



United Nations  
Economic Commission for Africa

**Report on the Use by UN-ECA  
of the Global Trade Analysis Project  
(GTAP) Tools**

**Period 2022-2023**

*Prepared for 2023 GTAP Advisory Board Meeting*

*12-13 June, 2023*

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## **Introduction**

As a leading think-tank on the African continent, the United Nations Economic Commission for Africa (ECA) is mandated to produce and disseminate high quality research on key priorities and emerging issues for Africa. In this context, the tools made available by the Global Trade Analysis Project (GTAP) to carry out various policy analyses are frequently used by the ECA. These allow the Commission to provide its member States and Regional Economic Communities (RECs), often on a demand-driven basis, with evidence-based policy analyses and recommendations.

At ECA, GTAP tools are used not only at its headquarter, based in Addis Ababa, Ethiopia, but also in its sub-regional offices (SROs) for sub-regional analyses, as well as at the African Institute for Economic Development and Planning (IDEP)-training arm of ECA, based in Dakar, Senegal.

ECA is also committed to work closely with the GTAP network to: 1) Improve data coverage for African countries in order to enhance the quality of policy analysis on issues of interest to Africa; 2) Build capacity of African researchers for them to be able to actively engage with the GTAP community, and thereby promoting policy analysis in relation to Africa.

Main activities framed around GTAP tools/network undertaken in 2022-2023 by ECA can be broadly summarized, as follow:

- 1) Research on trade and poverty, trade and environment, trade and diversification/industrialization, and export duration, each time with a strong focus on the African Continental Free Trade Area (AfCFTA).
- 2) Contribution to the GTAP database from an African perspective.
- 3) Active participation in the Annual Global Economic Analysis Conference and other events in relation to data and economic modelling.

**I. Research on trade and poverty, trade and environment, trade and diversification/industrialization, and export duration.**

One research paper under each of the 4 themes discussed below will be presented at the upcoming Global Economic Analysis Conference.

***a) Country-level implications of the AfCFTA Agreement's implementation on inequality and poverty***

A new comprehensive assessment of the macroeconomic impacts of the AfCFTA reform, was jointly undertaken in 2021 by ECA, through its African Trade Policy Centre (ATPC) of the Regional Integration and Trade Division (RITD), and the Centre for International Research and Economic Modeling (CIREM) using the dynamic MIRAGE-e computable general equilibrium (CGE) model.

ECA then conducted microsimulation in 2022 to assess the implications of the AfCFTA Agreement on inequality and poverty. In other words, key results from the CGE simulations (e.g. evolution of global consumption) were used as inputs for a non-parametric microsimulation model (describing individual income distribution and consumption patterns), itself informed by detailed household survey data.

The microsimulation exercise was conducted for 12 African countries (i.e. Cameroon, Cote d'Ivoire, Ethiopia, Kenya, Morocco, Namibia, Nigeria, Rwanda, Senegal, Tanzania, Uganda, and Zimbabwe), with country-level pieces currently being drafted. Consolidating the results for all countries covered, findings indicate that the AfCFTA will contribute to inequality and poverty reduction. However, the overall impacts will be rather moderate and tend to vary greatly across countries and socio-economic characteristics of the households within countries. For instance, poverty will still be predominantly rural and the decline in poverty will generally be greater for men than women.

The findings therefore suggest that ongoing negotiations on the design of an AfCFTA Protocol for Women and Youth in Trade are critical to ensure a more inclusive AfCFTA Agreement. Elements to be considered for the Protocol could, among others, include specific actions aimed at: formalizing women traders and ensuring greater incomes to them, facilitating their access to trade finance, granting better access to young women and girls to education—especially for jobs in the industrial and services sectors that are expected to substantially benefit from AfCFTA Agreement’s implementation.

***b) Greening the AfCFTA***

A Programme Cooperation Agreement (PCA) was signed in June 2022 between ECA and CIREM around “Implementation of the AfCFTA Agreement: Assessing the implications of climate change and green transition on African economies as well as identifying sectors with potential for development of regional value chains”.

Under the first component of this formal collaboration, MIRAGE-e was expended to become MIRAGE-Power, incorporating a detailed representation of electricity “power” generation taking benefit of data recently released by GTAP. In MIRAGE-Power, electricity is generated from multiple sources including renewables (i.e. hydro, solar, wind, and others), nuclear, coal, oil, and gas. The regional/national electricity producer provides aggregate electricity for intermediate consumption and households. Electricity as such can also be traded. As renewables are large sources of African electricity generation, this feature is of particular interest to the African electricity market. Beyond electricity power generation, specific features of MIRAGE-Power help analyze in more details trade policy with a focus on energy. Firstly, it is a standard energy-oriented model: energy is not considered as an intermediate consumption but directly substitutes with capital in the production function. In addition, energy is subject to independent productivity improvements, expressly calibrated. Secondly, GHG emissions are incorporated from both the production process and household consumption. Firms emit CO<sub>2</sub> from the intermediate use of fossil fuels (coal, refined oil, and gas). Non-CO<sub>2</sub> emissions (namely methane, nitrous oxide, and fluorinated gases) are considered to be

associated with the production process, and therefore modeled as production factors. Households emit CO<sub>2</sub> and non-CO<sub>2</sub> emissions based on their consumption. Carbon policy is implemented in the model as an implicit carbon price which includes not only carbon tax, but also regulations, standards, or/and technology transfer. Thirdly, the model also accounts for trade policies, based on highly disaggregated databases of the equivalents of bilateral tariff and non-tariff protection.

Using MIRAGE-Power model, preliminary results have been produced on the “Implications of the AfCFTA for Africa’s trade, climate and carbon market” and presented at the February 2023 Africa Business Forum (ABF). A comprehensive paper on “Greening the AfCFTA” is currently being written. Preliminary findings indicate that effective implementation of the AfCFTA Agreement would not only lead to a substantial increase of intra-African trade but that it wouldn’t significantly threaten climate change, leading to a marginal increase in CO<sub>2</sub> emissions. In fact, if climate policies (in line with national determined contributions made by African countries) were adopted along the implementation of the AfCFTA reforms, the expected increase in CO<sub>2</sub> emissions could be considerably curbed. The foreseen expansion of intra-African trade, thanks to the implementation of the AfCFTA Agreement, wouldn’t suffer from the adoption of climate policies. Finally, findings demonstrate that setting-up an African carbon market is achievable and more effective to reduce CO<sub>2</sub> emissions than having multiple national carbon markets established in parallel. While probably close to US\$ 25 per ton of carbon, the determination of the most effective carbon price for Africa to achieve its carbon objectives is still open to debate.

***c) Industrialization and Economic Diversification – Keys to Unlocking the Full Potential of the AfCFTA – A Case Study for Central Africa***

ECA, through the leadership of SRO-CA, jointly working with RITD, is undertaking research on industrialization and economic diversification, with a focus on Central Africa. On 29 September 2017, Central African member states adopted the Douala Consensus, committing to spur economic diversification through industrialization and

trade, with the aim to increase subregional production of higher-value products. In addition, all the Central African member States have already ratified the Agreement establishing the African Continental Free Trade Area (AfCFTA) which presents a key opportunity for Central African governments to build upon regional integration strategies, aligning their national trade strategies as well as industrial strategies, to ultimately enhance intra-regional trade.

It is against this background that ECA is currently assessing, based on the static GTAP CGE model, the impact of economic diversification and industrialization in combination with the implementation of the AfCFTA Agreement for Central Africa. Preliminary results show that liberalizing tariffs within the African continent would lead to overall increases in trade among member countries of the Economic Community of Central African States (ECCAS) across all products, except for extraction products which decrease. Trade between ECCAS members and the rest of the continent increases across all products. Extra-continental trade decreases. The most important increases in trade for ECCAS as a subregion occur for heavy and light manufacturing as well as processed food. While the largest current increases in trade for the ECCAS subregion represent import substitution (rest of world imports replaced by rest of Africa imports), structural change simulations illustrating the implementation of economic diversification and industrialization plans are anticipated to increase trade within the ECCAS subregion as well as boost exports to the rest of the continent.

***d) Exports Duration in Africa: The Importance of Economic Integration Agreements***

Under its own Fellowship programme targeted at young Africans, ECA promotes research on African matters. It is in that context that an ECA Fellow has been working on analyzing “Exports Duration in Africa: The Importance of Economic Integration Agreements” in 2022.

The study examines the effects of economic integration agreements on export duration in Africa. It relies on disaggregated data at the sectoral level between 1996 and 2020 to explore exports' lifetime.

Findings show that trade duration in Africa is short-lived (as observed in most other Continents where similar analysis has already been conducted). On average, 45 percent of trade relationships created reach the second year of exercise. There are however disparities in rates between countries and regions within the continent. Using a discrete-time proportional hazard model the analysis further finds that initial value of trade, foreign investments, and experience are key factors that influence the duration of trade. Agreements such as AGOA and ACP-EU have mixed effects on exports survival. While economic agreements in the continent do influence the survival rates, the effects and the magnitude are also mixed. In relation to the implementation of the AfCFTA Agreement, this study suggests a better integration of African countries in the international trading market and the promotion of intra-African investments that can support trade.

## **II. Contribution to the GTAP database from an African perspective**

Since late 2020, ECA has been undertaking efforts to fill the gaps in terms of African countries' coverage in GTAP database.

Working closely with national institutes in charge of statistics in selected countries, ECA, through ATPC, was able to collect and compile relevant information for insertion of 4 African countries (i.e. Chad, Comoros, Congo, Gabon) in the database in 2021. Throughout 2022, required information was collected for an additional 9 African countries, making possible the introduction of 5 new countries (i.e. Central African Republic, Equatorial Guinea, Eswatini, Mali, Niger) and update of tables for 4 countries (i.e. Botswana, Cameroon, Cote d'Ivoire, Zimbabwe) in GTAP database.

In sum, through ECA's efforts, the coverage of African countries as single economies in GTAP database passed from 26 countries (at the end of 2020) to 35 countries (at the end of 2022), with also data for 4 countries already in the database updated over that period. ECA is committed to continue this work moving forward, with work already ongoing or about to start in another 8 countries (i.e. Angola, Burundi, DRC, Madagascar, Mauritania, Mauritius, Sao Tome and Principe, and the Seychelles).

It is worth noting that data to be collected and compiled for Angola, DRC and Sao Tome and Principe will not only serve to improve Africa's coverage in GTAP database but also in the Trade in Value Added (TiVA) database of the OECD. Sensitization and capacity building missions on required data led by ECA sub-regional offices for Central and Southern Africa (SRO-CA and SRO-SA) in Angola, and by SRO-CA in DRC and Sao Tome and Principe, have already taken place over February and March 2023.

### **III. Active participation in the Annual Global Economic Analysis Conference and other events in relation to data and economic modelling**

At the 2022 Global Economic Analysis (8-10 June 2022), ECA led the organization of 4 sessions, including 3 jointly organized with partners, as follows:

- i) "Economic analyses for effective implementation of the African Continental Free Trade Area (AfCFTA) Agreement", with GIZ;
- ii) "Impact of the African Continental Free Trade Area (AfCFTA) on selected African countries that are members of the Organization of Islamic Cooperation (OIC)", with the International Islamic Trade Finance Corporation (ITFC) and the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC);
- iii) "Impact of Covid-19 on trade flows in Africa: Empirical evidence from three cases studies", with the World Trade Organization (WTO);



- iv) “Promoting Trade, Industrialization, and Economic Diversification in Central Africa: Evidence-Based Approaches to Policy Formulation and Implementation”.

Initially expected to be held in Kigali, Rwanda, the 2022 Global Economic Analysis was organized in an 100% virtual format but attracted many African researchers. ECA sponsored (through payment of Conference registration fees) all the African researchers (around 30) who either had papers selected for presentation at the Conference or were playing a role (e.g. moderator, discussant). ECA staff also attended and made presentations during the Conference.

ECA organized, jointly with GIZ, a multi-stakeholders Conference on the AfCFTA on 29 June 2022 in Addis Ababa, Ethiopia, where the preliminary findings from the modeling work on AfCFTA and inequality/poverty were shared.

A special session by ECA on the use of supply and use tables (SUTs) to support the design and implementation of economic policies in Africa, took place on 22 October 2022 in Addis Ababa, Ethiopia, on the margins of the Eighth Statistical Commission for Africa (StatCom-Africa-VIII).

The following capacity building events on data and modeling tools were also organized by ECA in 2022:

- 1) Workshop led by ECA SRO-CA on “Macroeconomic modeling in support of formulation and implementation of AfCFTA and economic diversification strategies, with a focus on Central Africa” which was held on 20-22 October 2022 in Douala, Cameroon.
- 2) Dedicate session on data gaps and modelling in AfCFTA context (with over 50 PhD Students attending), as part of the International Conference on “Trade policy, sustainable and inclusive development in Central Africa” by the WTO Chair of Cameroon/University of Yaoundé II which took place on 13-15 December 2022 in Yaoundé, Cameroon.

#### **IV. Plan for June 2023-June 2024**

The following activities based on GTAP-related data and tools are already planned by ECA between June 2023 and June 2024:

- Organize joint ECA-CIREM session on “Realizing Africa’s industrialization and diversification agenda, via the implementation of the African Continental Free Trade Area (AfCFTA) Agreement, considering environment and inclusivity” at 2023 Global Economic Analysis Conference.
- Facilitate participation of African researchers to 2023 Global Economic Analysis Conference.
- Presenting 4 papers (see Part I of this report for details on the themes of the papers) at the 2023 Global Economic Analysis Conference.
- 1 ECA staff to attend the 2023 GTAP Short Course.
- Pursue the data collection/compilation work for insertion/update of 8 African countries (i.e. Angola, Burundi, DRC, Madagascar, Mauritania, Mauritius, Sao Tome and Principe, and the Seychelles) in GTAP database, with 3 countries (i.e. Angola, DRC, and Sao Tome and Principe) also to be added in TiVA database.
- Undertake modelling work on the AfCFTA and implications for regional value chains.
- Undertake modelling work on the African Customs Union to feed in the 11<sup>th</sup> edition of ECA’s flagship Report on Assessing Regional Integration in Africa (ARIA XI) on the theme “Beyond the AfCFTA: Bringing the Continental Customs Union and Common Market About”.
- Continue disseminating of research outputs based on data and modelling tools, including at the 29<sup>th</sup> International Input-Output Association (IIOA) Conference, the European Association of Agricultural Economists (EAAE) Congress, etc.