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The Distributional Impacts of Trade: The World Bank CGE-GIDD model used in applied trade policy simulations in Rwanda[1]

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Summary

This paper assess the economic and distributional impacts of a set of ex-ante trade policy simulation in Rwanda based on a global top-down macro-micro simulation framework. Policies under analysis include Rwanda's integration in the African Continental Free Trade Area, greater participation of Rwanda in GVCs vis-à-vis reshoring global production, and the effects of temporary trade restrictions with main trading partners.

1 Introduction

Over the past decades, trade has been a significant driver of growth and poverty reduction throughout the developing world (Marrero and Servén 2021; Cerra, Lama, and Loayza 2021; Bartley Johns et al. 2018). Despite a recent return to protectionism (Freund et al. 2020; Fajgelbaum et al. 2020), countries are still pursuing new trade agreements and deepening existing ones in the hope that trade and increased integration can lead to broad-based gains[2]. It is well recognized that the dynamic gains of trade are large enough to continue supporting openness to international trade; but its distributional impacts have been uneven and unequal. Gains and costs have been concentrated in specific sectors, types of jobs, and regions. Notably, some regions affected by direct foreign competition experienced permanent economic, health and social damages; and recent evidence points toward widespread costs associated with trade, particularly on diminishing health-related outcomes.

The World Bank has examined the links between global trade and poverty reduction with the objective of designing policies that can ensure that gains from trade are share more widely (Engel et al. 2021). Among many tools used for this purpose, it has used a macro-micro simulation framework, CGE-GIDD, that links a global computable general equilibrium model with a micro simulation model to assess

[1] Corresponding author: iosoriorodarte@worldbank.org. This document was prepared with important inputs from World Bank reports (2020) "Economic and Distributional Impacts of the Africa Continental Free Trade Area"; (forthcoming) "Making the Most of the African Continental Free Trade Area" and (forthcoming) "Reshaping Value Chains in Light of COVID-19: Implications for Trade and Poverty Reduction in Developing Countries". It was prepared with financial assistance from the Trust Fund () under the project ().

[2] On January 1st, 2022 the Regional Comprehensive Economic Partnership (RCEP) entered into force comprising 10 countries from the Association of Southeast Asian Nations (ASEAN) and Australia, China, Japan, New Zealand, and South Korea. Similarly, the African Continental Free Trade Area is being negotiated and currently ratified by 38 countries (see https://www.tralac.org/resources/infographic/13795-status-of-afcfta-ratification.html).

the economy-wide and distributional effects of macroeconomic shocks and policies. The CGE-GIDD is documented in (Bourguignon and Bussolo 2013; Bussolo, De Hoyos, and Medvedev 2010) and (Maliszewska, Osorio-Rodarte, and Gupta 2020). Recently, the CGE-GIDD has incorporated two major improvements. First, the CGE-GIDD split the labor account in GTAP global database by gender and type of worker (skilled and unskilled) relying on the World Bank Gender Disaggregated Labor Database; and more recently, developing a multi-sector reallocation in its microsimulation model.

This paper uses the updated version of the CGE-GIDD to assess the economic and subnational labor market effects of a series of current trade policy options for the Rwandan economy, namely: i. integration into the African Continental Free Trade Area; ii. the effects of further global integration through global value chains (GVC) vis-à-vis regionalization through reshoring of production; and iii. assessing the effects of the ongoing trade blockades with neighboring countries.

The mechanics of the CGE-GIDD point towards significant economic gains that result from policy options that promote freer trade. For the case of AfCFTA and depending on the level of continental integration, the agreement could increase Rwanda´s real income between 3.3 to 3.8% by 2035, boosting exports of its agricultural products amid growing intra-Africa trade. The AfCFTA could potentially lift-up to 250 thousand from extreme poverty and up to 430 thousand from moderate poverty. Second, in the case of shocks to global value chains, if countries chose to re-shore its production, Rwanda´s real income would decrease 4.4% with sharp contraction in exports (-14.9%) and imports (-15.3%). But if countries pursue a GVC-friendly liberalization, Rwanda could see its income expanding up to 4.6% with the similar increases in trade outcomes. Lastly, the CGE-GIDD shows that a permanent trade blockade between Rwanda and neighboring countries can decrease Rwanda's income by -0.9%, with respect to the baseline conditions by 2035. If Rwanda maintains trade open with other neighboring trading partners, hence allowing for trade diversion, the negative impacts are smaller, -0.2%. In a similar way, escalating trade disputes in the region could hurt Rwanda's the most.

The paper elaborates on the distributional consequences of each one of these policies showcasing the mechanisms used in the microsimulation model. In this study, some general patterns emerge. First, growth enhancing policies lead to poverty reduction despite a regressive distribution of income. The regressive distribution of income is explained by increases in skill wage premia, which tend to dominate other progressive effects such as reduction in relative prices of food. Third, the implementation of trade reforms tends to accelerate the concentration of economic activity. A final discussion will assess on futures lines of research, particularly on the costs associated with trade reallocation.

2 Modeling framework

Data

The core data is sourced from the GTAP database (Aguiar et al. 2019). It provides a snapshot of the global economy in 2014—including domestic inter-industry flows and bilateral trade flows. The full database has 141 regions, of which 121 are

individual countries, and 65 sectors. For the purposes of this study, the 141 regions are aggregated into 37 regions including all 32 regions in Africa that are part of the database, of which 24 are individual countries with the remaining countries aggregated into 5 regional components. The 65 sectors are aggregated into 21.

The core data is supplemented with additional information. GTAP's tariff rates are replaced with the most recent estimates, as measured by the World Bank. In addition, the study incorporates estimates of non-tariff measures (NTBs). The NTBs for goods are sourced from World Bank's WITS database and documented in (Kee, Nicita, and Olarreaga 2009). These are aggregated to the model's regional and sector aggregation using trade weights. Estimates for the missing countries/regions are given by the simple average of the available estimates. The NTBs for services are sourced from (Jafari and Tarr 2017). These are provided for 11 services that are mapped to an aggregation of GTAP services. These three sources of data are incorporated into the 2014 reference year using a procedure that aims to preserve as much as possible the original structure of the aggregated GTAP database.

Detailed labor statistics by gender and skill are needed to assess the economic impact of trade-related policies beyond its macroeconomic aggregates, deepening the CGE model capacities to account for and draw conclusions about employment and its remunerations for specific segments of the population (i.e. women or the youth). Additional labor market information was incorporated for each country and activity in the GTAP version 10 database. The initial levels of employment as of 2014 with average remunerations (in US$) for four different types of workers that were differentiated based on their gender (male and female) and educational attainment (skill and unskilled). These statistics were constructed using harmonized nationally-representative household surveys available in the World Bank and the Luxembourg Income Study. Due to the natural inconsistency between macro and micro-based statistics, adjustments were performed so that total volumes and wages added-up to national accounts. This procedure is explained in detailed in (World Bank 2020).

Figure 1 below summarizes, the initial distribution of female employment by economic activity in Rwanda. On the horizontal axis, a value in female labor intensity greater than 1 indicates that an economic activity employs a greater proportion of women than the rest of the economy. In Rwanda, agriculture is the economic activities that tend to employ more women, followed by minerals and public services. This effect results from the prominent export-orientation of coffee and minerals (tin)[3]. In contrast, women tend to be employed the least in communication and other business servies. While this is true in general, experience from African countries show that in the continent, women also tend to be employed more frequently in services (recreational and other, insurance, real estate, trade, and financial) and the textiles and wearing apparel sector.

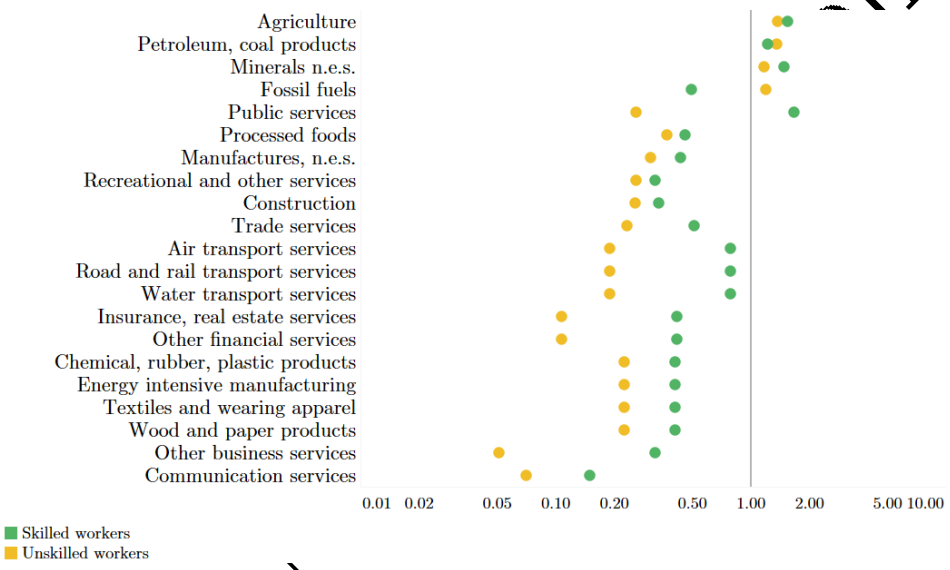
The second set of data that complement the CGE model relate to the expected formation of skills in each country. Projections for the working age population by gender, 5-year age groups, and educational attainment were incorporated into the CGE model. These series are in line with the initial labor volumes, with population

[3] Despite mining being a male-dominated industry, women can be found working in a wide variety of roles. Jobs include labor-intensive mineral processing work such as carrying ore, sluicing, panning, drying and grinding, as well as more technically skilled work in upper levels of the supply chain.

totals from the UN World Population Prospects (UN DESA 2019), assuming constant enrollment ratios for educational progress. The demographic and skill formation implications for Rwanda are summarized in Figure 2 below, which shows the formation of skills in Rwanda from 2020 until the simulation target year by 2035. Rwanda's working age population is expected to grow from 7.65 million to close to 11.11 million, at an annual increase of 2.60%. In absolute terms, the number of persons in the working-age population with 10+ years of schooling would grow in 318 thousand, at an annual rate of growth of 3.87 percent – 0.65 percentage points faster than the African continent's rate.

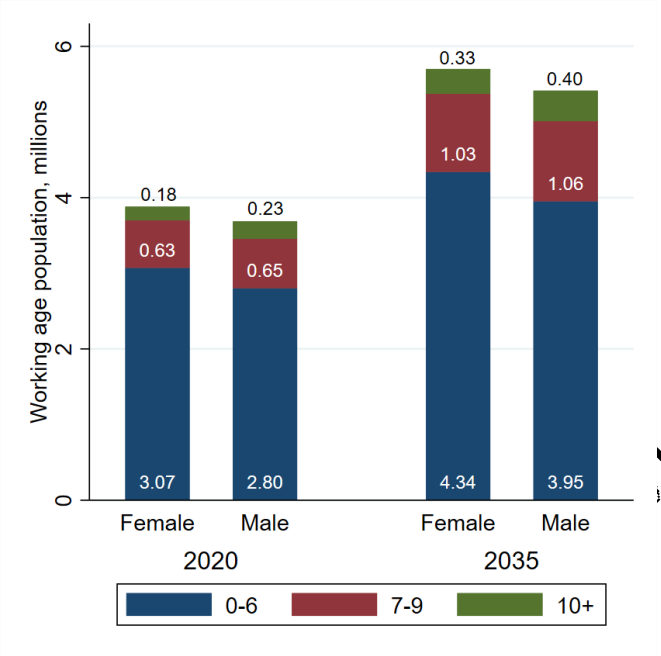
Figure 1 Female labor intensity in Rwanda

The share of female employment in an economic activity dividied by the share of female employment in the country



Source: World Bank's Gender Disaggregated Labor Database

Figure 2 Working age population in Rwanda, by years of schooling



Source: World Bank's Gender Disaggregated Labor Database

A top-down general equilibrium model

The quantitative macroeconomic estimates rely on the *ENVISAGE* computable general equilibrium model. It is a recursive dynamic model, calibrated to the GTAP database and has been widely used at the World Bank for a number of studies. The baseline, or reference simulation, runs from 2014 through 2035. The simulation is calibrated to the U.N. population projection (2015 Revision), combined with a long-term socio-economic scenario developed by the Integrated Assessment Modeling (IAM) community—the so-called socio-economic pathways (SSPs). There are 5 such pathways describing different possible storylines of the evolution of global GDP. SSP2 was selected for this study, the so-called 'Middle of the Road Scenario'.

The poverty and distributional impacts depend on the changes in relative prices across and within countries. To capture the full – between and within countries – distributional change, one needs a framework that captures both effects at the macro level (country averages) and the evolution of factor markets at the micro level (dispersion). To account for both effects, this paper uses the Global Income Distribution Dynamics (GIDD) microsimulation framework in combination with the *ENVISAGE* global computable general equilibrium (CGE) model. Both tools have been developed at the World Bank and are described in detail by (Bourguignon and Bussolo 2013; Maliszewska, Osorio-Rodarte, and Gupta 2020; van der Mensbrugghe 2020). Annexes describe the CGE-GIDD technical implementation.

3 Scenarios assumptions and results

The Africa Continental Free Trade Area

The Agreement establishing the African Continental Free Trade Agreement (AfCFTA) entered into force in May 2019 for the 22 countries that by then had deposited their instruments of ratification. To date 38 countries have ratified the agreement[4]. In July 2019, the Heads of State adopted the Niamey Declaration which launched the Operational Phase of the AfCFTA. Once completed, the AfCFTA will be the largest free trade area in the world in terms of membership and will potentially cover a market of 1.3 billion people with a Gross Domestic Product (GDP) of 3.4 trillion dollars. This section includes 3 scenarios: AfCFTA Trade, AfCFTA Broad, and AfCFTA Deep.

AfCFTA Trade, contemplates reduction in tariffs and non-tariff barriers, as well as the implementation of trade facilitation measures that reduce transport costs across the continent – (World Bank 2020). AfCFTA Trade considers only the static gains from trade and does not capture fully the potential dynamic gains from trade. **AfCFTA Broad**. This scenario incorporates the impacts of FDI from a preferential trade agreement among all countries on the continent representing a shallow but broad integration. Gravity analysis is used to yield estimates of potential impacts of FDI flows in and out of the continent, including among the AfCFTA members themselves. Lastly, **AfCFTA Deep** simulates the impact of provisions in additional policy areas to be covered by the AfCFTA, notably in investment policy, competition policy, and intellectual property rights representing deep integration further boosting FDI gains from AfCFTA. In a similar analysis, gravity analysis is done to obtain the additional expected trade cost reductions driven by deeper preferential commitments.

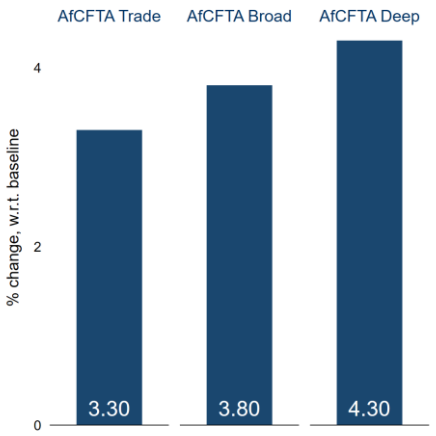
AfCFTA has the potential to lift 430K Rwandans from moderate poverty, by 2035. AfCFTA Trade has the potential to increase 3.3% Rwandan real income by 2035, with respect to a baseline that does not contemplate the implementation of the AfCFTA. Under AfCFTA assumptions, 180 and 320 thousands would be lifted from poverty using the PPP$1.90 and PPP$3.20 a day poverty lines, respectively. Under AfCFTA Broad and AfCFTA Deep, income gains could potentially reach 3.8 and 4.3% above baseline. This could lead to up to 430 thousand people lifted from moderate poverty (PPP$3.20/day), which is equivalent to a decline in the poverty headcount ratio of 2.45% adjusting for the projected Rwandan population.

[4] As of November 15th, 2021. Updates on ratification can be found at https://www.tralac.org/resources/infographic/13795-status-of-afcfta-ratification.html

Scenarios assumptions and results

Figure 3 Real Income

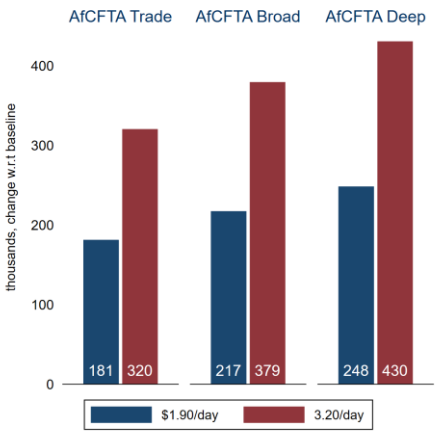
% change w.r.t. baseline by 2035



Source: Author's estimates using ENVISAGE-GIDD model

Figure 4 People lifted from poverty

Thousands, change by 2035



Source: Author's estimates using ENVISAGE-GIDD model

Box 1. What does the AfCFTA entail?

At present the AfCFTA Treaty contains only the legal framework for trade in goods, trade in services, the institutional set up and the provisions for State-to-State dispute settlement. The specific terms of trade liberalization in both goods and services are still being negotiated in the form of annexes to the protocols of the Treaty. Official trading under the AfCFTA tariffs started on January 1st, 2021. However, negotiations on trade in goods, including the rules of origin, is expected to be finalized by end June 2021. Negotiation on trade in services has been delayed due to lack of data, although it is expected to be concluded by June 2021. Additional protocols on investment, competition policy, intellectual property rights, and e-commerce, are expected to be negotiated in the second phase of negotiations, scheduled to conclude by December 2021. The dates are indicative in nature – it is common in negotiating this type of complex plurilateral agreement that there will be delays in the conclusion of the negotiations.

Substantial aspects of the AfCFTA therefore remain to be negotiated, notably those envisaged in Phase II of the negotiations. Harmonization in the investment, competition, and intellectual property rights policy areas is an important complement to trade liberalization efforts, providing for consistent protections that can support entrepreneurship and cross-border investment, and ensure markets function fairly and efficiently. As with trade arrangements, the rules on investment, competition, and intellectual property rights vary across Africa with a range of overlapping national, bilateral, and regional initiatives. For example, African countries are party to as many as 515 bilateral investment treaties (BITs), of which 173 are intra-African treaties. There is therefore considerable scope for Phase II negotiations to improve harmonization, with the potential to significantly bolster the overall effects of AfCFTA on intra-African trade and investment integration.

Under the trade components of AfCFTA agreed in Phase I, countries have agreed to progressively eliminate tariffs on at least 90 percent of goods, as well as addressing non-tariff barriers (NTBs) and restrictions on trade in services. Tariff reductions are scheduled over five and 15 years, depending on a country's level of development. The agreement allows trade in sensitive goods to be liberalized over longer time frames (up to 7 percent of tariff lines) or exempted altogether from the liberalization (up to 3 percent of tariff lines). In addition, annexes to the Agreement require countries to cooperate on simplifying and harmonizing trade and transit procedures, and to establish institutional structures and processes for monitoring the elimination of NTBs. Member countries have also agreed to make detailed commitments on liberalizing service sectors, including logistics and transport, financial services, tourism, professional services, energy services, construction, and communications.

The AfCFTA Treaty contains a Protocol on Trade in Services. The protocol distinguishes between normative commitments of general application for all services sectors on the one hand, and on the other, market access commitments for specific sectors and the different "modes of supply" (that is, the different modalities under which services can be traded). In addition, the AfCFTA Services Protocol also calls Member States to negotiate additional norms and disciplines guiding domestic regulation in various specific services sectors. AfCFTA countries have identified five priority services sectors: business services (which is a broad category of services including professional services, and many services which can be provided through call centers) telecommunication, financial, transport and tourism services. The importance of addressing barriers to trade in services is twofold: First, eliminating barriers to trade in services will lower the costs of production of physical goods, because the cost of services used for production in manufacturing and agriculture is embedded in the cost structure of the latter. Second, eliminating barriers to trade in services should also enable greater foreign direct investment (FDI). Given that the lion's share of FDI worldwide is concentrated in services sectors, eliminating barriers to trade in services also leads to dismantling barriers preventing FDI.

AfCFTA Trade, % change deviations w.r.t. baseline by 2035

Assumptions:

Reduction in tariffs follow the negotiated schedule under AfCFTA
+ NTB reductions on both goods and services on a most-favored-nation (MFN) basis. It is assumed that 50 percent of NTBs are actionable within the context of AfCFTA—with a cap of 50 percentage points.

Scenarios assumptions and results

+ Trade facilitation measures will halve trade costs, although this reduction is capped at 10 percentage points See additional details in Annex: Detailed trade scenario assumptions				
Macro Results (percentage deviations from baseline, 2035)			Poverty (thousands of people)	
Real Income Variation	Exports	Imports	Exterme	Moderate
3.3	Total 8.8 Intra-Africa 39.3	Total 7.5 Intra-Africa 35.2	181	320

AfCFTA Broad, % change deviations w.r.t. baseline by 2035 AfCFTA Trade + AfCFTA FDI Broad shock on FDI				
Macro Results (percentage deviations from baseline, 2035)			Poverty (thousands of people)	
Real Income Variation	Exports	Imports	Exterme	Moderate
3.8	Total: 8.9 Intra-Africa: 40.2	Total: 8.3 Intra-Africa: 36.3	217	379

AfCFTA Deep AfCFTA trade + AfCFTA FDI Deep shock on FDI + Additional trade costs reduction brought about by deeper PTA commitments				
Macro Results (percentage deviations from baseline, 2035)			Poverty (thousands of people)	
Real Income Variation	Exports	Imports	Exterme	Moderate
4.3	Total: 9.5 Intra-Africa: 43.1	Total: 8.9 Intra-Africa: 42.6	248	430

Integration into GVCs vis-à-vis reshoring

[Add text and add poverty]

Assumptions	Macro Results (percentage deviations from Covid L-shape recovery baseline, 2030)			Poverty (millions of people)	
	Real Income Variation	Exports	Imports	Extreme	Moderate
Reshoring Leading Economies	-1.2	-2.9	-6.1		

Leading economies: -Subsidy to local production of agricultural and manufacturing products amounting to 1 percent of GDP in the corresponding region. -Barriers to imports - a 25 percentage point surcharge - Harder to substitute domestic production for imports (reduction of trade elasticities by 50 percent).					
Reshoring All -Same policies of reshoring leading economies, but applied to all countries	-4.4	-14.9	-19.3		
GVC Friendly Liberalization Developing countries: -Eliminate tariffs on all intermediate inputs -Easier to substitute imported inputs for domestic (increase trade substitution elasticity by 50%) -Implementation of trade facilitation measures. Reduction of trade costs by between 14-16%.	4.6	6.5	18		

Temporary trade blockade

A CGE model has been calibrated to estimate the effects of temporary trade restrictions on the Rwandan economy. The shock affects flows between Rwanda and its neighbors with drastic trade reductions with Burundi and Uganda amid observed increases in trade with Tanzania and Congo, D.R. Figure 5 below shows that starting in 2016, temporary trade restrictions between Rwanda and Burundi halted trade although with a temporary ease in 2019. By 2020, trade flows with Burundi and Uganda plummeted. Pane A shows that these trade restriction with Uganda and Burundi have been compensated by growing flows with Congo D.R. and Tanzania.

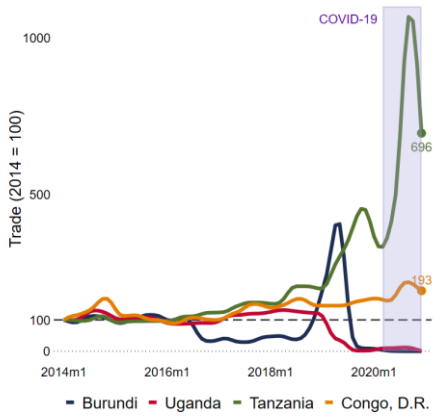
Figure 5 Pane B, on the right-side, shows the magnitude of these trade flows in millions of USD. The decline of trade flows with Burundi represents less than one tenth of the trade decline with respect to Uganda. The composition of the trade is also different. From Uganda, Rwanda received mostly imports while Burundi served primarily as a destination for exports. There is evidence that Rwanda has partially redirected these trade flows through Tanzania and Congo, D.R.

Scenarios assumptions and results

Figure 5. Trade flows between Rwanda and neighboring countries, 2014-2021

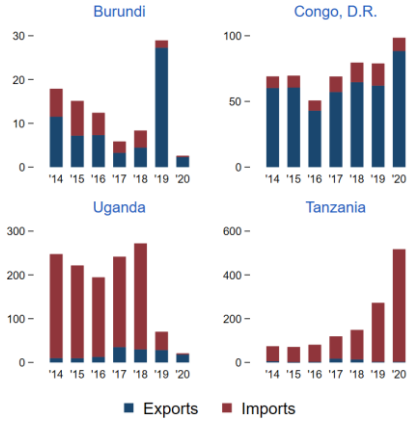
Pane A. As index, monthly

January 2014 = 100



Pane B. By flow, annually

US$millions



Source: Author's calculations using data from MINICOM

Temporary trade blockade

Scenario 3.a Trade blockade with Burundi and Uganda

Part i. Trade blockade with Burundi and Uganda

Rwanda vis-à-vis Burundi and Uganda: Drastic increase of bilateral iceberg trade costs in goods (50%) and in services (25%)

Part ii. Trade diversion towards Tanzania, Uganda and Rest of SSA

Rwanda vis-à-vis Tanzania: Bilateral reduction of trade barriers in goods (15%) and in services (10%)

Rwanda vis-à-vis Congo, D.R. : Bilateral reduction of trade barriers in goods (2.5%) and in services (1.67%)

Rwanda vis-à-vis non-neighboring SSA: Bilateral reduction of trade barriers in goods (5%) and in services (2.5%)

Scenario 3.b Escalation of trade blockade within the region

Part i. Trade blockade with Burundi and Uganda, increase of trade costs in the region

Rwanda vis-à-vis Burundi and Uganda: Drastic increase of bilateral iceberg trade costs in goods (50%) and in services (25%)

Rwanda vis-à-vis Congo, D.R. and Tanzania: Increase of bilateral iceberg trade costs in goods (10%) and in services (5%)

Congo, D.R., Burundi, Uganda, Tanzania: increase of bilateral iceberg trade costs in goods (10%) and in services (5%)

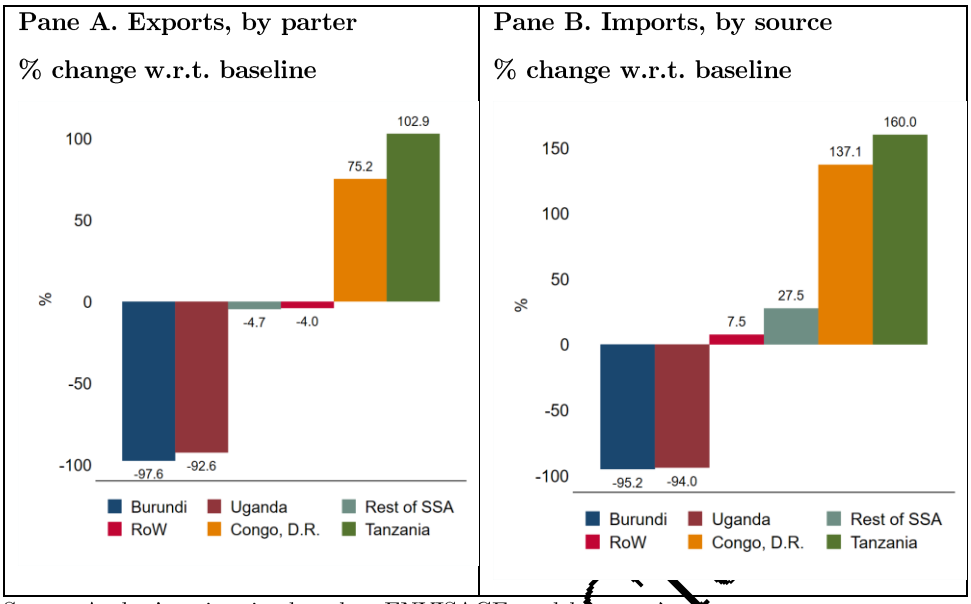
Part ii. Limited trade diversion towards rest of SSA

Non-neighboring SSA countries: Reduction of trade barriers in goods (2.5%) and in services (1.25%)

Macro Results, % deviations from baseline by 2035					Poverty	
Real Income Variation	Exports		Imports		Extreme	Moderate
	Uganda		Uganda			
	Burundi		Burundi			
	Congo, D.R.		Congo, D.R.			
	Tanzania		Tanzania			
	Rest of SSA		Rest of SSA			
	Rest of World		Rest of World			

* Based on observed trade data provided by MINICOM

Figure 6 Simulation results, Trade diversion



Source: Author's estimation based on ENVISAGE model

4 Conclusions

Unlocking the potential gains from the AfCFTA will not be easy. It will require:

i. finalizing negotiations of a series of protocols to the AfCFTA Treaty in areas such as trade in services, investment, competition policy, e-commerce and trade-related intellectual property rights incorporating clear, ambitious and enforceable rules and disciplines;
ii. The adoption of the relevant legislative changes by the different AfCFTA parties; and
iii. Capacity building of cadres of government officials that can ensure the full implementation of AfCFTA commitments on the ground. Learning from historical experience in Africa and other parts of the world, the AfCFTA treaty should include norms and disciplines aiming to enable, and not hamper, the insertion of African countries into global and regional value chains.

Further, the AfCFTA treaty will need to be embedded into domestic policies in order to create a policy environment to enable trade and boost investment. After they have been approved as part of the domestic legislation, the norms and disciplines included in the AfCFTA treaty—ranging from trade in goods, services, investment, intellectual property and e-commerce—will need to be implemented in full. In order to be effective, the implementation process should involve the various stakeholders, such as the government, private sector and civil society, with concrete recommendations to maximize the potential benefits of the AfCFTA agreement.

5 Annex: Timeline of trade blockade in the EAC Northern Corridor

Feb. 27 – Mar. 4, 2019	
	• Uganda says Rwanda partially lifts trade blockade[5] • Hostilities between Uganda and Rwanda due to a longstanding mutual suspicion provoke a blockade that was partially lifted • Any prolonged disruption of the flow of commerce on the route could potentially trigger a serious economic crisis in the region. • Rwanda accuses Uganda of supporting rebels[6] • More than a hundred cargo trucks carrying **fuel, food, construction materials and other items** from Kenya and Uganda have been stranded at Katuna, the busiest crossing point on the Rwanda-Uganda border since the blockade started on Feb. 27. • Rwanda depends for **much of its imports** on a trade route through Uganda to Kenya's Indian Ocean port of Mombasa. The same artery is also a pipeline for goods from Kenya and Uganda to Burundi and parts of eastern Democratic Republic of Congo.
May, 2019	
	• Feud between Rwanda, Uganda strongmen takes toll[7] • In February 2019 Rwanda abruptly closed the crossing with Uganda, with queues of cargo trucks and thronging merchants turned back. • **Food prices** have jumped in Rwanda, which relies heavily on imports from its larger northern neighbour. *The blockade has also severed Uganda's land access to export markets in Democratic Republic of Congo (DRC) and Burundi*
April, 2020 – COVID-19 starts	
	• Rwanda writes to Kenya, Uganda over Burundi cargo blockade[8][9] • The Government of Rwanda has formally notified Uganda and Kenya of the sudden decision by Burundi to block cargo trucks entering their country through Rwanda. All Burundi-bound trucks transporting cargo from the Kenyan port of Mombasa, transit through Uganda and Rwanda. However, authorities in Gitega recently decided to block trucks using the Northern Corridor, causing gridlocks at points of entry.

[5] https://www.reuters.com/article/us-uganda-rwanda/uganda-says-rwanda-partially-lifts-trade-blockade-idUSKCN1QL1GU

[6] https://www.reuters.com/article/us-uganda-rwanda-diplomacy/rwanda-accuses-uganda-of-supporting-rebels-idUSKCN1QM1T9

[7] https://www.france24.com/en/20190515-feud-between-rwanda-uganda-strongmen-takes-toll

[8] https://www.newtimes.co.rw/news/rwanda-writes-kenya-uganda-over-burundi-cargo-blockade

[9] https://allafrica.com/stories/202004010014.html

Annex: Timeline of trade blockade in the EAC Northern Corridor

	• "Since Burundi has effectively closed all its borders to cargo transiting through Rwanda, the Government of Rwanda will no longer allow entry on its territory to cargo trucks destined to Burundi."
May, 2021	
	• In a recent state visit, Burundi failed to explain why it blocked Ugandan goods[10] • Burundian President Evariste Ndayishimiye announced that Uganda and Burundi will be using a new trade route via Tanzania. In a carefully worded declaration, he alleged that Rwanda (calling it a neighbour) blocked trade between Uganda and Burundi. In reality, Burundi blocked all goods and transit goods through the Rwanda-Burundi border. • **At the start of the Covid-19 pandemic in the last week of March 2020, Burundi refused all entry from Rwanda, including transit goods and passengers, through its land border crossing points**. The move created gridlock in the EAC Northern Corridor (Burundi-Rwanda-Uganda-Kenya) and a diplomatic protest from Uganda and Kenya.
February, 2021	
	• Kenya, Uganda Relations Strained Over Milk Export Blockade[11][12] • Uganda has threatened to sue Kenya for stopping its milk from accessing the coastal country. • Kenya has in the past one year had trade related tensions with its landlocked neighbour, especially on milk products, which led to confiscation of hundreds of tonnes of Lato milk from Uganda in 2020. • The Ugandan Parliament has also raised the matter saying Kenya has blocked their products over the last three years, pointing out that it is unfair, yet it (Uganda) acts as a 'supermarket' for Kenyan made goods. • A number of goods, key among them **milk, sugar, poultry and beef products**, among others have been blocked particularly from entering Kenya with claims that are not well explained. • Trade wars have cost Uganda in different sectors, especially sugar, where stockpiles have grown to nearly 150,000 tonnes after manufacturers and suppliers were closed out of some EAC member states. • In 2019, **Tanzania blocked Uganda's sugar from entering its market only to allow 20,000 tonnes in 2020 but that was also stopped**. • **Kenya continues to impose a ban on Uganda's milk only easing the one on sugar to allow 90,000 tonnes**. • According to a Ministry of Finance economic performance report for the period ended November, **during October, exports to East African**

[10] https://www.newtimes.co.rw/news/recent-state-visit-burundi-failed-explain-why-it-blocked-ugandan-goods

[11] https://taarifa.rw/kenya-uganda-relations-strained-over-milk-export-blockade/

[12] https://allafrica.com/stories/202102250175.html

	Community region declined from $102.9m in October 2019 to $82.2m, marking a sustained decline in almost two calendar years. • During this period Uganda's exports to East Africa suffered 20 per cent decline, representing a drop of $20.7m (shs75.5b) compared to the same period in 2019. • This was partly blamed on a hostile environment, characterised by non-trade barriers and blockades on a number of goods originating from Uganda
February, 2021	
	• Two African neighbours give peace a chance[13] • Rwanda and Burundi are normalizing relations after **nerly six year dispute** • The two countries are linked in a web of bilateral and regional agreements. The governors of both countries' border provinces meet regularly. Both nations belong to the Economic Community of the Great Lakes Countries, the East African Community, the Common Market for Eastern and Southern Africa, and the Economic Community of Central African States. The two are also members of the African Union and the United Nations, which provide extensive channels for resolving disputes. Considering the more conciliatory stance taken by Burundi's president Ndayishimiye compared to his predecessor, future disputes will probably be resolved without causing renewed hostilities.

[13] https://www.dandc.eu/en/article/rwanda-and-burundi-are-normalising-relations-after-nearly-six-year-dispute

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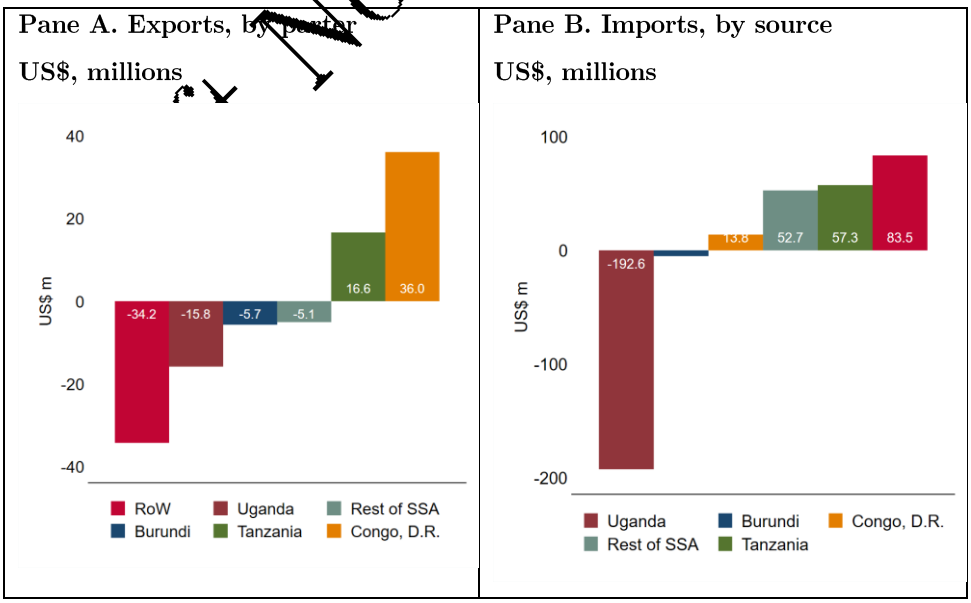
Figure 7 Simulation results, Trade diversion



Source: Author's estimation based on ENVISAGE model

7 Annex: Summary description of the ENVISAGE CGE Model

The Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) model follows the circular flow of an economy paradigm. Firms purchase input factors (such as labor and capital) to produce goods and services. Households receive factor income and in turn demand the goods and services produced by firms. Equality of supply and demand determine the equilibrium prices for factors, goods, and services. The model is solved as a sequence of comparative static equilibria in which the factors of production are exogenous for each time period and linked between time periods with accumulation expressions. Production is implemented as a series of nested constant-elasticity-of-substitution (CES) functions aimed at capturing the substitutability across all inputs. Three production archetypes are implemented: (1) for crops, reflecting the intensification of inputs versus land intensification; (2) for livestock, reflecting range-fed versus ranch-fed production; and (3) as the default, revolving largely around capital/labor substitutability. Some production activities highlight specific inputs (for example, agricultural chemicals in crops and feed in livestock), and all activities include energy and its components as part of the cost minimization paradigm. Production is also identified by vintage—divided into old and new—with typically lower substitution possibilities associated with old capital.

Each production activity is allowed to produce more than one commodity—for example, the ethanol sector can produce ethanol and distiller's dried grains with solubles (DDGS). And commodities can be formed by the output of one or more activities (such as electricity). ENVISAGE therefore uses a different classification of activities and commodities[14]. One of the features of the model is that it integrates the new Global Trade Analysis Project (GTAP) power database that disaggregates GTAP's electricity sector ("ely") into 11 different power sources plus electricity transmission and distribution. Although the database has both a supply and a demand side for all 11 power sources, the aggregation facility permits aggregation of electricity demand into a single commodity and the "make" matrix specification combines the output from the different power activities into a single electricity commodity.

Income accrues from payments to factors of production and is allocated to households (after taxes). The government sector accrues all net tax payments and purchases goods and services. The model incorporates multiple utility functions for determining household demand. A set of three household demand functions is linked to the ubiquitous linear expenditure system (LES): (1) the standard LES; (2) the extended LES (ELES) that incorporates household saving into the utility function; and (3) an implicitly directly additive demand system (AIDADS) that allows for nonlinear Engel curves in the LES framework[15]. The fourth option relies on the constant differences in elasticity (CDE) utility function that is used in the core GTAP model (Corong et al. 2017; Hertel 1997). The ELES framework incorporates the

[14] Production activities are indexed with a and commodities are indexed with i

[15] Users cal also specify implementing Cobb-Douglas (CD) utility function, which can be considered part of the LES framework.

decision to save in a top-level utility function. The other demand systems assume savings is an exogenous proportion of disposable income in the default closure. The consumer utility function determines consumer demand bundles that are subsequently converted to produced goods using a consumer demand "make" or transition matrix. Investment is savings driven and equal to domestic savings adjusted by net capital flows.

Trade is modeled using the so-called Armington specification, which posits that the demand for goods is differentiated by region of origin. The model allows for domestic/import sourcing at the aggregate level (after aggregating domestic absorption across all agents) or at the agent level. In the standard specification, a second Armington nest allocates aggregate import demand across all exporting regions using a representative agent specification.

A newer though minimally tested version of the model known as the MRIO specification allows for sourcing imports by agent. Exports are modeled in an analogous fashion using a nested constant-elasticity-of-transformation (CET) specification. The domestic supply of each commodity is passed to the domestic market and an aggregate export bundle using a top-level CET function. The latter is allocated across regions of destination using a second-level CET function[16]. Each bilateral trade node is associated with four prices: (1) producer price; (2) export border price, also referred to as the free on board (FOB) price; (3) import border price, also known as the cost, insurance, and freight (CIF) price; and (4) the end-user price, which includes all appli- cable trade taxes. The wedge between the producer price and the FOB price repesents the export tax (or subsidy if negative), and the wedge between the CIF and end-user prices represents the import tariff (and perhaps other import-related distortions). Finally, the wedge between the CIF and FOB prices represents the international trade and transport margins. These margins represent in turn the use of the real resources supplied by each region. The global international trade and transport sector purchases these services from each region in order to minimize the aggregate cost.

The model has two fundamental markets for goods and services: (1) domestically produced goods sold on the domestic market and (2) domestically produced goods sold by region of destination. All other goods and services are composite bundles of these goods. Two market equilibrium conditions are needed to clear these two markets[17].

The model incorporates five types of production factors: (1) labor (up to five types); (2) capital; (3) land; (4) a sector-specific natural resource (such as fossil fuel energy reserves); and (5) water. Segmentation of the labor market is allowed (though not required)—typically agriculture versus nonagriculture. The model also allows for regime switching between full and partial wage flexibility. In this gender-sensitive version of the model, the labor bundle is composed of four labor types—skilled and unskilled labor, each broken out by gender (figure G.1). At a first stage, the aggregate labor bundle is composed of skilled and unskilled labor. In the default

[16] The model allows for perfect transformation, which is the standard specification in the GTAP model.

[17] If there are N commodities and R regions, there will be R x N market clearing conditions for domestic goods and R x N x R market clearing conditions for bilateral trade.

parameterization, the substitution elasticity is 0.5. Each skill bundle, unskilled and skilled, is composed of labor by gender—male and female. The default substitution elasticity is 0.5 across gender. This implies that all four labor types are equally substitutable in the default configuration.

Capital is allocated across sectors to equalize rates of return. If all sectors are expanding, old capital is assumed to receive the economywide rate of return. In contracting sectors, old capital is sold on secondary markets using an upward sloping supply curve. This implies that capital is only partially mobile across sectors. Aggregate land and water supply are specified using supply curves. Although there are several options, the preferred supply curve is a logistic function that has an upper bound. Water demand also includes exogenous components for environmental uses and groundwater recharge. Land and water are allocated across activities using a nested CET specification[18]. Natural resources are supplied to each sector using an isoelastic supply function, with the possibility of differentiated elasticities, depending on market conditions.

ENVISAGE incorporates the main greenhouse gases—carbon, methane, nitrous oxides, and fluorinated gases. It also incorporates 10 non-greenhouse gases[19] that may have impacts on the atmosphere and climate change, and yet often also have significant local impacts, particularly on health. Emissions are generated by consumption of commodities (such as fuels) and factor use (such as land in rice production and herds in livestock production). There are also processed base emissions such as methane from landfills[20].

A number of carbon control regimes are available in the model. Carbon taxes can be imposed exogenously—potentially differentiated across regions. The incidence of the carbon tax allows partial or full exemption by commodity and end user. For example, households can be exempted from the carbon tax on natural gas consumption. The model allows emission caps in a flexible manner—regions can be segmented into coalitions on a multiregional or global basis. In addition to the standard cap system, a cap and trade system can be defined in which each region within a coalition is assigned an initial emission quota.

Dynamics involves three elements: labor supply, capital stock, and technological change. Labor supply (by skill level) grows at an exogenously determined rate. The aggregate capital supply evolves according to the standard stock/flow motion equation—that is, the capital stock at the beginning of each period is equal to the previous period's capital stock less depreciation plus the previous period's level of investment. Finally, the standard version of the model assumes that labor augments technological change calibrated to given assumptions about growth of the gross

[18] Land is implemented only for agricultural activities. Water demand by activity is present only in irrigated crop sectors. Other water demand is based on aggregate demand functions with market clearing, but it is not part of the cost structure.

[19] Black carbon (BC), carbon monoxide (CO), ammonia (NH_3), volative organic compound (VOCs – NMVB and NMVF), nitrogen oxides (NO_x), organic carbon (OC), particulate matter (PM_{10} and $PM_{2.5}$), and sulfur dioxide (SO_2).

[20] The current version of the model does not include carbon emnissions from deforestation – an important source of global carbon emissions.

domestic product (GDP) and intersectoral productivity differences. In policy simulations, technology is typically assumed to be fixed at the calibrated levels.

For this particular analysis, the key model specifications include:

- An agent-based Armington specification for import demand with an aggregate agent allocation of total import demand by source region
- Capture of the value of time in trade by an iceberg parameter specified for each commodity and bilateral trade node. The iceberg parameter is assumed to be fixed over time in the baseline. The model has a separate iceberg parameter for imports and exports
- Diagonal make matrix—that is, one-to-one correspondence between activities and commodities
- Constant differences in elasticity utility function
- Logistic aggregate land supply function
- Fixed capital account within each time period at reference year levels, implying that the capital acccount declines over time as a share of GDP

The model's reference year is 2014, and it is initialized and calibrated to the GTAP database, Version 10 prerelease 3.[21] The 141 regions in the database were aggregated to 34 regions (table G.1). Similarly, the database's 65 sectors were aggregated to 21 sectors (table G.2), with an emphasis on the more traded manufacturing sectors and the trade and transport services.

The key macroeconomic drivers of the baseline rely on a number of existing baselines. Population growth is calibrated to the United Nations Population Division's 2015 projection, the medium variant[22]. The baseline GDP is calibrated to Shared Socio-Economic Pathway 2 (SSP2). The five SSPs were developed by the Integrated Assessment Modeling (IAM) community to provide a macroeconomic framework for quantitative analysis of the economics of climate change.[23] Three economic modeling groups have quantified global GDP projections: the Organisation for Economic Co-operation and Development (OECD), International Institute for Applied Systems Analysis (IIASA), and Potsdam Institute for Climate Impact Research (PIK). All three teams harmonized to the same demographic projections provided by IIASA's demographic unit. This analysis uses the OECD-based SSP2 projection. SSP2—called the middle of the road scenario—is treated by many modeling groups as a business-as-usual scenario.

Labor force growth is being generated by the GIDD projections (appendix A). The projections are available by broad age group (the 15–64 age cohort for the labor

[21] Prereleases are made available only to GTAP Consortium members. The public version of Version 10 was posted on July 31, 2019. The databased used for this analysis is a special version of Version 10 prerelease 3; it includes the Democratic Republic of Congo (COD) as a separate region using an input-output table provided by the World Bank. Angola was aggregated with the Central Africa region. COD is not yet available in other version of the database.

[22] http://www.un.org/en/development/desa/publications/world-population-prospects-2015 - revision.html.

[23] A special issue of *Global Environmental Change* provides significant background material on the SSPs and their development. See, in particular, (delink et al 2017 for a discussion of the OECD-based macroeconomic drivers.

force is used here), gender, and education (primary, secondary, and tertiary). The growth of skilled labor is equated with the growth of specific education categories. For low- and lower-middle-income countries, skilled workers are equated with the secondary and tertiary level. For upper-middle and high-income countries, skilled workers are equated only with the tertiary level. The baseline scenario tracks the per capita income growth of countries and implements a switch in the definition of skilled workers if a country graduates from lower-middle-income status to upper-middle-income status (using the 2014 World Bank income thresholds)[24].

The analysis targets real GDP growth by calibrating labor productivity in the baseline. It allows for sector differences in labor productivity growth, with a (fixed) higher rate in agriculture and manufacturing relative to services. Other factors that affect calibrated labor productivity include an exogenous improvement in energy efficiency, agricultural yields, and international trade and transport margins.

The baseline also incorporates the following exogenous assumptions:

- The income parameter of the CDE is adjusted between periods based on an estimated economic relation between the income parameter and aggregate per capita consumption. The parameterization of this relationship is based on a least-squares estimate using the base year GTAP database. One key purpose is to reduce the share of food expenditures as income rise.
- Capital accumulation is based on the standard capital motion equation: $K_t = (1 - d)K_{t-1} + I_{t-1}$. Thus the capital stock trends depend on investment and savings decisions. In the baseline, household savings are adjusted in order to target future trends in the investment to GDP ratio, with the basic idea that these trends should more or less line up with steady state returns to capital.

The following is a brief outline of the contours of the baseline for this analysis:[25]

- World population is expected to rise from 7.3 billion in 2014 to 8.8 billion in 2035, an increase of around 1.5 billion with a annual growth rate of about 1 percent on average.
- Population growth in Africa accounts for 45 percent of the increase, with an increase of 700 million, some 61 percent from the 2014 base of 1.1 billion. This figure translates into a blistering annual growth rate of 2.3 percent, compared with 0.6 percent for the rest of the world. Africa's share of the global population increases from 16 percent to 21 percent.
- Global GDP will rise from US$82 trillion in 2014 to US$158 trillion in 2035—an average annual increase of 3.2 percent.
- The annual growth rate of GDP in Africa is a relatively rapid 5.8 percent between 2014 and 2035, somewhat tempered by high population growth. Nevertheless, Africa sees its share of global output increase from 3.7 percent to 6.2 percent (at constant 2014 U.S. dollar prices and market exchange rates).
- Average per capita income in Africa rises from US$2,600 to US$5,300 between 2014 and 2035, growing at an annual clip of 3.4 percent. The global

[24] The respective thresholds for 2014 are US$1,045, US$4,125, and US$12,736.

[25] Additional details and tables are available from the World Bank study team.

average income rises from US$11,300 to US$19,700 over the same period—an annual growth rate of 2.2 percent.

- African incomes exhibit some convergence to the world average, with the parity index rising from 23 percent to 30 percent.

Table 1 and Table 2 provide GTAP regional and sectoral concordance, respectively, used in this analysis.

Annex: Summary description of the ENVISAGE CGE Model

Table 1 GTAP regional concordance

	Region	GTAP concordance
1	Egypt (EGY)	Egypt (EGY)
2	Morocco (MAR)	Morocco (MAR)
3	Tunisia (TUN)	Tunisia (TUN)
4	Rest of North Africa (XNF)	Rest of North Africa (XNF)
5	Burkina Faso (BFA)	Burkina Faso (BFA)
6	Cameroon (CMR)	Cameroon (CMR)
7	Côte d'Ivoire (CIV)	Côte d'Ivoire (CIV)
8	Ghana (GHA)	Ghana (GHA)
9	Nigeria (NGA)	Nigeria (NGA)
10	Senegal (SEN)	Senegal (SEN)
11	Rest of Westn Africa (XWF)	Benin (BEN), Guinea (GIN), Togo (TGO), Rest of Westn Africa (XWF)
12	Central Africa (XCF)	Central Africa (XCF)
13	Congo, DR (COD)	Congo, DR (COD)
14	Ethiopia (ETH)	Ethiopia (ETH)
15	Kenya (KEN)	Kenya (KEN)
15	Madagascar (MDG)	Madagascar (MDG)
17	Malawi (MWI)	Malawi (MWI)
18	Mauritius (MUS)	Mauritius (MUS)
19	Mozambique (MOZ)	Mozambique (MOZ)
20	Rwanda (RWA)	Rwanda (RWA)
21	Tanzania (TZA)	Tanzania (TZA)
22	Uganda (UGA)	Uganda (UGA)
23	Zambia (ZMB)	Zambia (ZMB)
24	Zimbabwe (ZWE)	Zimbabwe (ZWE)
25	Rest of East Africa (XEC)	Rest of East Africa (XEC)
26	Botswana (BWA)	Botswana (BWA)
27	Namibia (NAM)	Namibia (NAM)
28	South Africa (ZAF)	South Africa (ZAF)
29	Rest of South African Customs Union (XSC)	Rest of South African Customs Union (XSC)

Source: (World Bank 2020)

Table 1 GTAP regional concordance (continued)

	Region	GTAP Concordance
30	China (CHN)	China (CHN)
31	Rest of East Asia (XEA)	Hong Kong (HKG), Japan (JPN), Korea (KOR), Mongolia (MNG), Taiwan (TWN), Rest of East Asia (XEA), Brunei Darussalam (BRN), Cambodia (KHM), Indonesia (IDN), Laos (LAO), Malaysia (MYS), Philippines (PHL), Singapore (SGP), Thailand (THA), Viet Nam (VNM), Rest of Southeast Asia (XSE)
32	United States (USA)	United States of America (USA)
33	European Union + EFTA (weu)	Austria (AUT), Belgium (BEL), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Ireland (IRL), Italy (ITA), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malta (MLT), Netherlands (NLD), Poland (POL), Portugal (PRT), Slovakia (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE), United Kingdom (GBR), Switzerland (CHE), Norway (NOR), Rest of EFTA (XEF), Bulgaria (BGR), Croatia (HRV), Romania (ROU)
34	Rest of the World (row)	Australia (AUS), New Zealand (NZL), Rest of Oceania (XOC), Bangladesh (BGD), India (IND), Nepal (NPL), Pakistan (PAK), Sri Lanka (LKA), Rest of South Asia (XSA), Canada (CAN), Mexico (MEX), Rest of North America (XNA), Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Ecuador (ECU), Paraguay (PRY), Peru (PER), Uruguay (URY), Venezuela (VEN), Rest of South America (XSM), Costa Rica (CRI), Guatemala (GTM), Honduras (HND), Nicaragua (NIC), Panama (PAN), El Salvador (SLV), Rest of Central America (XCA), Dominican Republic (DOM), Jamaica (JAM), Puerto Rico (PRI), Trinidad and Tobago (TTO), Rest of Caribbean (XCB), Albania (ALB), Belarus (BLR), Russian Federation (RUS), Ukraine (UKR), Rest of East Europe (XEE), Rest of Europe (XER), Kazakhstan (KAZ), Kyrgyzstan (KGZ), Tajikistan (TJK), Rest of Former Soviet Union (XSU), Armenia (ARM), Azerbaijan (AZE), Georgia (GEO), Bahrain (BHR), Iran (IRN), Israel (ISR), Jordan (JOR), Kuwait (KWT), Oman (OMN), Qatar (QAT), Saudi Arabia (SAU), Turkey (TUR), United Arab Emirates (ARE), Rest of Westn Asia (XWS), Rest of the World (XTW)

Source: (World Bank 2020)

Annex: Summary description of the ENVISAGE CGE Model

Table 2 GTAP sector concordance

	Sector name	GTAP concordance
1	Agriculture (AGR)	Paddy rice (PDR), Wheat (WHT), Cereal grains nec (GRO), Vegetables, fruit, nuts (V_F), Oil seeds (OSD), Sugar cane, sugar beet (C_B), Plant-based fibers (PFB), Crops nec (OCR), Bovine cattle, sheep and goats, horses (CTL), Animal products nec (OAP), Raw milk (RMK), Wool, silk-worm cocoons (WOL), Forestry (FRS)
2	Fossil fuels (FFL)	Coal (COA), Oil (OIL), Gas (GAS), Gas manufacture, distribution (GDT)
3	Minerals n.e.s. (OXT)	Other Extraction (formerly omn Minerals nec) (OXT)
4	Processed foods (PFD)	Fishing (FSH), Bovine meat products (CMT), Meat products nec (OMT), Vegetable oils and fats (VOL), Dairy products (MIL), Processed rice (PCR), Sugar (SGR), Food products nec (OFD), Beverages and tobacco products (B_T)
5	Wood and paper products (WPP)	Wood products (LUM), Paper products, publishing (PPP)
6	Textiles and wearing apparel (TWP)	Textiles (TEX), Wearing apparel (WAP), Leather products (LEA)
7	Energy intensive manufacturing (KE5)	Mineral products nec (NMM), Ferrous metals (I_S), Metals nec (NFM)
8	Petroleum, coal products (P_C)	Petroleum, coal products (P_C)
9	Chemical, rubber, plastic products (crp)	Chemical products (CHM), Basic pharmaceutical products (BPH), Rubber and plastic products (RPP)
10	Manufactures n.e.s. (XMN)	Metal products (FMP), Computer, electronic and optical products (ELE), Electrical equipment (EEQ), Machinery and equipment nec (OME), Motor vehicles and parts (MVH), Transport equipment nec (OTN), Manufactures nec (OMF)
11	Construction (CNS)	Construction (CNS)
12	Trade services (TRD)	Trade (TRD), Accommodation, Food and service activities (AFS), Warehousing and support activities (WHS)
13	Road and rail transport services (OTP)	Transport nec (OTP)

Source: (World Bank 2020)

Table 2 GTAP sector concordance (continued)

	Sector name	GTAP concordance
14	Water transport services (WTP)	Water transport (WTP)
15	Air transports services (ATP)	Air transport (ATP)
16	Communication services (CMN)	Communication (CMN)
17	Other financial services (OFI)	Financial services nec (OFI)
18	Insurance, real estate services (INS)	Insurance (formerly isr) (INS)
19	Other business services (OBS)	Real estate activities (RSA), Business services nec (OBS)
20	Recreational and other services (ROS)	Recreational and other services (ROS)
21	Other services (XSV)	Electricity (ELY), Water (WTR), Public Administration and defense (OSG), Education (EDU), Human health and social work activities (HHT), Dwellings (DWE)

Source: (World Bank 2020)

8 The Global Income Distribution Dynamics model

[to be added]

9 Annex: Detailed trade scenario assumptions

- Tariffs on intra-continental trade are progressively reduced in line with AfCFTA modalities. Starting in 2020, tariffs on 90 percent of tariff lines are gradually eliminated (over a five-year period for non-LDCs and ten years for LDCs). Starting in 2025, tariffs on an additional 7 percent of tariff lines are gradually eliminated (over a five-year period for non-LDCs and eight years for LDCs). Up to 3 percent of tariff lines, which account for no more than 10 percent of intra-African imports, can be excluded from liberalization by the end of 2030 for non-LDCs and until 2033 for LDCs.
- Non-Tariff Barriers (NTBs) on both goods and services are reduced on a most favored nation (MFN) basis. It is assumed that 50 percent of the NTBs can be addressed with policy changes within the context of the AfCFTA—with a cap of 50 percentage points. It is also assumed that there will be additional reductions on NTBs on exports.
- The AfCFTA will also be accompanied by measures to facilitate trade with commitments closely aligned with the Trade Facilitation Agreement (TFA). We borrow estimates of the size of these trade barriers from the existing

literature ((de Melo, J. 2019). The resulting reductions in trade cost from the adoption of trade facilitation measures range between 2 and 10 percent over 2020-2035.

Building on AfCFTA Trade, we consider two additional scenarios: AfCFTA Broad and AfCFTA Deep. These two scenarios are built on comprehensive estimates of impacts of deep preferential trade agreements on FDI based on the database on deep trade agreements (Hofmann, Osnago, and Ruta 2018) and structural gravity approach. Finally, the economic impacts under the three scenarios are translated into their effects on poverty an dincome distribution using the Global Income Distribution Dynamics (GIDD) microsimulation framework.