reduction of NTMs. The World Bank's modeling of the TFA is based on an estimate by de Melo, Sorgho, and Wagner (2021) of the impact of full implementation of the agreement on trade costs, which is the result of an econometric model regressing the time spent in customs on structural variables, policy variables, and trade facilitation variables, particularly the efficiency of customs procedures. This estimate concludes that full implementation of the TFA would reduce the time spent in customs by 31.8 percent for Nigeria, 10.9 percent for Kenya, but only 2.6 percent for South Africa and 0.3 percent for Senegal. With this reform, African countries would see a 7 percent reduction in trade costs on average, with no implementation cost in return. This constitutes a significant shock that largely explains the difference between the World Bank's estimate and the other three evaluations.

The methods for including NTMs in the CGE models also differ greatly across the four evaluations. The ENVISAGE and MAGNET models use AVEs of NTMs; these are drawn from the World Bank¹⁷ based on the approach of Kee, Nicita, and Olarreaga (2009). The MAGNET model makes a distinction between technical measures, considered to be cost-generating and modeled as an iceberg cost,¹⁸ and nontechnical measures, considered to be rent-generating and modeled as ad valorem tariff equivalents.¹⁹ In the ENVISAGE model, NTMs are modeled as ad valorem tariff equivalents. MIRAGE also uses data from Kee, Nicita, and Olarreaga (2009), with NTMs implemented as a uniform mix (one-third each) of tariff equivalent, iceberg costs, and costs borne by the exporter. As far as services are concerned, NTMs consist only of iceberg costs. In MIRAGRODEP, AVEs of NTMs are evaluated following Bao, Bouët, and Traoré (2021) and are implemented within the model as a cost borne by the exporting sector: first, complying with the NTM requires additional value added from the exporter, and second, it leads to payment of an additional intermediate consumption to the local sector of business services. The MIRAGRODEP evaluation also differs in that it assumes NTMs only impede trade in goods, whereas the other three evaluations assume NTMs impede trade in both goods and services.

The MAGNET model assumes that the AfCFTA reduces NTMs by 50 percent for trade in goods and services between African countries, and also reduces NTMs between African and non-African countries by 25 percent because the AfCFTA is expected to result in a greater standardization and harmonization of African products. The ENVISAGE model makes a similar assumption, but the reduction of trade costs benefiting African exporters to non-African markets

16 Details may be requested from the authors (a.bouet@cgiar.org).

17 <https://datacatalog.worldbank.org/dataset/ad-valorem-equivalent-non-tariff-measures>

18 A modelling of transport costs according to the iceberg cost hypothesis implies that a fraction of the goods shipped "melts" in transit.

19 Technical measures are SPS measures and TBTs. Nontechnical measures are non-automatic licenses, price-control measures, financial measures, rules of origin, and so on.

is only 20 percent. The MIRAGRODEP model reduces NTMs between African countries by 50 percent but does not assume that the AfCFTA will lead to any reduction of trade costs borne by African exporters to non-African markets. This is a significant difference, as African exports to non-African markets are much larger than exports to African markets. Under the simulation conducted with the MIRAGE model, AVEs of NTMs are reduced by 25 percent (it is supposed that only 50 percent of NTMs are actionable and that these NTMs are reduced by 50 percent).

Concerning services, the MIRAGRODEP model does not include a liberalization of trade in services. The MAGNET model simulates a 50 percent reduction in the costs of NTMs on services for all trade between African countries. The MIRAGE study evaluates a first scenario with liberalization of trade in goods, and two other scenarios adding liberalization of trade in services: a 50 percent reduction and a 100 percent reduction in actionable trade barriers in the five priority service sectors and in health and education services. The World Bank models two scenarios, both including a 50 percent reduction of NTMs that impede the trade of services; the first scenario facilitates African exports to Africa and to the rest of the world, the second facilitates only intra-African trade.

In a nutshell, the results of these previous evaluations are comparable when we take into consideration the nature and scope of the reforms modeled in each one. These studies conclude that (1) the AfCFTA reform will be beneficial for African countries in terms of GDP and trade, with small diversion effects for non-African countries; (2) tariff revenue losses will be relatively small; and (3) the tariff reform will not deliver substantial benefits, but reforming NTMs and trade facilitation will bring larger benefits.

SCENARIOS

With the MIRAGRODEP model and a disaggregation based on 40 sectors (16 agricultural or food) and 29 countries or groups of countries (16 African), we simulate five scenarios.²⁰ (The appendix to this chapter provides details on the model and on the sectors and countries included.)

The first scenario is entitled AfCFTA. It simulates the tariff liberalization between African countries as described in the official texts of the AfCFTA with the schedule of tariff reductions along with two lists, one of sensitive products and one of products excluded from liberalization. In May 2022, the official lists of excluded and sensitive products were not yet available, so to simulate the agreement, we used political economy criteria to select the excluded and sensitive products. Our list reflects a reduced form of a model where each government tries to maximize the welfare of its economy while taking into account the interests of the most influential lobbies (see Jean, Laborde, and Martin 2010).

Table 5.3 shows the decline in average tariffs on imports and exports by 2035 for the baseline case (no reforms implemented), scenario 1 (AfCFTA), and scenario 2 (AfCFTA Full, see below). It shows both the average protection implemented by each region at its borders (left columns) and the average duty faced by exports of each region (right columns) – for Africa as a whole and for the five African regions²¹ – at the end of the liberalization process. Note that in Table 5.3, the average tariff applied on imports for each region includes not only tariffs from other African countries but also from non-African countries. Likewise, the average duty faced by exports reflects protectionism in the rest of the world. Thus, although tariff reduction occurs only within Africa under the AfCFTA, this table shows average tariffs between African regions and *all* their partners.

²⁰ We do not simulate any reduction of trade barriers in services.

²¹ The five regions presented in this chapter follow a geographic breakdown that is frequently adopted (see, for example, https://www.datawrapper.de/_/0ED2c/), except that in our study, Mauritania is included in Northern Africa rather than Western Africa.

Table 5.3 Average tariff applied on imports and faced by exports in 2035

	Average tariff on imports (%) in 2035			Average duty faced by exports (%) in 2035		
	Baseline	AfCFTA	AfCFTA Full	Baseline	AfCFTA	AfCFTA Full
Africa	6.75	6.62	6.57	1.95	1.77	1.72
Central Africa	7.13	6.94	6.87	1.62	1.41	1.36
Eastern Africa	7.36	7.24	7.19	1.45	1.29	1.26
Northern Africa	6.31	6.21	6.17	2.59	2.44	2.40
Southern Africa	3.96	3.92	3.87	2.93	2.72	2.66
Western Africa	7.84	7.66	7.64	1.78	1.62	1.53

Source: MAcMAP-HS6 and authors' calculation.

The AfCFTA will be a shock on both imports and exports of African countries. Table 5.3 allows us to see the macroeconomic magnitude of this shock by evaluating the variation in total average protection applied on African imports and total average protection faced by African exports.

Concerning average duties applied on imports, comparison of the rates under the AfCFTA scenario with the baseline rates shows that the tariff liberalization implied by the AfCFTA is small. It ranges from 4 basis points (Southern Africa) to 19 basis points (Central Africa), which is a relative decrease in the rate of protection of 1.0 to 2.7 percent. The reason for this small effect is clear: most of African countries' trade today is with non-African countries.

Concerning average protection faced by exports, the variation in basis points is generally greater than for average protection on imports (except in the case of Western Africa). This means that, as a result of the AfCFTA reform, the gains that African regions see in access to foreign markets are greater than what they offer to competition from imports. This is especially true in the case of Southern Africa, which gains 21 basis points in access to external markets, while decreasing the average protection of its economy by only 4 basis points.

The second scenario is entitled AfCFTA Full. To illustrate how a lack of ambition in terms of tariff liberalization can be costly for the effectiveness of this trade agreement, this scenario entails a complete cancellation of all tariffs on trade in goods between African countries, with no products excluded. A comparison with the first scenario allows us to assess the cost of the sensitive and excluded products clause. In Table 5.3 the AfCFTA Full columns show the average tariff applied by each African region in 2035 if tariffs on intra-African trade are all removed. This reform obviously lowers tariff protection more than the AfCFTA reform, but the difference remains small. For Africa as a whole, the protection applied on imports decreases by 18 basis points with a complete removal of tariffs on intra-African trade, as compared to 13 basis points in case of the AfCFTA; the protection faced by exports decreases by 23 basis points under the AfCFTA Full scenario, compared to 18 basis points under the AfCFTA scenario.

The next two scenarios, AfCFTA NTM-25% and AfCFTA NTM-80%, increase the scope of the reform. In addition to the tariff reform established in the official texts of the AfCFTA, these scenarios include an agreement that reduces the AVEs of NTMs, by 25 and 80 percent, on trade flows in goods between African countries.²² Again, these scenarios were chosen to assess the cost of a lack of ambition in trade reform. Table 5.4 shows the change in the average AVE of

²² NTMs are included in MIRAGRODEP as costs borne by firms when they export, with half of this cost in additional value added, half in additional intermediate consumption to the "Business Services nec" GTAP sector, included in the model. They are modeled in a way that they affect all imports going into countries implementing these measures, but the trade reform only reduces the cost of African imports from African countries. The levels of these rates of variation of NTMs (25 and 80 percent) may be questioned. It is possible to simulate other rates of variation. Details from a reform with a 50 percent reduction of NTMs between African countries may be requested from the authors.

NTMs applied to imports from each region under the baseline, AfCFTA NTM-25%, and AfCFTA NTM-80% scenarios. This average uses weights that reflect bilateral trade in the products covered by these measures. The declines in these average barriers are small, again reflecting the weakness of intra-African trade.

Table 5.4 Average ad valorem equivalents of nontariff measures on goods (%) in 2035

	Baseline	AfCFTA NTM-25%	AfCFTA NTM-80%
Africa	4.34	4.31	4.25
Central Africa	4.26	4.23	4.17
Eastern Africa	4.18	4.16	4.11
Northern Africa	4.56	4.53	4.47
Southern Africa	4.39	4.36	4.28
Western Africa	4.50	4.47	4.39

Source: Bao, Bouët, and Traoré (2020), and authors' calculations.

Note: These are the ad valorem equivalents of NTMs before and after the reform; these are not rates of variation.

Our final scenario reflects a maximumly ambitious trade reform. This scenario, AfCFTA Full NTM-80%, includes the complete elimination of tariffs on intra-African trade in goods plus an 80 percent reduction in NTMs on trade in goods between African countries. It combines the decrease in average customs duties indicated by the last columns of Table 5.3 (AfCFTA Full) and the reduction in NTMs in the last column of Table 5.4 (AfCFTA NTM-80%).

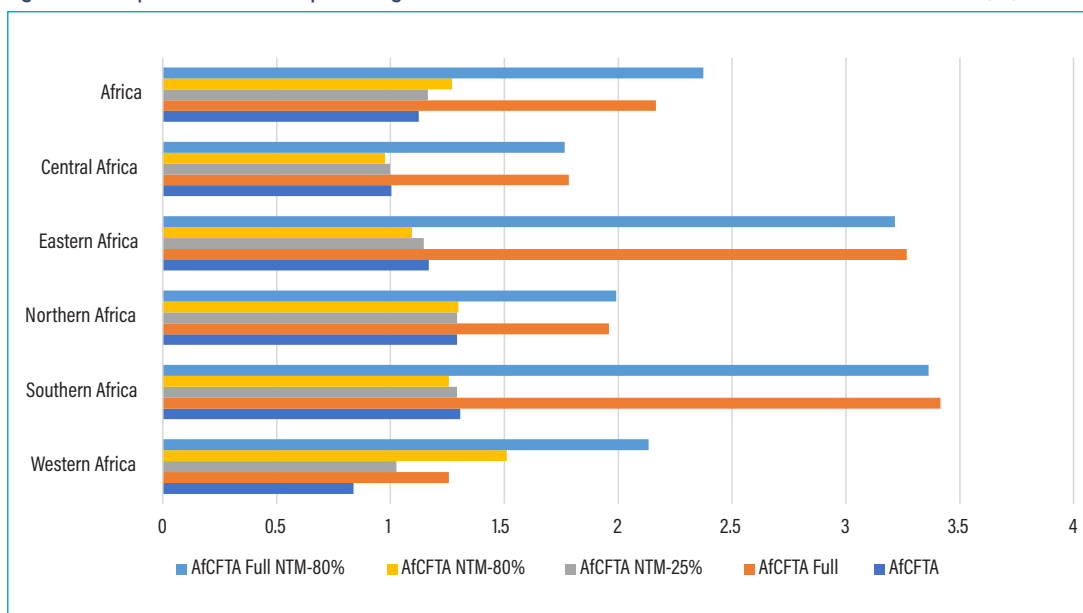
RESULTS

Results derived from these five scenarios include the impacts on trade, on macroeconomic variables (GDP and welfare), on value added by major sector, and on the remuneration of production factors. All results are presented for the year 2035 for five African regions (Central Africa, Eastern Africa, Northern Africa, Southern Africa, and Western Africa). This is a counterfactual analysis, meaning each impact is measured by the difference between the baseline and one of the five scenarios in 2035.

Impact on trade

Figure 5.2 shows the impact of each of the five scenarios on total volume of African exports of goods and services to the world.

Figure 5.2 Impact on African exports of goods and services to the world in volume: Rate of variation (%), 2035



Source: MIRAGRODEP and authors' calculations.

The AfCFTA tariff agreement (AfCFTA scenario) increases the volume of African exports of goods and services by only 1.1 percent, whereas a complete elimination of tariffs on intra-African trade (AfCFTA Full) leads to a 2.2 percent increase. For the agriculture and agribusiness sector alone, these figures are 1.6 percent and 6.2 percent (not shown in Figure 5.2). If NTMs are also reduced, the impact on export volumes of goods and services is greater: +1.2 percent with a 25 percent reduction in AVEs of NTMs and +1.3 percent with an 80 percent reduction, compared with +1.1 percent when there is no reduction of NTMs. Yet, this gain in trade creation from the reduction in NTMs is small. Several plausible explanations can be advanced. First, the reduction of NTMs is not modeled here as a reduction of simple barriers to trade, but rather as greater efficiency in the production of exports: it requires less value added and less intermediate consumption. This efficiency gain is reflected in lower domestic prices and higher incomes, and thus in a simultaneous increase in domestic sales and exports. Second, unlike the World Bank's assessment of the reform, this negotiation concerns only the NTMs affecting intra-African trade, and not the trade of African countries with non-African countries. Finally, the estimate of NTMs is based on a dataset that gives AVEs of NTMs for only 14 African countries (out of a possible 55). This estimate of AVEs is limited because, first, it is based on information on NTMs provided by the WTO Integrated Trade Intelligence Portal and the UNCTAD Trade Analysis Information System; these databases only cover 21 African countries. Second, it relies on an estimation of elasticities of import demand at the HS6 level (Ghods, Grüber, and Stehrer 2016) that also does not cover all African countries. Third, we do not keep AVEs of NTMs if either the elasticity of import demand or the coefficient of the NTM is not significantly different from zero. We also do not keep negative AVEs of NTMs, because their integration in the model would be difficult to interpret (a negative cost for exporters).²³ At the end of this process, we are only able to include AVEs of NTMs in the model for 14 African countries.²⁴ As a result, our assessment may underestimate the impact of an NTM reform. However, this approach was the best option, given that the methodology adopted by Bao, Bouët, and Traoré (2021) is the only one that does not bias the trade impact of NTMs.²⁵

²³ These 14 African countries are Algeria, Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Ethiopia, Gambia, Ghana, Mali, Mauritius, Morocco, Niger, Senegal, and Tunisia.

²⁴ It is worth noting that the data from Kee, Nicita, and Olarreaga (2009) is also incomplete and includes only 21 countries.

²⁵ See Bao, Bouët, and Traoré (2021) for a detailed explanation.

What are the effects of these different reforms on intra-African trade and on African countries' trade with the rest of the world? Notably, these trade reforms "boost" intra-African trade (Table 5.5). The AfCFTA tariff reform alone more than doubles exports of goods and services between Western and Eastern African, between Central and Western Africa, between Northern and Central Africa, and between Northern and Western Africa. Overall, under the AfCFTA reform, intra-African trade of goods and services by value increases by 15.2 percent. If the reform allowed for the complete elimination of intra-African tariffs, this trade in goods and services would increase by 29.1 percent. Also noteworthy is that a complete tariff elimination would greatly benefit exports of goods and services from Southern and Eastern Africa.

Table 5.5 Impact on intra-African trade in goods and services in value: Rate of variation (%), 2035

Exporter	Importer	AfCFTA	AfCFTA Full	AfCFTA NTM-25%	AfCFTA NTM-80%	AfCFTA Full NTM-80%
Africa	Africa	15.2	29.1	15.3	15.6	29.7
Africa	Central Africa	30.9	49.7	31.2	31.8	51.1
Africa	Eastern Africa	16.0	42.3	15.9	15.6	42.0
Africa	Northern Africa	9.2	14.7	9.2	9.4	15.1
Africa	Southern Africa	0.9	6.2	0.9	0.8	6.1
Africa	Western Africa	35.2	47.7	36.0	37.8	50.7
Central Africa	Africa	8.0	11.7	7.6	6.6	10.4
Central Africa	Central Africa	-1.4	-5.4	-1.5	-1.6	-5.6
Central Africa	Eastern Africa	4.7	9.4	3.4	-0.3	4.5
Central Africa	Northern Africa	15.1	36.8	14.9	14.5	36.0
Central Africa	Southern Africa	1.3	3.2	1.3	1.4	3.4
Central Africa	Western Africa	100.4	126.1	100.1	99.5	125.5
Eastern Africa	Africa	7.3	12.1	7.4	7.5	12.3
Eastern Africa	Central Africa	5.8	4.4	6.3	7.8	5.9
Eastern Africa	Eastern Africa	9.3	18.5	9.3	9.6	18.9
Eastern Africa	Northern Africa	4.5	1.2	4.5	4.4	1.0
Eastern Africa	Southern Africa	1.4	4.7	1.3	1.0	4.4
Eastern Africa	Western Africa	80.3	90.6	80.4	80.9	91.4
Northern Africa	Africa	35.5	54.8	35.6	35.8	55.2
Northern Africa	Central Africa	111.5	121.5	111.3	110.5	121.2
Northern Africa	Eastern Africa	34.3	59.2	34.6	35.1	59.9
Northern Africa	Northern Africa	7.1	7.6	7.2	7.2	7.7
Northern Africa	Southern Africa	38.1	306.5	38.0	37.9	304.4
Northern Africa	Western Africa	114.8	151.7	115.0	115.4	153.6
Southern Africa	Africa	15.1	34.8	15.0	14.7	34.4
Southern Africa	Central Africa	26.0	42.1	25.9	25.5	41.2
Southern Africa	Eastern Africa	14.3	52.4	14.1	13.6	51.7
Southern Africa	Northern Africa	49.1	76.0	49.1	49.2	76.0
Southern Africa	Southern Africa	-1.1	-3.6	-1.1	-1.1	-3.6
Southern Africa	Western Africa	95.0	138.5	94.7	94.3	138.2
Western Africa	Africa	4.7	17.0	5.6	7.7	20.7
Western Africa	Central Africa	53.2	126.0	54.5	57.9	133.7
Western Africa	Eastern Africa	102.7	318.5	104.4	108.9	332.8
Western Africa	Northern Africa	15.5	75.9	16.4	18.8	81.8
Western Africa	Southern Africa	1.4	2.8	1.4	1.3	2.8
Western Africa	Western Africa	-4.4	-5.9	-3.3	-0.4	-1.5

Source: MIRAGRODEP and authors' calculations.

Note: Africa refers to the entire African continent

To gauge the significance of these rates of change, it is useful to look at the value change in trade flows (goods and services) between the different regions. Table 5.6 shows the change in trade flows in dollar terms resulting from the AfCFTA scenario alone. The AfCFTA reform implies a

contraction of trade of goods and services within three of the regions – Central, Southern, and Western Africa – in comparison with the baseline. This means that these trade flows actually increase *less* between 2021 and 2035 under AfCFTA than they do without the reform (not that there is an actual decline). This is explained by the fact that trade flows within some regions are already duty free. Thus, for example, as the reform reduces customs duties between each Western Africa country and non-Western African countries, producers reallocate the sale of their production outside Western Africa and consumers make more purchases outside Western Africa. From the work of Anderson and van Wincoop (2003), we know that the relative costs of trade determine the size of trade flows. In other words, lowering protection between Senegal and Morocco, for example, without changing protection between Senegal and Mali, should increase trade between Senegal and Morocco and decrease trade between Senegal and Mali, all other things being equal, and in particular with constant output and income. In all other cases, the reform implies an increase in trade of goods and services within African regions. Concerning trade between African regions, there are eight cases in which trade increases by more than US\$1 billion²⁶ (in bold in Table 5.6). The largest increase occurs in exports from Northern Africa to Western Africa, which increase by \$5.2 billion.

Table 5.6 Variation of intra-African trade in value between large regions (US\$ millions): AfCFTA scenario, 2035

		Importing region				
		Central Africa	Eastern Africa	Northern Africa	Southern Africa	Western Africa
Exporting region	Central Africa	-40	142	107	60	682
	Eastern Africa	114	1,216	213	112	430
	Northern Africa	1,488	2,270	1,150	302	5,236
	Southern Africa	950	2,756	488	-218	3,009
	Western Africa	1,249	388	256	104	-688

Source: MIRAGRODEP and authors' calculations.

Note: Variations greater than US\$1 billion in absolute value are bolded.

Table 5.7 provides an overview of the impact of the five reform scenarios on extra-African trade. We focus on Africa's trade with the three largest trading powers: China, the European Union plus the United Kingdom (EU+UK), and the United States.

The AfCFTA causes some trade diversions: reduced exports from China to Western, Eastern, and Central Africa; reduced exports from the EU+UK to Western and Eastern Africa; and reduced exports from the United States to Western and Eastern Africa. These trade diversions were theorized by Jacob Viner (1950): they are explained by the changes in relative costs discussed above. There is also trade creation in more than a third of the cases in Table 5.7. Trade creation is most notable in cases where the GDP of the African region or country is positively impacted by the reform, implying an increase in households' incomes and thus an increase in their demand and imports of the country. As we shall see, the GDP of the Southern and Northern Africa regions is affected positively by these reforms, which is not the case for Western Africa.

²⁶ Throughout this chapter, \$ refers to US dollars.

Table 5.7 Impact on extra-African trade in goods and services in value: Rate of variation (%), 2035

Exporter	Importer	AfCFTA	AfCFTA Full	AfCFTA NTM-25%	AfCFTA NTM-80%	AfCFTA Full NTM-80%
Africa	China	-0.5	-0.9	-0.5	-0.5	-0.9
Africa	EU + UK	-0.9	-1.7	-0.9	-0.8	-1.5
Africa	US	-0.7	-1.4	-0.7	-0.7	-1.4
Central Africa	China	0.1	0.4	0.1	0.2	0.4
Central Africa	EU + UK	1.0	1.7	1.0	1.0	1.8
Central Africa	US	0.7	1.9	0.8	0.8	2.0
China	Africa	-1.2	-2.0	-1.1	-1.1	-1.9
China	Central Africa	-3.7	-4.8	-3.8	-3.9	-5.0
China	Eastern Africa	-2.0	-4.5	-2.0	-2.0	-4.5
China	Northern Africa	0.8	1.4	0.7	0.7	1.4
China	Southern Africa	2.0	3.0	2.0	1.9	3.0
China	Western Africa	-3.0	-3.7	-2.9	-2.7	-3.3
Eastern Africa	China	-0.1	0.5	-0.1	-0.3	0.4
Eastern Africa	EU + UK	0.0	1.3	0.0	-0.1	1.2
Eastern Africa	US	0.1	1.4	0.1	-0.1	1.2
EU + UK	Africa	-0.2	-0.4	-0.2	-0.1	-0.3
EU + UK	Central Africa	-1.7	-2.7	-1.7	-1.8	-2.9
EU + UK	Eastern Africa	-1.8	-4.8	-1.8	-1.7	-4.8
EU + UK	Northern Africa	0.8	1.3	0.8	0.9	1.3
EU + UK	Southern Africa	1.9	4.2	1.9	1.8	4.2
EU + UK	Western Africa	-2.4	-3.2	-2.2	-1.9	-2.7
Northern Africa	China	-1.4	-2.2	-1.5	-1.7	-2.5
Northern Africa	EU + UK	-1.3	-2.0	-1.3	-1.4	-2.1
Northern Africa	US	-1.4	-2.2	-1.4	-1.4	-2.1
Southern Africa	China	-3.1	-6.7	-3.1	-3.0	-6.6
Southern Africa	EU + UK	-2.8	-6.1	-2.8	-2.8	-6.1
Southern Africa	US	-3.2	-6.6	-3.2	-3.1	-6.6
US	Africa	-0.7	-1.1	-0.7	-0.7	-1.1
US	Central Africa	-1.9	-2.9	-1.9	-2.0	-3.1
US	Eastern Africa	-2.7	-6.1	-2.7	-2.7	-6.0
US	Northern Africa	1.0	1.4	1.0	0.9	1.3
US	Southern Africa	2.1	4.3	2.1	2.0	4.2
US	Western Africa	-3.1	-3.4	-3.0	-2.9	-3.1
Western Africa	China	0.4	-0.2	0.4	0.4	-0.1
Western Africa	EU + UK	0.2	-0.5	0.6	1.4	0.9
Western Africa	US	0.4	-0.4	0.3	0.3	-0.5

Source: MIRAGRODEP and authors' calculations.

Note: Africa refers to the entire African continent.

It is interesting to consider whether the AfCFTA reform significantly modifies the geographic structure of African trade (that is, to the benefit of intra-African trade and to the detriment of traditional trading partners like EU+UK), and also if the evolution of the world economy between 2020 and 2035 would change this structure without the AfCFTA reform (that is, in the baseline scenario). Shifting trade from traditional partners to African countries is clearly at the core of the AfCFTA reform (see Fontagné, Mitaritonna, and Zheng 2022). In Table 5.8, we present the distribution of African trade in goods and services in 2020 prior to the AfCFTA and in 2035, both with and without the reform.

Table 5.8 Geographic distribution of African trade in goods and services, 2022 and 2035

	2020	2035	
		without AfCFTA	with AfCFTA
Africa	11.3%	12.4%	13.9%
China	16.3%	18.8%	18.5%
EU+UK	32.6%	28.7%	28.2%
US	7.7%	6.3%	6.2%
Rest of the World	32.1%	33.8%	33.2%

Source: MIRAGRODEP and authors' calculations.

Note: Africa refers to the entire African continent.

Table 5.8 shows us that even without the AfCFTA reform, between 2020 and 2035 the African trade share within the continent grows and the share with traditional partners such as the EU+UK and the United States declines. The AfCFTA reform accentuates this reorientation, with intra-African trade in goods and services increasing from 11.3 percent of African trade in 2020 to 13.9 percent in 2035. Nevertheless, this intra-African trade remains a minor share of African total trade: the EU+UK remains an important partner, with more than a quarter of African trade, and China increases its share.

Table 5.9 presents the rate of variation in exports under the different scenarios, by value, for large economic sectors.²⁷ The AfCFTA and AfCFTA Full scenarios for the crops sector for Southern Africa differ substantially: exports by value increase by 0.2 percent in the first scenario and by 35.8 percent in the second. When African countries can exclude products from tariff liberalization, it is often crops that are excluded, especially in countries to which South Africa exports these products. The ability to exclude 3 percent of products from tariff liberalization therefore significantly affects exports from Southern African countries. Differences in the same direction, but of different magnitudes, are seen for processed food in Central Africa and for the crops sector in Eastern Africa. Again, the differences between the two scenarios are explained by the excluded products clause. The political economy model adopted in this study to select the list of excluded products concludes that wheat will regularly be exempted from tariff cuts by African countries and RECs. However, liberalizing NTMs is important for the processed food sector, which is impeded by many SPS measures and TBTs. These NTMs create a cost for exporters but reflect consumer preferences on the importing side. Worldwide African exports of processed food increase by 6.3 percent by value under the AfCFTA Full scenario, but by 12.1 percent under AfCFTA Full NTM-80%. Western Africa would benefit most from this reduction in nontariff barriers, with a 27.9 percent increase in its processed food exports by value.

In the industry sector, the impact of the various reforms is positive, but on a much smaller scale than in agriculture. Overall, in 2035, the AfCFTA reform increases African industrial exports to all destinations by 1.5 percent in value (2.3 percent in the case of the AfCFTA Full reform), while processed food exports increase by 4 percent (6.3 percent) and livestock exports by 3.3 percent (2.6 percent). Exports of services generally increase little or even fall: this is a general equilibrium effect (the increase in activity obtained through tariff liberalization increases factor demand, and thus factor remunerations and production costs) and the consequence of the external closure hypothesis (the current account balance of each region or country must remain constant as a proportion of GDP).

²⁷ It is also interesting to consider the effects of the reform on intra-African trade by sector; we lack space to present them. These results may be requested from the authors (a.bouet@cgiar.org).

Table 5.9 Impact on African exports by large sector in value: Rate of variation (%), 2035

	Sector	AfCFTA	AfCFTA Full	AfCFTA NTM-25%	AfCFTA NTM-80%	AfCFTA Full NTM-80%
Africa	Agrifood	1.7	6.4	2.1	3.2	8.5
	Processed food	4.0	6.3	5.3	8.8	12.1
	Farm	0.7	6.5	0.7	0.8	6.9
	Livestock	3.3	2.6	3.3	3.5	2.8
	Crops	0.7	7	0.7	0.8	7.5
	Industry	1.5	2.3	1.5	1.5	2.2
	Services	-0.6	-1.0	-0.7	-0.9	-1.4
Central Africa	Agrifood	4.0	9.4	3.9	3.9	9.1
	Processed food	3.0	15.7	2.8	2.3	14.7
	Farm	4.3	7.2	4.3	4.4	7.2
	Livestock	3.4	5.7	3.6	3.9	6.3
	Crops	4.4	7.3	4.4	4.6	7.3
	Industry	0.8	1.4	0.8	0.8	1.4
	Services	1.1	1.6	1.1	1.2	1.8
Eastern Africa	Agrifood	0.8	4.4	0.8	0.9	4.5
	Processed food	0.9	3.0	1.2	1.8	4.4
	Farm	0.7	4.8	0.7	0.6	4.6
	Livestock	1.0	3.2	1.0	1.0	3.3
	Crops	0.8	5.1	0.8	0.7	4.8
	Industry	1.9	3.2	1.8	1.7	3.0
	Services	0.3	1.3	0.2	-0.1	1.0
Northern Africa	Agrifood	4.4	5.8	4.8	5.8	7.8
	Processed food	8.9	10.9	9.5	11.2	14.3
	Farm	0.5	1.2	0.6	1	2.1
	Livestock	10.7	9.3	10.8	11	9.6
	Crops	0	0.9	0.2	0.5	1.9
	Industry	1.9	3.0	1.9	1.9	3.0
	Services	-1.2	-1.9	-1.3	-1.6	-2.4
Southern Africa	Agrifood	1.9	18.3	1.9	1.7	18
	Processed food	4.4	6.5	4.3	3.9	5.9
	Farm	0.1	27.1	0.1	0.1	27
	Livestock	1.8	-1.4	1.8	1.8	-1.4
	Crops	0.2	35.8	0.2	0.2	35.7
	Industry	2.5	3.0	2.5	2.4	2.9
	Services	-2.2	-4.8	-2.2	-2.1	-4.6
Western Africa	Agrifood	0.7	1.6	1.9	4.9	7.3
	Processed food	1.3	2.7	7.3	22.7	27.9
	Farm	0.6	1.4	0.7	0.8	2.6
	Livestock	1.2	1.1	1.8	3.0	2.5
	Crops	0.6	1.4	0.6	0.8	2.6
	Industry	0.8	1.3	0.8	0.7	1.1
	Services	0.6	0.6	0.3	-0.3	-0.5

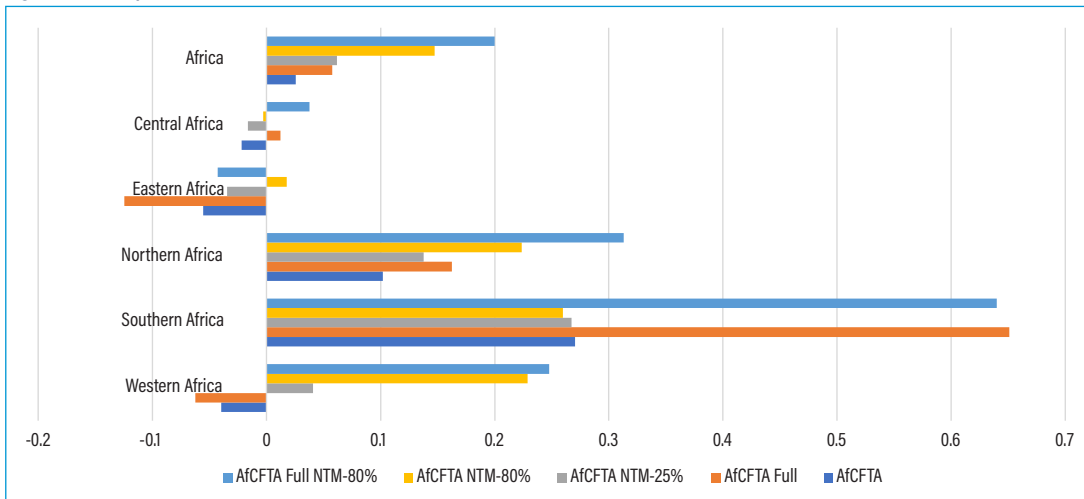
Source: MIRAGRODEP and authors' calculations.

Note: Africa refers to the entire African continent.

Impact on macroeconomic variables

The five reform scenarios affect key macroeconomic variables – the real income (or welfare) of the representative household (Figure 5.3) and real GDP (Figure 5.4). The general profile of the impact of the different scenarios on welfare and GDP is very similar, so that it is possible to make the same comment for both macroeconomic variables.

Figure 5.3 Impact on real income: Rate of variation (%), 2035



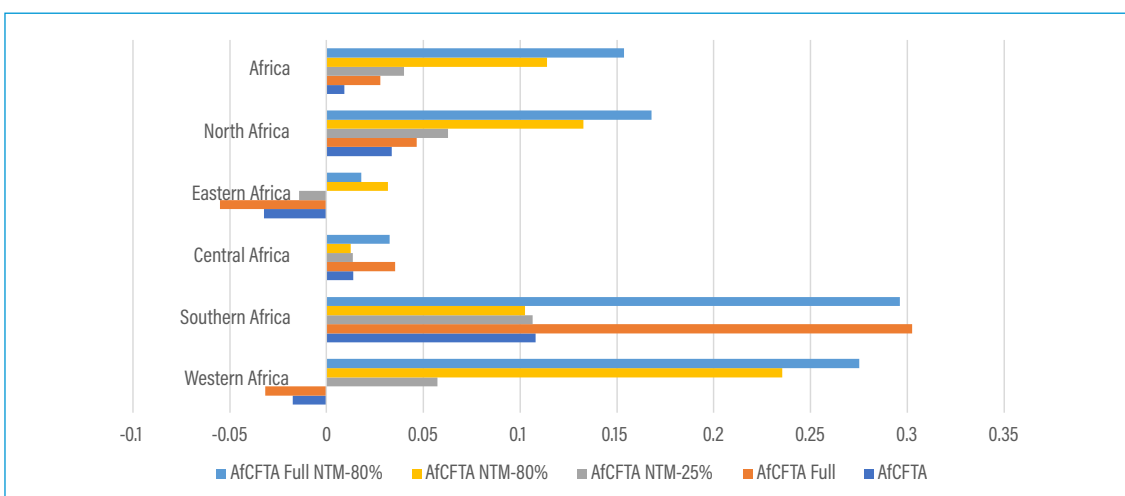
Source: MIRAGRODEP and authors’ calculations.

Note: Variation of real income is measured by “Hicksian” equivalent variation, that is, the amount of money needed for the representative consumer in each country, the amount that makes the consumer indifferent between the reform and receiving it, at initial prices.

For Africa overall, the more ambitious the reform, the greater the macroeconomic gains. While the gains from the AfCFTA reform alone are positive but small, the gains from tariff reform accompanied by a significant reduction in NTMs are larger, on the order of 0.15 percent for real income and for GDP. If the ambitious reform of NTMs were accompanied by a complete elimination of tariffs on intra-African trade (AfCFTA Full NTM-80%), the gains would be on the order of 0.2 percent for real household income and GDP.

The profile of the different impacts for Northern Africa is relatively similar to the impacts for the whole continent.

Figure 5.4 Impact on GDP in volume: Rate of variation (%), 2035



Source: MIRAGRODEP and authors’ calculations.

For Southern Africa, significant gains are expected from lower tariffs. Comparison of the AfCFTA and AfCFTA Full scenarios shows that the excluded products clause represents a loss of 0.2 percent of GDP and a loss of 0.4 percent of real income for Southern Africa: this clause is therefore significantly costly for this region. NTM reforms, however, have little impact on this region, though it is possible that NTMs affecting exports from this region are not well captured by this study due to the limited database used.

For Western Africa, however, reform of NTMs has macroeconomic benefits but tariff reform is counterproductive. The establishment of a free trade area has two effects, a beneficial effect from trade creation (trade liberalization increases exports and therefore economic activity) and a trade diversion effect (imports from the new free trade area substitute for imports from countries outside the area). This second effect is negative because it implies a deterioration in the terms of trade. For Western Africa, trade creation is lower than the other regions, at just \$1.3 billion (based on a calculation of the total increase in exports between regions indicated in Table 5.6). The reform reduces intra-Western Africa trade by \$688 million. In addition, the EU+UK is the source of more than a quarter of Western Africa's imports of goods and services in 2020 (28.7 percent), and the reform implies significant reductions in these imports with the share reduced to 24.3 percent in 2035 (compared with 25.1 percent in the baseline). The AfCFTA tariff reform thus creates relatively little trade in this region and diverts a relatively large amount of trade, not only within the region but also from its main source of imports, the EU+UK. The same mechanisms are at work for the tariff reform in Eastern Africa. For Central Africa, all the effects are close to zero.

Impact on economic activity by sector and remuneration of factors of production

Table 5.10 shows the impact of the various reforms on real value added by sector. The gains are heterogeneously shared within each region. For instance, if we consider the AfCFTA scenario, on average (when looking at the Africa aggregate), gains generally occur in industry and losses in other sectors. The AfCFTA Full scenario also benefits services.

This pattern differs in some regions, such as Southern and Northern Africa, where gains also occur in agricultural activities. The processed food sector, which includes all food processing activities, sees a significant increase in activity in Southern Africa (+0.8 percent in case of the AfCFTA scenario; +1.7 percent in AfCFTA Full) and in Northern Africa (+0.4 percent in AfCFTA; +4.7 percent in AfCFTA Full), reflecting the high cost of the sensitive and excluded products clause for the agrifood sector for these regions. In Southern Africa, value added in the crop sector increases only with complete removal of tariffs on intra-African trade. In Northern Africa, activity increases in both food processing and livestock. Across the continent, there is a general decline in activity in the livestock sector, with the most significant declines in Western, Central, and Eastern Africa.

Table 5.10 Impact on African value added by large sector in volume: Rate of variation (%), 2035

		AfCFTA	AfCFTA Full	AfCFTA NTM-25%	AfCFTA NTM-80%	AfCFTA Full NTM-80%
Africa	Agrifood	-0.1	-0.1	-0.1	0.0	0.0
	Processed food	0.0	-0.1	0.1	0.2	0.2
	Farm	-0.1	-0.2	-0.1	-0.1	-0.1
	Livestock	-0.1	-0.4	-0.2	-0.4	-0.7
	Crops	-0.1	-0.1	-0.1	-0.1	0.0
	Industry	0.1	0.2	0.1	0.2	0.3
	Services	0.0	0.1	0.1	0.2	0.2
Central Africa	Agrifood	-0.2	-0.2	-0.2	-0.2	-0.4
	Processed food	-0.2	0.1	-0.2	-0.3	0.0
	Farm	-0.1	-0.4	-0.2	-0.2	-0.5
	Livestock	-0.4	-1.4	-0.5	-0.5	-1.6
	Crops	-0.1	-0.2	-0.1	-0.2	-0.3
	Industry	0.1	0.2	0.1	0.2	0.3
	Services	0.0	0.0	0.0	0.0	0.0
Eastern Africa	Agrifood	-0.1	-0.3	0.0	0.0	-0.3
	Processed food	0.0	-0.2	0.0	0.1	-0.2
	Farm	-0.1	-0.4	-0.1	-0.1	-0.4
	Livestock	-0.2	-0.7	-0.2	-0.2	-0.7
	Crops	-0.1	-0.3	0.0	0.0	-0.3
	Industry	0.1	0.5	0.1	0.2	0.6
	Services	0.0	-0.1	0.0	0.0	0.0
Northern Africa	Agrifood	0.2	0.1	0.2	0.3	0.2
	Processed food	0.4	4.7	0.3	0.3	4.6
	Farm	0.1	-0.2	0.1	0.2	0.0
	Livestock	0.4	0.3	0.4	0.6	0.5
	Crops	0.0	-0.2	0.1	0.2	-0.1
	Industry	0.1	0.2	0.1	0.2	0.4
	Services	0.0	0.0	0.0	0.1	0.1
Southern Africa	Agrifood	0.4	4.7	0.3	0.3	4.6
	Processed food	0.8	1.7	0.7	0.6	1.6
	Farm	0.0	7.4	0.0	0.0	7.3
	Livestock	0.2	-0.1	0.2	0.2	-0.1
	Crops	-0.1	13.6	-0.1	-0.1	13.6
	Industry	0.1	-0.8	0.1	0.1	-0.7
	Services	0.1	0.3	0.1	0.1	0.3
Western Africa	Agrifood	-0.1	-0.1	0.0	0.2	0.3
	Processed food	-0.1	-0.1	0.2	0.8	1.0
	Farm	-0.1	-0.1	-0.1	0.0	0.1
	Livestock	-0.2	-0.3	-0.5	-1.0	-1.1
	Crops	-0.1	-0.1	0.0	0.1	0.2
	Industry	0.1	0.2	0.1	0.1	0.1
	Services	-0.1	-0.1	0.1	0.4	0.4

Source: MIRAGRODEP and authors' calculations.

Table 5.11 shows the impact of the various reforms on real factor remuneration. At the continental level, the variations are close to zero. However, in Southern and Northern Africa, trade reform benefits both skilled and unskilled labor, in both the rural and urban sectors. This clearly indicates a potential positive effect of these reforms on poverty in these two regions, whereas the effect on poverty would be close to zero in the other regions. In the case of the most ambitious reform (AfCFTA Full NTM-80%), the wages of skilled and unskilled workers would increase significantly, especially in Western, Southern, and Northern Africa. Finally, a tariff reform without a sensitive products clause would substantially benefit the remuneration

of land and rural unskilled labor in Southern Africa: these remunerations increase by 3.6 and 2.4 percent respectively in the AfCFTA Full scenario, compared with increases of only 0.04 and 0.4 percent in the AfCFTA scenario.

Table 5.11 Impact on real remuneration of productive factors: Rate of variation (%), 2035

		AfCFTA	AfCFTA Full	AfCFTA NTM-25%	AfCFTA NTM-80%	AfCFTA Full NTM-80%
Africa	Skilled labor	0.1	0.1	0.1	0.2	0.3
	Rural unskilled labor	0	-0.1	0	0.1	0.1
	Urban unskilled labor	0.1	0.1	0.1	0.3	0.3
	Capital	0	0.1	0.1	0.1	0.2
	Land	0	-0.1	0	0	0
Central Africa	Skilled labor	0	0	0	0	0
	Rural unskilled labor	-0.2	-0.3	-0.2	-0.2	-0.3
	Urban unskilled labor	-0.1	0	-0.1	0	0
	Capital	0	0.1	0	0	0.1
	Land	-0.2	-0.3	-0.2	-0.2	-0.4
Eastern Africa	Skilled labor	-0.1	-0.1	0	0.1	0
	Rural unskilled labor	-0.1	-0.3	-0.1	0	-0.3
	Urban unskilled labor	0	0	0	0.1	0.1
	Capital	0	0.1	0	0.1	0.2
	Land	-0.1	-0.4	-0.1	0	-0.4
Northern Africa	Skilled labor	0.1	0.3	0.2	0.3	0.4
	Rural unskilled labor	0.2	0.1	0.3	0.4	0.4
	Urban unskilled labor	0.2	0.3	0.2	0.3	0.5
	Capital	0.1	0.1	0.1	0.2	0.2
	Land	0.1	-0.1	0.2	0.3	0.1
Southern Africa	Skilled labor	0.3	0.5	0.3	0.3	0.5
	Rural unskilled labor	0.4	2.4	0.4	0.4	2.3
	Urban unskilled labor	0.3	0.5	0.3	0.3	0.5
	Capital	0.1	0.3	0.1	0.1	0.3
	Land	0	3.6	0	0	3.6
Western Africa	Skilled labor	-0.1	-0.1	0.1	0.4	0.4
	Rural unskilled labor	-0.1	-0.1	0	0.2	0.3
	Urban unskilled labor	0	0	0.1	0.5	0.5
	Capital	0	0	0.1	0.3	0.3
	Land	-0.1	0	0	0.1	0.2

Source: MIRAGRODEP and authors' calculations.

CONCLUSION

In this chapter, we have re-estimated the potential impact of the African Continental Free Trade Area. This evaluation was carried out with the MIRAGRODEP model, which allows us to better estimate the impact of tariff reductions both because this model uses a consistent aggregator of tariffs and because the selection of sensitive products and excluded products is based on a political economy model with strong microeconomic foundations. As compared to the

UNECA-CEPII study conducted using MIRAGE, the tariff aggregator is indeed an improvement. However, our selection of sensitive products is less in line with the selection criteria agreed under the negotiation. In our MIRAGRODEP study, we did not account for the criteria for promotion of industrialization and green industrialization. These criteria were agreed on at the negotiations.

Our study also simulates a reduction in NTMs based on two innovations. Our evaluation of the magnitude of these measures is stronger econometrically. Even if AVEs of NTMs have not been estimated for a few African countries (the main caveat for this modeling exercise), we think the adoption of a better econometric estimation was useful; however, these NTMs are not integrated as simple costs to international trade, but rather as an additional cost that exporting firms must pay, in terms of factors of production and payments to the commercial services sector.

This evaluation largely confirms the findings of the previous evaluations. The AfCFTA will be a game-changer only if it is ambitious, both for tariff liberalization (important for boosting trade) and NTMs (important for raising GDP). The sensitive and excluded products clause reduces the potential impact of this reform: the AfCFTA tariff agreement (AfCFTA scenario) increases African exports of agrifood goods by only 1.6 percent in volume, whereas a complete elimination of tariffs on intra-African trade (AfCFTA Full scenario) would increase these exports by 6.2 percent. The opportunity cost of this clause is thus significant.

Negotiating a reduction of NTMs is also a critical issue. The AfCFTA tariff scenario has an impact of close to zero on Africa's GDP, and a complete elimination of tariffs on intra-African trade (AfCFTA Full) increases African GDP by only 0.05 percent (almost no impact). However, adding an 80 percent reduction in NTMs would increase African GDP by 0.2 percent. The ambitious AfCFTA Full NTM-80% scenario increases African GDP at market prices by \$4 billion more than the AfCFTA Full scenario. Notably, our evaluation of NTMs includes such measures in only 14 of the 55 African countries, so it underestimates the impact of these negotiations.

Our assessment does not account for informal cross-border trade (ICBT), which is a key feature of African trade, particularly agricultural trade. The other evaluations reviewed in this chapter also omit informal trade. ICBT is trade operated by unregistered traders or informally by registered traders. Typically, it is "proximity trade, involving movement of produce between markets close to a border. The informality refers to the status of the trader (unregistered), not necessarily to the trade itself (captured or unrecorded by the official customs system)."²⁸ ICBT thus refers to either unregistered traders or firms operating entirely outside the formal economy (trade in small quantities through a border crossing such that this passage is not subject to control and smuggling by traders operating shipments of a good through a border avoiding official custom posts); or registered firms partially evading trade-related regulations and duties by resorting to illegal practices.

Several initiatives have been developed to monitor informal (or "unregistered") trade in recent years in Africa: in West Africa, the Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS, Permanent Interstate Committee for Drought Control in the Sahel) and West African Association for Cross-Border Trade in Agro-forestry-pastoral and Fisheries Products (WACTAF); in Uganda surveys started in 2005 by the Uganda Bureau of Statistics (UBoS) and the Bank of Uganda; surveys conducted in Eastern and Southern Africa by FEWSNET; and an evaluation conducted by the Rwandan government at 53 border crossings with its four neighboring countries. Although many studies aimed at assessing the magnitude of ICBT in

28 UNCTAD website: <https://unctad.org/project/informal-cross-border-trade-empowerment-women-economic-development-and-regional-integration>; accessed February 18, 2020.

Africa are partial, they all suggest the importance of unrecorded trade and the figures are large in all surveys. Informal trade is thought to be equal to between 7 and 16 percent of official intra-African trade flows and between 30 percent and 72 percent of official trade between neighboring countries (Gaarder, Luke, and Sommer 2021).

What are the consequences of omitting ICBT from the ex ante evaluation conducted in this chapter? We identify two channels through which the resulting underestimation may affect our assessment of the AfCFTA. First, the implications of a trade agreement, or more generally of a reduction in trading costs, depend on the initial size of trade, including ICBT. Costinot and Rodríguez-Clare (2014) show that the benefit (or welfare, in economic terms) that a nation derives from a variation in international trade costs depends on the variation in the share of national expenditure on local products and the elasticity of trade with respect to trading costs. For the same variation in trading costs, this variation in the share of national expenditure on local products will be smaller for a large country or for a country that initially trades little.²⁹ If intra-African trade is larger than initially expected (because ICBT was not considered), the share of domestic spending on local products is automatically lower, and the change in this share for some reduction in trade costs should be higher. This suggests that the trade-generating and welfare-enhancing effects of the AfCFTA are larger when ICBT is included.

Second, ICBT also has an effect on trade structure. Informal trade in Africa is essentially between neighboring countries, and generally, neighboring African countries belong to the same REC. There are 212 pairs of contiguous countries on the African continent, among which 160 belong to the same REC, that is 75.5 percent of cases.³⁰ Informal trade in Africa takes many forms. It can take the form of individuals crossing a border with small quantities that customs officials tolerate without registering; it is then trade between bordering countries that may belong to the same REC (for example, between Uganda and Kenya as recorded by UBoS at the Busia border post)³¹ or to two different RECs (for example, between Nigeria and Cameroon). Another illustration comes from West Africa, where a significant portion of trade between ECOWAS countries is not recorded by customs officials because it is not subject to tax collection, whether it is carried out in small quantities by individuals in the informal sector or by trucks of formal sector companies. However, in the same region, a significant portion of trade between Benin and Nigeria is smuggled through border crossings without customs officers, simply because Nigeria levies duties or imposes bans on imports from Benin.³² This pattern of informal trade is important to the subject of this study – accounting for ICBT will either add trade on borders that impose costs on trade in the form of tariffs or NTMs, and thus the implementation of the AfCFTA will likely lead to even larger welfare and activity gains; or ICBT will add trade on borders between countries that are already trading freely and the effect will be indeterminate

Based on our analysis, policy recommendations concerning the AfCFTA are clear. If the implementation of this trade reform is unambitious, the benefits for the African economy will be minor. However, the data available for our analysis are weak both on NTMs and on informal trade. There are many initiatives targeting improved data collection on trade and trade policies in Africa. Continuing these efforts must be a priority.

²⁹ See also Fontagné, Guimbard, and Orefice (2019).

³⁰ These statistics have been obtained through calculations operated on CEPII data from `geo_cepil.xlsx` and `dist_cepil.xls` (<http://www.cepil.fr/CEPII/fr/>) and Mario Larch's database on regional trade agreements for 2019 (RTA-Data (uni-bayreuth.de)).

³¹ <https://www.ubos.org/explore-statistics/10/>

³² Nigeria officially levies duties and imposes import bans on Benin's re-exports, for which Nigerians exhibit a strong demand. In fact, Benin violates ECOWAS regulations through re-export of products that are sensitive for Nigeria. In that context, Nigeria's customs officials find reasons for harassment and corruption.

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APPENDIX

Technical presentation of MIRAGRODEP

Main features

The study is based on the MIRAGRODEP model,³³ which is a multiregion, multisectoral, recursive dynamic computable general equilibrium (CGE) model, based on the MIRAGE model (Modelling International Relations under Applied General Equilibrium). MIRAGE was developed at the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) in the early 2000s to assess the consequences of trade policy reforms (see Bchir et al. 2002). MIRAGRODEP is an improved version of MIRAGE with a government explicitly represented in each country (see Laborde, Robichaud, and Tokgoz 2013). The GTAP database is the main data source; the GTAP10 version was used for this study. The model uses an aggregated version of 40 sectors and 29 countries/regions (see below).

The trade protection data are primarily from the MAcMAP database (Market Access Maps; see Guimbard et al. 2012), but additional sources have been used to complete this information, such as data relating to export taxes.

On the supply side in each sector, the production function is a Leontief function of value added and intermediate inputs. To produce, a production unit needs x percent (x is country and sector specific) of an aggregate of factors of production (labor, both unskilled and skilled; capital; land and natural resources) and $(1 - x)$ percent of intermediate inputs. For intermediate inputs, an aggregate function, with constant elasticity of substitution (CES), of all goods is used. Therefore, there is always substitutability between two intermediate goods, depending on the relative prices of these goods. Value added is a CES function of unskilled labor, land, natural resources, and a composite factor combining skilled labor and capital. This specification makes it possible to introduce less substitutability between capital and skilled labor than between these two factors and other factors such as unskilled labor. In this version, we assume that all sectors operate in perfect competition, that there are no fixed costs, and that price is equal to marginal cost.

The only factor whose supply is fixed over time is natural resources. The supply of capital is variable from year to year in this dynamic version of the model and varies endogenously. Total investment in an economy is determined by macroeconomic equilibrium, which links private savings, public savings, investment, and the current account balance. Investment in a sector depends on the return to capital in that sector, the price of the capital good, and the stock of capital in that sector. The growth rates of the labor supply are set exogenously following the evolution of the labor force. The supply of land is endogenous and varies according to the real remuneration of land.

Skilled labor is the only factor that is perfectly mobile within a region. Installed capital and natural resources are specific to each sector. New capital is allocated among the sectors according to an investment function. Unskilled labor is imperfectly mobile between the agriculture and nonagriculture sectors according to a constant elasticity of transformation function. Land is also imperfectly mobile between agriculture sectors. Capital in a given region, regardless of its origin (domestic or foreign), is assumed to be obtained by assembling intermediate inputs in a specific combination. The capital good is the same regardless of the sector.

³³ Our evaluation can be considered as a continuation of the IFPRI study presented in review section of this chapter. No document has been produced on that IFPRI, only a presentation at an IFPRI seminar, January 5, 2021 (<https://www.ifpri.org/blog/policy-seminar-prospects-african-continental-free-trade-area>).

Demand for final consumption is modeled in each region through a representative agent whose propensity to save is constant. The income from the factors of production provides the income of this representative agent and allows it to finance final consumption. Its preferences over goods are represented by an LES-CES (linear expenditure system-constant elasticity of substitution) function, which implies that final consumption has a non-unitary income elasticity. The sectoral sub-utility function used in MIRAGRODEP is a nesting of four CES-Armington functions that defines the origin of goods. The Armington hypothesis (Armington 1969) captures product differentiation, assuming a differentiation of goods by country of origin. It is a robust way to represent bilateral and inter-industry trade flows. In this study, the Armington elasticities are taken from the GTAP10 database (Aguiar et al. 2019).

Key closures

The model includes three important assumptions: the external account closure, the government account closure, and the private account closure.

The private account closure hypothesis relates to the savings-investment closure. The MIRAGRODEP model is neoclassical, which means that the marginal propensity to save is constant, so that a change in income leads to a change in savings, which leads to a change in investment.

The closure of the external account concerns the hypothesis on the current account. In the MIRAGRODEP model, the real exchange rate is adjusted such that the current account balance is stable as a percentage of world GDP.

The closure of the public account or the general government account concerns the way in which the public balance is affected when taxes and duties are modified by a reform. The choice made here by the modeler is important and several options are possible. If the public balance is variable, there may be a crowding-out effect on private investment in the event of an increase in the demand for financing from the public sector. If the public balance is constant because public expenditure adjusts, this can affect the supply of public services and therefore impact the welfare of individuals; yet the model does not include the utility function, defined on private consumption, tracing this change. If the public balance is constant and public expenditure per capita is constant, tax compensation is needed for public revenue to be constant. The modeler can then choose a direct tax, which may appear fair but is politically unrealistic, or an indirect tax, which may appear unfair but is politically more realistic.

In this study, we assume that each government keeps the public balance constant. After a shock that modifies customs duties, a variation in the consumption tax (increase or decrease) is established in order to keep real public expenditure per capita constant, the public budget balance being constant as a percentage of GDP. With this assumption, the level of public services in each country is constant and there is no variation in the public budget balance and therefore no associated crowding-out effect on private investment.

A flat per capita tax could have been chosen to achieve this adjustment. Such a tax is efficient in the sense that it does not interfere with market mechanisms. In addition, it is useful for measuring an imperfection associated with the reform: the magnitude of the flat tax measures the cost or gain imposed on each individual to maintain constant real public expenditure per capita, and therefore the constant supply of public goods. Nevertheless, a flat tax is politically unrealistic, while a consumption tax is unfair but more politically realistic.

Nontariff measures

The inclusion of nontariff measures (NTMs) within the MIRAGRODEP model received special attention. First an econometric study, presented in Bao, Bouët, and Traoré (2020), has been conducted to estimate their magnitude. This estimation has been innovative: in previous studies evaluating the ad valorem equivalent (AVE) of NTMs based on a gravity equation, Jensen's inequality is not considered. Yet the issue of estimating the impact of dummy or count variables in semi-log or related equations has been shown since the 1980s to bias the estimation. In Bao, Bouët, and Traoré (2020), this bias is demonstrated and it is shown that when it is not considered, the estimation of AVEs can be significantly biased. This omission leads to a significant underestimation of the restrictive impact of NTMs and can even change the sign of the AVE. With these estimates of the AVE of NTMs available at the HS2 level, a correspondence between HS2 and the GTAP nomenclature, then the sectoral disaggregation of the model was established on the basis of simple averages. Then a correspondence between the geographic aggregation and the nomenclature of the model was established, again based on simple averages. Finally, it was decided to set the negative AVEs to zero. NTMs are included in the MIRAGRODEP as costs borne by firms when they export, with half of this cost in additional value added for the exporting sector, half in additional intermediate consumption to the "Business Services nec" GTAP sector, included in the model.

Sector and geographic correspondences

Table A5.1 Sector correspondence

Model code	Label	GTAP corresp.	Big sectors
AutCereales	Other Cereals	pdr, gro, pcr	Agro-Food, crops, Farm
Ble	Wheat	Wht	Agro-Food, crops, Farm
FruitsLeg	Fruit and Vegetables	v_f	Agro-Food, crops, Farm
Oleagineux	Oilseeds	Osd	Agro-Food, crops, Farm
Sucre	Sugar	c_b, sgr	Agro-Food, Farm
AutCultures	Other crops	pfb, ocr	Agro-Food, crops, Farm
Betail	Livestock	Ctl	Agro-Food, Livestock, Farm
PetitsAnimaux	Small animals	oap, wol	Agro-Food, Livestock, Farm
Lait	Milk	rmk, mil	Agro-Food, Farm
Foret	Forestry	frs	Agro-Food
Peche	Fishing	fsh	Agro-Food, Processed Food
Energie	Energy	coa, oil, gas, p_c	Agro-Food
Mines	Mines	omn, nmm	Agro-Food
ViandeRouge	Red meat	cmt	Agro-Food, Processed Food
ViandeBlanche	White meat	omt	Agro-Food, Processed Food
HuilesVeg	Vegetable oils	vol	Agro-Food, Processed Food
AutreAgro	Other food	ofd	Agro-Food, Processed Food
Boissons	Beverages	b_t	Agro-Food, Processed Food
Textiles	Textiles	tex	Industry
Habillement	Wearing, apparel, and leather	wap, lea	Industry
IndBois	Wood industry	lum, ppp	Industry
ChimieNon-Petro	Chemicals and chemicals products	chm	Industry
Pharma	Pharmacy	bph	Industry
IndCon	Rubber and plastic products	rpp	Industry
Metaux	Ferrous and non-ferrous metals, metal products	i_s, nfm, fmp	Industry
Automobiles	Automobiles	mvh, otn	Industry
Electronique	Electronics	ele	Industry
Industrie	Electrical equipment	eeq	Industry
BiensInvest	Machinery and equipment nec	ome	Industry
AutIndustrie	Furniture and other manufacturing	omf	Services
DistrEauEner	Electricity, gas, and water and their distribution	ely, gdt, wtr	Services
Construction	Construction	cns	Services
Commerce	Trade	trd	Services
ServAlimTour	Accommodation	afs, ros	Services
Transport	Transport	otp, wtp, atp, whs	Services
Communication	Communication	cmn	Services
Finance	Finance	ofi, ins	Services
Logement	Real estate, dwellings	rsa, dwe	Services
AutServices	Other services	obs	Services
ServPublics	Public Services	osg, edu, hht	Services

Table A5.2 Geographic correspondence

GTAP Code	GTAP Label	Aggreg. Code	MIRAGRODEP Label	GTAP Code	GTAP Label	Aggreg. Code	MIRAGRODEP Label
AUS	Australia	AsieR	Asia Rich	PRY	Paraguay	MERCOSUR	MERCOSUR
NZL	New Zealand	AsieR	Asia Rich	PER	Peru	AmLatine	Latin America
XOC	Rest of Oceania	AsieR	Asia Rich	URY	Uruguay	MERCOSUR	MERCOSUR
CHN	China	Chine	China	VEN	Venezuela	AmLatine	Latin America
HKG	Hong Kong	Chine	China	XSM	Rest of South America	AmLatine	Latin America
JPN	Japan	AsieR	Asia Rich	CRI	Costa Rica	AmCent	Central America
KOR	Korea	AsieR	Asia Rich	GTM	Guatemala	AmCent	Central America
MNG	Mongolia	AsieR	Asia Rich	NIC	Nicaragua	AmCent	Central America
TWN	Taiwan	AsieR	Asia Rich	PAN	Panama	AmCent	Central America
XEA	Rest of East Asia	AsieR	Asia Rich	SLV	El Salvador	AmCent	Central America
KHM	Cambodia	AsieP	Asia Poor	HND	Honduras	AmCent	Central America
BRN	Brunei	AsieP	Asia Poor	XCA	Rest of Centr. Amer.	AmCent	Central America
IDN	Indonesia	AsieP	Asia Poor	DOM	Dominican Republic	AmCent	Central America
LAO	Laos PDR	AsieP	Asia Poor	JAM	Jamaica	AmCent	Central America
MYS	Malaysia	AsieP	Asia Poor	PRI	Puerto Rico	USA	USA
PHL	Philippines	AsieP	Asia Poor	TTO	Trinidad and Tobago	AmCent	Central America
SGP	Singapore	AsieP	Asia Poor	XCB	Rest of the Caribbean	AmCent	Central America
THA	Thailand	AsieP	Asia Poor	AUT	Austria	EU28	European Union+UK
VNM	Viet Nam	AsieP	Asia Poor	BEL	Belgium	EU28	European Union+UK
XSE	Rest of Southeast Asia	AsieP	Asia Poor	CYP	Cyprus	EU28	European Union+UK
BGD	Bangladesh	AsieP	Asia Poor	CZE	Czech Republic	EU28	European Union+UK
IND	India	AsieP	Asia Poor	DNK	Denmark	EU28	European Union+UK
PAK	Pakistan	AsieP	Asia Poor	EST	Estonia	EU28	European Union+UK
LKA	Sri Lanka	AsieP	Asia Poor	FIN	Finland	EU28	European Union+UK
NPL	Nepal	AsieP	Asia Poor	FRA	France	EU28	European Union+UK
XSA	Rest of South Asia	AsieP	Asia Poor	DEU	Germany	EU28	European Union+UK
CAN	Canada	Canada	Canada	GRC	Greece	EU28	European Union+UK
USA	United States of America	USA	USA	HUN	Hungary	EU28	European Union+UK
MEX	Mexico	AmCent	Central America	IRL	Ireland	EU28	European Union+UK
XNA	Rest of North America	Canada	Canada	ITA	Italy	EU28	European Union+UK
ARG	Argentina	MERCOSUR	MERCOSUR	LVA	Latvia	EU28	European Union+UK
BOL	Bolivia	AmLatine	Latin America	LTU	Lithuania	EU28	European Union+UK
BRA	Brazil	MERCOSUR	MERCOSUR	LUX	Luxembourg	EU28	European Union+UK
CHL	Chile	AmLatine	Latin America	MLT	Malta	EU28	European Union+UK
COL	Colombia	AmLatine	Latin America	NLD	Netherlands	EU28	European Union+UK
ECU	Ecuador	AmLatine	Latin America	POL	Poland	EU28	European Union+UK

Table A5.2 Geographic correspondence (continued)

GTAP Code	GTAP Label	Aggreg. Code	MIRAGRODEP Label	GTAP Code	GTAP Label	Aggreg. Code	MIRAGRODEP Label	Large African regions
PRT	Portugal	EU28	European Union+UK	EGY	Egypt	AfrN	North Africa	North Africa
SVK	Slovakia	EU28	European Union+UK	MAR	Morocco	MAROC	Morocco	North Africa
SVN	Slovenia	EU28	European Union+UK	TUN	Tunisia	AfrN	North Africa	North Africa
ESP	Spain	EU28	European Union+UK	XNF	Rest of North Africa	AfrN	North Africa	North Africa
SWE	Sweden	EU28	European Union+UK	NGA	Nigeria	CEDEAO	ECOWAS	ECOWAS
GBR	United Kingdom	EU28	European Union+UK	SEN	Senegal	CEDEAO	ECOWAS	ECOWAS
CHE	Switzerland	OEUR	Other Europe	BEN	Benin	CEDEAO	ECOWAS	ECOWAS
NOR	Norway	OEUR	Other Europe	BFA	Burkina Faso	CEDEAO	ECOWAS	ECOWAS
XEF	Rest of EFTA	OEUR	Other Europe	CIV	Côte d'Ivoire	CEDEAO	ECOWAS	ECOWAS
ALB	Albania	OEUR	Other Europe	GHA	Ghana	CEDEAO	ECOWAS	ECOWAS
BGR	Bulgaria	EU28	European Union+UK	GIN	Guinea	CEDEAO	ECOWAS	ECOWAS
BLR	Belarus	CIS	Com. of Ind. States	TGO	Togo	CEDEAO	ECOWAS	ECOWAS
HRV	Croatia	EU28	European Union+UK	XWF	Rest of West. Africa	CEDEAO	ECOWAS	ECOWAS
ROU	Romania	EU28	European Union+UK	CMR	Cameroon	CEMAC	CEMAC	Central Africa
RUS	Russian Federation	CIS	Com. of Ind. States	XCF	Central Africa	CEMAC	CEMAC	Central Africa
UKR	Ukraine	CIS	Com. of Ind. States	XAC	South Central Africa	RAFcent	Rest of Central Africa	Central Africa
XEE	Rest of East. Africa	CIS	Com. of Ind. States	ETH	Ethiopia	ETH	Ethiopia	Eastern Africa
XER	Rest of Europe	CIS	Com. of Ind. States	KEN	Kenya	EAC	Eastern African Com.	Eastern Africa
KAZ	Kazakhstan	CIS	Com. of Ind. States	MDG	Madagascar	RAF Orientale	Rest of East. Africa	Eastern Africa
KGZ	Kyrgyzstan	CIS	Com. of Ind. States	MWI	Malawi	RAF Orientale	Rest of East. Africa	Eastern Africa
TJK	Tadjikistan	CIS	Com. of Ind. States	MUS	Mauritius	RAF Orientale	Rest of East. Africa	Eastern Africa
XSU	Rest of FSU	CIS	Com. of Ind. States	MOZ	Mozambique	RAF Orientale	Rest of East. Africa	Eastern Africa
ARM	Armenia	CIS	Com. of Ind. States	RWA	Rwanda	EAC	Eastern African Com.	Eastern Africa
AZE	Azerbaijan	CIS	Com. of Ind. States	TZA	Tanzania	EAC	Eastern African Com.	Eastern Africa
GEO	Georgia	CIS	Com. of Ind. States	UGA	Uganda	EAC	Eastern African Com.	Eastern Africa
IRN	Iran, Islamic Rep. of	AsiaW	Middle East	ZMB	Zambia	RAF Orientale	Rest of East. Africa	Eastern Africa
TUR	Türkiye	Turquie	Turkey	ZWE	Zimbabwe	RAF Orientale	Rest of East. Africa	Eastern Africa
ISR	Israel	AsiaW	Middle East	XEC	Rest of East. Africa	EAC	Rest of East. Africa	Eastern Africa
JOR	Jordania	AsiaW	Middle East	BWA	Botswana	SACU	SACU	SACU
ARE	United Arab Emirates	AsiaW	Middle East	ZAF	South Africa	SACU	SACU	SACU
BHR	Bahrain	AsiaW	Middle East	NAM	Namibia	SACU	SACU	SACU
KWT	Kuwait	AsiaW	Middle East	XSC	Rest of South Afr. Cust. Un.	SACU	SACU	SACU
OMN	Oman	AsiaW	Middle East	XTW	Rest of the World	Canada	Canada	
QAT	Qatar	AsiaW	Middle East					
SAU	Saudi Arabia	AsiaW	Middle East					
XWS	Rest of Western Asia	AsiaW	Middle East					