

Welfare Decomposition of the Continental Free Trade Area

Selected Paper for Presentation at the 19th Conference on Global
Economic Analysis,

Washington DC, 15-17 June, 2016

Preliminary Draft

15 April 2016

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Abstract

The Continental Free Trade Area (CFTA) is set to be launched in 2017, culminating ultimately into duty free quota free trade among African countries. The rationale for the establishment of the African mega-regional trade agreement is boost intra-African trade beyond the current levels of 13% and improve welfare of Africans. This study makes use of the Dynamic GTAP model to simulate the welfare effects of hundred percent tariff liberalisation. Results, measured through the equivalent variation, show that all African countries benefit - on a varying scale- from increases in labour demand, capital accumulation, terms of trade, and allocative efficiencies. However, many countries experience huge revenue losses from tariff liberalisation, and this tends to water down gains from other variables. Regional hegemonies in Africa dominate as major gainers in absolute terms, in the CFTA hundred percent tariff liberalisation, notably South Africa in Southern Africa, Kenya in East Africa, and Nigeria in West Africa. However, the magnitude could be higher if tariff liberalisation is coupled with infrastructure development in the widest sense, and removal of NTBs as part of the broader trade facilitation processes. And in order to consolidate these gains, African countries must focus on export diversification, conflict, border issues, and financial constraint.

Acronyms

AMU	Arab Maghreb Union
AU	African Union
CEN-SAD	Community of Sahel-Saharan States
CEPII	Centre d'Études Prospectives et d'Informations Internationales
CFTA	Continental Free Trade Area
CGE	Computable General Equilibrium
ECCAS	Economic Community of Central African States
ECOWAS	Economic Commission of West African States
EV	Equivalent Variation
GDP	Gross Domestic Product
GDyn	Dynamic GTAP Model
GTAP	Global Trade Analysis Project
RCEP	Regional Comprehensive Economic Partnership
RECs	Regional Economic Communities
TPP	Trans-Pacific Partnership
TTIP	Transatlantic Trade and Investment Partnership
UNECA	United Nations Economic Commission for Africa

Introduction and Background

The genesis of the accelerated regional integration agenda goes back to December 2010, when African trade ministers meeting in Kigali, Rwanda, agreed on a fast track agenda for regional integration to address Africa's low internal and external trade performances (at 13% and 3%, respectively). This in effect means to eventually bringing together 54 African countries with a combined population of more than one billion people, and a combined gross domestic product of more than USD 1.2 trillion.

At its 18th Ordinary Session in January 2012 in Addis Ababa, on the theme "Boosting Intra-African Trade," the Assembly of Heads of State and Government of the AU adopted a decision and a declaration that reflected the strong political commitment of African leaders to accelerate and deepen the continent's market integration. The Heads of State and Government agreed on a roadmap for establishing a Continental Free Trade Area (CFTA) by the indicative date of 2017. As highlighted in the roadmap, the CFTA is set to build on the Tripartite FTA negotiations, which would create a free trade area among the 26 countries of the East African Community (EAC), the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC). Since the formal launch of the tripartite negotiations in 2011, significant progress was made, and the Tripartite Free Trade Area was launched in the Egyptian resort city of Sharm El Sheik by 26 Member States on Wednesday 10th June, 2015. However, there is still some outstanding technical work with respect to the actual removal of import duties, trade remedies, and Rules of Origin. Upon the launch, the leaders also directed the commencement of Phase II negotiations covering trade in services, cooperation in trade and development, competition policy, intellectual property rights and cross border investments. The 26 Tripartite countries represent close to 60 percent of the AU's GDP and population, and an FTA among them would constitute a fundamental building block for the CFTA.

The creation of a single continental market for goods and services, with free movement of business people and investments, would help bring closer the Continental Customs Union and the African Common Market envisaged in phases 4 and 5 of the Abuja Treaty, and turn the 54 single African economies into a more coherent, larger market. The larger, more viable economic space would allow African markets to function better and promote competition, as well as resolve the challenge of multiple and overlapping Regional Economic Communities (RECs), helping thereby to boost inter-REC trade. Moreover, the sheer size of the single market would provide a more conducive environment for industrial diversification

and regional complementarities, than what is viable under existing individual country approaches to development.

The United Nations Economic Commission for Africa (UNECA) calculates that the CFTA could increase intra-African trade by as much as \$35 billion per year, or 52 percent above the baseline, by 2022. Imports from outside of the continent would decrease by \$10 billion per year, and intra-African trade in agricultural and industrial exports would increase by \$4 billion (7 percent) and \$21 billion (5 percent) above the baseline, respectively. If coupled with complimentary trade facilitation measures to boost the speed and reduce the cost of customs procedures and port handling, the share of intra-African trade would more than double over the baseline, to 22 percent of total trade by 2022. The figures look impressive.

Analysts have cited a number of factors to this low intra-African trade, to include a plethora of NTBs, high intra-REC and particularly inter-REC tariffs, and poor export diversifications. The salient point is that intra-African trade is relatively low, and the question being asked in this report is how intra-African tariff liberalisation may impact upon both trade and economic welfare of Africans.

Table 1: Sources of intra-African exports

Exporters		2011	2012	2013	2014	2015
Africa	Aggregation	94792.94	98293.29	96871.64	89888.76	40132.31
(US\$ millions)						
South Africa		28%	28%	28%	31%	59%
Nigeria		14%	14%	11%	14%	8%
Zimbabwe		3%	3%	3%	3%	6%
Zambia		2%	3%	3%	2%	4%
Angola		3%	5%	4%	2%	3%
Swaziland		1%	1%	2%	2%	3%
Congo		2%	1%	2%	1%	2%
Mauritius		0%	0%	0%	0%	2%
Mozambique		1%	1%	1%	1%	2%
Namibia		3%	2%	4%	3%	2%
Ethiopia		1%	1%	1%	1%	1%
Botswana		1%	1%	1%	2%	1%
Kenya		3%	2%	2%	3%	1%
Egypt		5%	5%	5%	4%	1%
Rest of Africa		33%	32%	32%	29%	4%

Source: International Trade Center (ITC)²

² <http://www.trademap.org/>, data accessed on 15 April 2016

The figures above gives an indicative picture with respect to the sources of intra-African exports. Major exporters to other African economies being South Africa and Nigeria. The overall conclusion from this analysis is that 1) intra-African trade is low and not really changing; 2) a large percentage of this trade is concentrated in mineral fuels; 3) South Africa is the main destination for this trade; and 4) similarly, South Africa is even more dominant as the main source of the trade. The trade of industrial goods in Africa is, however, dominated by South Africa, which accounts for more than two-thirds of African exports of these goods. A particularly telling point the paper makes is that intra-African trade owes its current modesty to a lack of diversification and competitiveness.

The establishment of the African Continental Free Trade Area (CFTA) is gaining speed. At the June 2015 African Union Summit, the Heads of State and Government reaffirmed to tentatively get the CFTA agreement launched by 2017, and to immediately initiate negotiations on the liberalisation of trade in goods and services. A first round of these negotiations took place in February 2016, and the second round in May 2016. Evidently, negotiation processes for the CFTA are intensifying. Continental integration has figured high on the African agenda ever since African countries gained political independence, but the CFTA initiative is the latest and perhaps the most ambitious of intra-African trade initiatives to date. It may be considered “the” African “mega-regional” trade agreement, even if the economic and trade weight of the participants cannot be compared to those of other mega-regionals currently in the making, i.e. the Trans-Pacific Partnership (TPP), the Regional Comprehensive Economic Partnership (RCEP) and the Transatlantic Trade and Investment Partnership (TTIP).

The COMESA-SADC-EAC Tripartite Free Trade Area (TFTA) and CFTA demonstrate the inclination of African governments to rival mega-regional agreements that have taken over the global trade playing field. The continued proliferation of regional trade agreements (RTAs) emerged formally as a concern among WTO members during the 10th WTO Ministerial Conference , with their final ministerial declaration including language reaffirming the need to ensure that RTAs remain complementary to, not a substitute for, the multilateral trading system. As Africa endeavours to advance its regional integration agenda, a number of challenges must be addressed in order to realise economic and development opportunities that would arise from a fully integrated African market. African stakeholders agreed that a successful negotiation and implementation of the CFTA agreement as a modern 21st century trade pact is an important requirement to achieve economic transformation and generate sustainable development outcomes. For now, several regional integration initiatives still operate alongside each other often with overlapping membership. Notwithstanding these developments, structural impediments such as infrastructure constraints and behind-the border issues persist.

Research Objectives

Whilst most of literature on the CTFA has been of qualitative discourses in nature, with limited quantitative assessment, there has been limited dynamic assessment of the impact of the CFTA on welfare of Africans. Policy makers, politicians, and trade negotiators have limited insights into their actions with regard to the welfare decomposition of the CFTA. Hence this study is motivated by the desire to understand if the CFTA will indeed achieve the political objective of improving the demand of labour, terms of trade, increase in exports, allocative and productive efficiencies, changes in preferences, price of investment relative to saving, population, technological changes, and ownership of capital endowments. The study makes use of the equivalent variation (EV) to understand the welfare implications of establishing the CFTA. The EV in income measures annual change in a country's income from having implemented an FTA. Put simply, it is defined as the difference between initial pre-FTA income and the post-FTA income after implementation of the FTA, with all prices fixed at pre-FTA level. Areas of interest in this study are

- demand for labour,
- terms of trade,
 - revenue
- increase in exports,
- allocative and productive efficiencies,
- population,
- ownership of capital endowments.

This will help in guiding national policies with regards to the welfare implications of the CFTA by 2017. The study will look into these variables in 2025, a few years after the formal launch of the mega-continental free trade area. The study looks into hundred percent eliminations of import tariffs among African economies by 2017.

Model and Database

The modelling framework used to analyse potential impacts of our CFTA liberalisation scenarios is the Dynamic GTAP Model (GDyn), as documented in Ianchovichina and

Walmsley (2012a). The standard GTAP model is a well-known and widely used comparative static global CGE model that captures interactions between regions and sectors within a fully consistent economic framework (Hertel 1997). The model and supporting database are widely used for policy analysis: they are fully documented and publicly available, providing a relatively high degree of transparency³.

The GDyn model being used in this study is a recursive dynamic version of the standard GTAP model that permits modelling and implementation of policy changes over time, as well as capital accumulation along with international mobility and foreign ownership of capital (Ianchovichina and McDougall, 2012b). Other features of the standard GTAP model are retained, including: consumers maximise welfare subject to their budget limitations while firms maximise profits, within perfectly competitive markets with constant returns to scale and using the limited resources available in the economy⁴. Three primary factors of production (land, capital, and labour) combine with intermediate inputs, both domestically produced and imported, to produce final output⁵. Elasticities specify the extent to which substitution is possible between imports from different sources and between imports and domestic production. When a policy change such as CFTA liberalisation is simulated, prices and quantities of commodities, along with related impacts on total output, welfare and incomes are endogenously determined within the model⁶.

In the current study, we use the GDyn v8.1 database benchmarked to 2007. The full database comprises 134 countries and regions, disaggregated into 57 sectors (Narayanan, 2012). However, we aggregate the database to model 31 sectors and 21 countries or regions further aggregating the sectors for reporting purposes.

The use of welfare measures is now a commonplace in many AGE applications. The calculation and decomposition of welfare have become important parts of analytical tools used to evaluate and/or compare the impact of policies on the regions. In dynamic models, in which the importance of capital ownership features significantly, welfare measures are clearly superior to the use of real GDP as a measure of assessing the benefits of a policy. This is because GDP is defined as goods and services produced in a country, rather than ownership of the produced goods and services.

However, calculating and decomposing welfare in a dynamic model are much more difficult tasks than in the traditional comparative static models. One of the challenge is that welfare decomposition in dynamic model is high path dependency. This means that the result depends on the path taken, rather than being a true reflection of the actual impact of the policy. To remove path dependency from the welfare decomposition, after the baseline and

³ See www.gtap.agecon.purdue.edu for detailed information on the GTAP model and database.

⁴ In contrast, some CGE models assume monopolistic competition between producers.

⁵ While skilled and unskilled labour supplies are assumed to change over time in the baseline, the macroeconomic closure we use in the policy scenarios assumes that labour is fully employed and fixed at the baseline labour supply level for each respective year.

⁶ The model is solved with GEMPACK software (Harrison and Pearson 1996), using the RunDynam interface.

policy simulation are undertaken, a comparative static simulation is undertaken. This gives the difference in welfare between baseline and policy at a single point in time.

Total welfare gains/losses can be decomposed into contributions from improvements in allocative efficiency, capital accumulation, changes in the employment rate of the labour force, and terms of trade (Huff and Hertel, 2000).

Gains from **allocative efficiency** arise from improved reallocation of resources from less to more productive uses. For instance, when import tariffs are abolished, resources shift from previously protected industries towards sectors where the country has a comparative advantage, producing an increase in real GDP and economic welfare.

Terms of trade effects are the consequence of changing export and import prices facing a country. So, when a country experiences an increase in its export price relative to its import price (e.g. due to improved market access), it may finance a larger quantity of imports with the same quantity of exports, thus expanding the supply of products available to the country's consumers. While allocative efficiency contributes to increases in global welfare, the terms of trade affect the distribution of welfare gains across countries; essentially, one country's terms of trade gain is another country's terms of trade loss. The global total must therefore add up to zero, and if a large proportion of the benefit to a country from an FTA is derived from terms of trade effects, this implies transfers to that country from the rest of the world. Note, however, that in our equivalent variation (EV) we are including a value for the changes in the price and levels of investments and savings (terms of trade on capital) in our terms of trade (ToT) values. This can be a significant portion of the total ToT values.

Capital accumulation summarises the long-run welfare consequences of changes in the stock of capital due to changes in net investment. A policy shock affects the global supply of savings for investment as well as the regional distribution of investments. If a trade agreement has a positive effect on income through improvements in efficiency and/or ToT, a part of that extra income will be saved by households, making possible an expansion in the capital stock. At the same time, rising income will increase demand for produced goods, pushing up factor returns and thus attracting more investments. Generally, economies with the highest growth will be prepared to pay the largest rate of return to capital, and will obtain most of the new investments. Therefore long-run welfare gains from capital accumulation tend to reinforce the short-term welfare gains deriving from allocative efficiency and ToT.

The welfare effects of changed **employment** rates are the consequence of changes in the employment of the labour force due to changes in the real wage. In a situation where the demand for labour and thereby the real wage increases, the amount of labour employed increases, reducing the relative increase in the real wage, thereby increasing the competitiveness of the country's industries.

Baseline Projections

The increasing interest in dynamic models and in particular the development of the Dynamic GTAP model at the Center for Global Trade Analysis has highlighted the need to develop a base case scenario depicting how the world economy might be expected to change over the next 20 years. The base case scenario should reflect as closely as possible the changes expected to occur in the world economy. These changes in the world economy are grouped into two areas: the first deals with the macro economic forecasts of each country, and the second deals with expected policy changes.

In this section, we outline our assumptions for developing the baseline projections of the world economy through 2050, just to give a general indicative direction of macroeconomic indicators. However, the analysis is limited to 2025 in order to be cautious of exogenous global dynamics which might have an implications on African economies if the period of analysis is overly stretched. As noted above, simulations and the related impacts are calculated relative to the baseline projections to capture the world as it might appear when the CFTA is implemented.

The GTAP model then determines changes in output through both an expansionary and a substitution effect in each country/region of the model. The expansionary effect represents the effects of growth in domestic and foreign demand shaped by income and population growth, and the assumed income elasticities. The substitution effect reflects the changes in competitiveness in each country/region shaped by changes in relative total factor productivity, cost of production, and any policy changes. The GTAP model uses this set of macroeconomic projections to generate the 'best estimate' of global production and trade data for 2025. The relative growth rates of each country/region for GDP, population, labour, capital and total factor productivity play an important role in determining the relative growth in output of the commodities when projecting the world economy to 2025. Capital and TFP are endogenously determined by the GTAP model and Version 8 database given the exogenous GDP, population, unskilled, skilled labour and natural resource projections. After updating the GTAP database to the year 2025, the Africa FTA is implemented using the updated GTAP database as the base for this simulation. This enables the gains achieved by implementing the FTA to be put into perspective. Differences between the baseline and the primary scenario as measured by the changes in 2025 as expressed in real US dollars are therefore the results of implementation of the African FTA.

Graphs 1, 2 and 3 in the annexes presents an overview of our macroeconomic assumptions and estimates. Real GDP and population growth are historical rates from 2012 (World Bank 2014). For projections beyond 2017, GDP growth rates are drawn from international estimates (World Bank 2014a; OECD 2014; and Fouré et al. 2010 and 2012); population

growth rates, along with skilled and unskilled labour growth rates are based on CEPII estimates compiled by Chappuis and Walmsley (2011). The projections indicate a sluggish growth pattern in GDP, with declining growth levels of labour and population, as shown in Graphs 1, 2 and 3 in Annex 1. In terms of regional aggregation, the study makes use all African countries in the GTAP database as listed in Annex 2. However, interpretation of results is limited to North Africa (3 countries), West Africa (3 countries), East Africa (4 countries), and Southern Africa (6 countries). Hundred percent tariff liberalisation is applied on food and manufactured goods sectors, as listed in Table 3, Annex 2.

Welfare Decomposition

Results from RunDynam

Simulation

Policy changes impact economic welfare and the GDyn model provides a summary measure of welfare changes for each region. Aggregate welfare results, as measured by equivalent variation, are positive for selected African regions⁷ from assumed full tariff liberalisation under the continental integration. Total welfare effects comprise a range of components, including: changes in allocative efficiency as resources move to more or less efficient uses; changes in the terms of trade as a country's export prices change relative to import prices; changes in returns to ownership of capital; and also growth in endowments, technological change and efficiency improvements.

Table 2: Summary of Welfare Results (US\$ million)

GTAP Region	Allocative Efficiency	Labour	Capital Accumulation	Terms of Trade	Tariff Revenue	Total Welfare Gain/Loss
North Africa						
Egypt	95	42	257	129	-25	523
	115	46	195	226	-18	564

⁷ This measure is equivalent variation (EV), a commonly used dollar value indicator of changes in economic welfare. EV is defined as the addition or subtraction of income one would have to undertake, at the base level of prices, to obtain the same level of welfare after the proposed policy or regulation is implemented. Welfare results can provide a comprehensive measure of policy impacts: along with changes in allocative efficiency, endowments and technology, they include changes in ownership of capital and in the terms of trade. Terms of trade measure the price of exports relative to the price of imports, with improvements in the terms of trade enabling a country to purchase more imports for any given level of exports. For detailed discussion of welfare analysis in GTAP, see Huff and Hertel (2000); for applying welfare analysis within the GDyn framework, see Walmsley et al. (2012a).

GTAP Region	Allocative Efficiency	Labour	Capital Accumulation	Terms of Trade	Tariff Revenue	Total Welfare Gain/Loss
Morocco						
	89	35	142	95	-22	339
Tunisia						
West Africa						
	274	52	263	251	-380	460
Ghana						
	508	447	943	158	-683	1373
Nigeria						
	338	52	625	218	-33	1200
Senegal						
East Africa						
Kenya						
	272	94	969	-22	-426	887
	69	40	190	-34	-171	94
Ethiopia						
	88	18	138	85	-5	324
Rwanda						
	214	36	137	18	-465	-60
Tanzania						
	152	42	403	98	-88	607
Uganda						
Southern Africa						
	128	68	125	142	-22	441
Zambia						
	-205	-59	-475	-748	-1135	-2622
Zimbabwe						
	17	22	46	-9	-22	54
Botswana						
	28	52	296	108	-25	459
Namibia						
	1469	914	2270	1138	230	6021
South Africa						
Rest of South African Customs⁸	19	19	53	26	-22	95

Source: Authors' GDyn model results

Major gainers from the tariff liberalisation through the CFTA are South Africa, Nigeria and Angola in terms of capital, terms of trade and allocative efficiency, in absolute terms. However, many countries experience huge revenue losses from tariff liberalisation, and this tends to water down gains from other variables. African countries are vulnerable to tariff revenue losses from trade liberalisation, and hence must identify alternative sources of income ahead of 2017.

Countries that are more integrated in terms of tariff liberalisation within RECs incur modest tariff revenue losses. Small and vulnerable economies have modest gains mainly coming

⁸ Rest of South African Customs include Swaziland and Lesotho

from terms of trade, and capital accumulation. Huge losses are registered in Zimbabwe from terms of trade, revenue and capital gains losses. This is partly due to the fact that Zimbabwe has the highest regional tariffs, and tariff revenue coupled with surcharges contribute over 10% to the fiscus.

The demand for both skilled and unskilled labour in most African countries shows huge increases. Regional hegemonies in Africa dominate as major gainers in absolute terms, in the CFTA hundred percent tariff liberalisation, notably South Africa in Southern Africa, Kenya in East Africa, and Nigeria in West Africa. North Africa experiences a fairly shared welfare gains from trade liberalisation. Outside South Africa and Nigeria, gains from labour are moderate, partly due to low productivity of labour and declining labour populations.

However, national welfare is rarely independent of who wins and losses. These welfare gains indeed justify the establishment of the CFTA, as it will culminate in more jobs and investment. Whilst gains to economies from the CFTA vary, the overall outlook points to improved economic welfare in Africa. More gains can be anticipated from Phase II of the CFTA negotiations, coupled with improvements in infrastructure, removal of NTBs, and political stability.

Tariff removal is only one part of regional integration processes with respect to removal of trade costs. The CFTA commits WTO members to customs cooperation “with a view to further expediting the movement, release and clearance of goods, including goods in transit.” Put simply, this would mean significantly reduced transactions costs, red tape, and corruption at ports and cargo airports. Such improvements will support global value chains and over the long term could deliver a positive uptick in the sluggish growth of international trade. Hufbauer and Schott (2013) estimated that full implementation of trade facilitation reforms could deliver some \$1 trillion in global export gains, based on gravity model estimates of the impact of countries improving both “hard” and “soft” infrastructure in categories like ports and services and customs administration, at least halfway to the region’s top performer in each category. Major gains from implanting the trade facilitation processes accrue to developing countries, particularly Africa. More gains can be registered if the CFTA tariff liberalisation processes are coupled with export diversification, conflict, border issues, financial constraint, and currency as complimentary measures.

Conclusion

A tariff reduction of an FTA has a wide variety of economic impacts to the member countries of the agreement, as well as the rest of the world. The effects encompass those on welfare,

production, exports and imports in both real and nominal terms. Hence, the establishment of the CFTA will culminate in improved welfare in many African economies, at varying degrees. The continental initiative will result in more jobs, investment and competitiveness, as indicated in the above GTAP simulations. However, many African countries will experience revenue losses from hundred percent tariff liberalisation on intra-African trade. There is therefore a need to come up with innovative alternative sources of income ahead of the launch of the CFTA.

This process will not rival the ongoing negotiations under the TPP and TTIP, but will improve Africa's footprint in global trade. Effective regional integration can support Africa's industrialization. Free movement of goods across borders will increase both the competitive pressure on incumbent firms in the region, and create new possibilities for task-based production focused on extra-regional markets. The CFTA presents an opportunity to spring intra-Africa's trade beyond the current 13% levels.

In addition to tariff barriers, many NTBs limit African trade. They take multiple forms, such as lengthy customs procedures, sanitary and phytosanitary measures, product standards, anti-dumping measures, countervailing duties, and licensing, as well as lack of infrastructure. Considering the high trade protection levels, elimination of tariff barriers following the establishment of FTAs among African economies could lead to substantial increases in trade flows within the continent.

Increased trade between African countries holds promise for shared growth and development in the continent. However, before African countries can fully exploit the benefits associated with increased trade with each other, they must first address the barriers to the movement of goods and people within their countries. It is difficult to imagine how Africa will be able to move goods from Cape Town to Cairo when it is unable to move goods from one city to another within the same country. Addressing Africa's transportation infrastructure deficiencies will require an innovative combination of strategies, including prioritizing maintenance, creating mechanisms to engage the private sector, leveraging China's growing interest in the region, and increasing connectivity between existing infrastructure.

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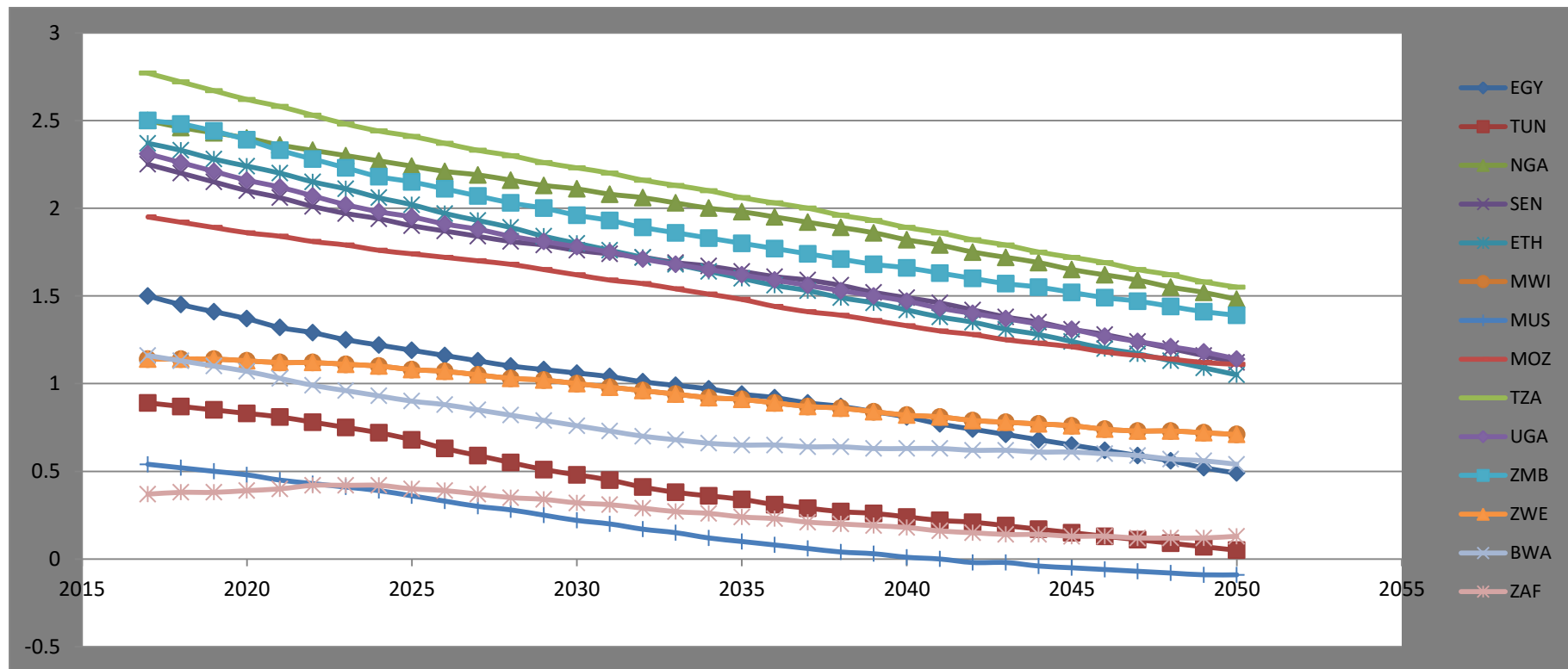
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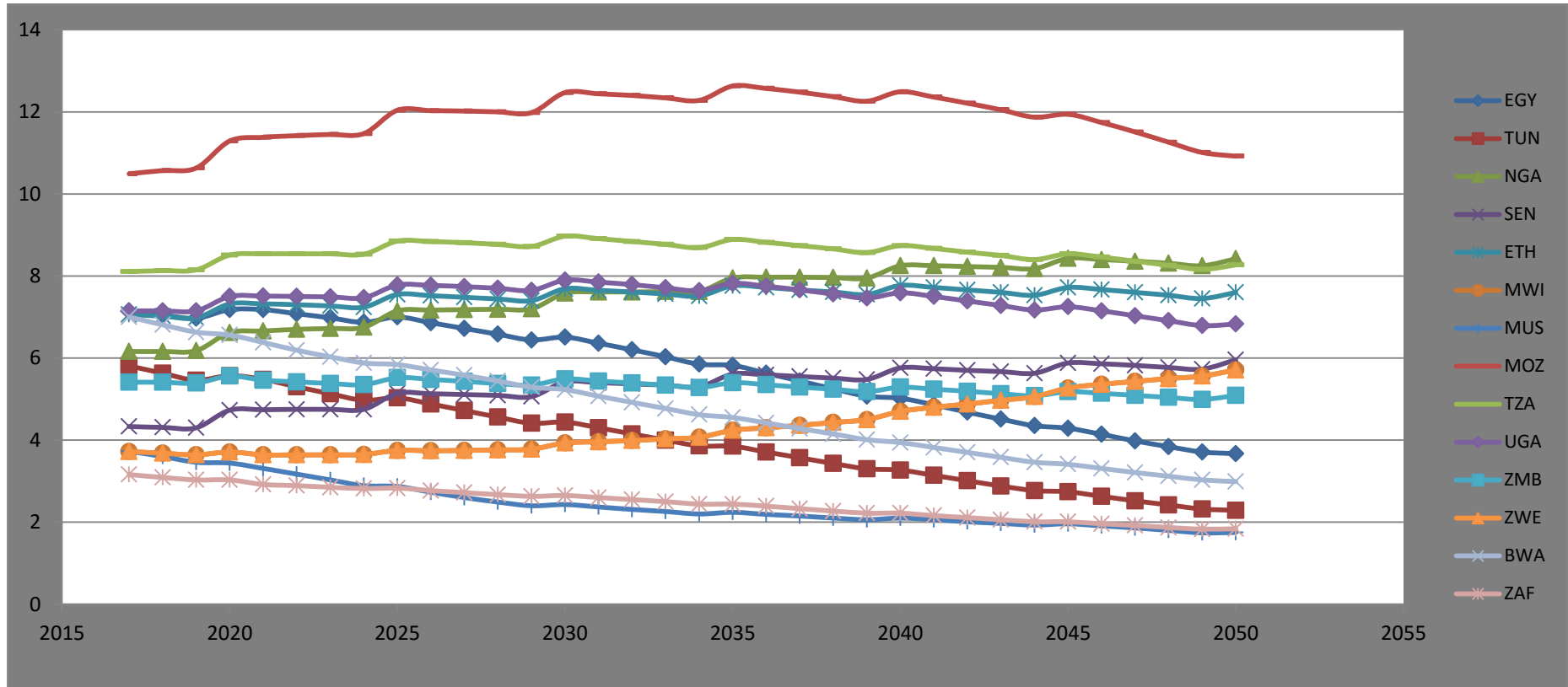
Annex 1

Graph 1: Projected Growth in African Populations



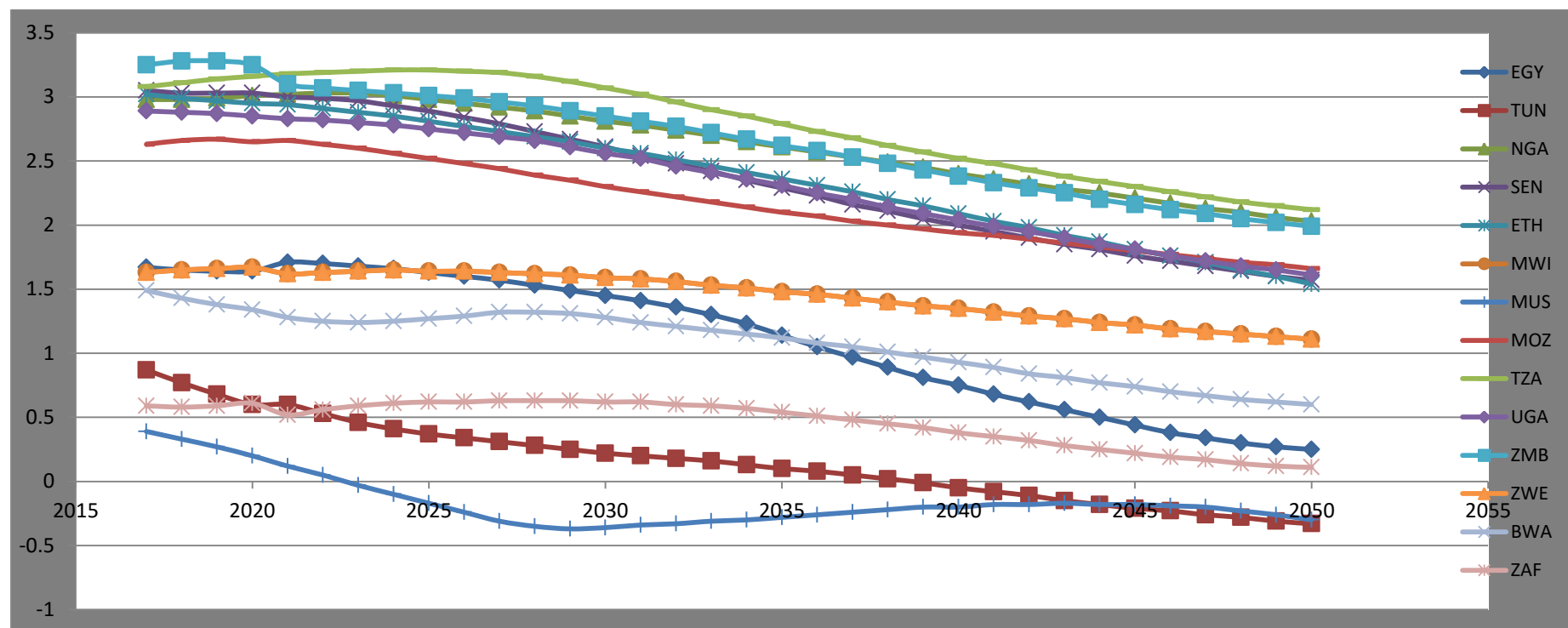
Source: CEPII

Graph 2 : Projected Growth in GDP for African Economies



Source: CEPII

Graph 3: Projected Growth in Labour Force for African Economies



Source: CEPII

Annex 2

Table 3: GTAP Sectors

GTAP Code	Product	Aggregation	GTAP Code	Product	Aggregation
pdr	paddy rice	food	lum	wood products	mnfc
wht	wheat	food	ppp	paper products, publishing	mnfc
gro	cereal grains nec	food	p_c	petroleum, coal products	mnfc
v_f	vegetables, fruit, nuts	food	crp	chemical, rubber, plastic products	mnfc
osd	oil seeds	food	nmm	mineral products nec	mnfc
c_b	sugar cane, sugar beet	food	i_s	ferrous metals	mnfc
pfb	plant-based fibers	food	nfm	metals nec	mnfc
ocr	crops nec	food	fmp	metal products	mnfc
ctl	bovine cattle, sheep and goats, horses	food	mvh	motor vehicles and parts	mnfc
oap	animal products nec	food	otn	transport equipment nec	mnfc
rmk	raw milk	food	ele	electronic equipment	mnfc
wol	wool, silk-worm cocoons	food	ome	machinery and equipment nec	mnfc
frs	forestry	mnfc	mnfc	manufactures nec	serv
fsh	fishing	mnfc	ely	electricity	serv
coa	coal	mnfc	gdt	gas manufacture, distribution	serv
oil	oil	mnfc	wtr	water	serv
gas	gas	mnfc	cns	construction	serv
omn	minerals nec	mnfc	trd	trade	serv
cmt	bovine cattle, sheep and goat meat products	food	otp	transport nec	serv
omt	meat products	food	wtp	water transport	serv
vol	vegetable oils and fats	food	atp	air transport	serv
mil	dairy products	food	cmn	communication	serv
pcr	processed rice	food	ofi	financial services nec	serv
sgf	sugar	food	isr	insurance	serv
ofd	food products nec	food	obs	business services nec	serv
b_t	beverages and tobacco products	mnfc	ros	recreational and other services	serv
tex	textiles	mnfc	osg	public admin. and defence, education, health	serv
wap	wearing apparel	mnfc	dwe	ownership of dwellings	
lea	leather products	mnfc			

Table 4: GTAP African countries/regions

egy	Egypt	ken	Kenya
mar	Morocco	mdg	Madagascar
tun	Tunisia	mwj	Malawi
xnf	Rest of North Africa	mus	Mauritius
ben	Benin	moz	Mozambique
bfa	Burkina Faso	rwa	Rwanda
cmr	Cameroon	tza	Tanzania
civ	Cote d'Ivoire	uga	Uganda
gha	Ghana	Zmb	Zambia
gin	Guinea	zwe	Zimbabwe
nga	Nigeria	xec	Rest of Eastern Africa
sen	Senegal	Bwa	Botswana
tgo	Togo	nam	Namibia
xwf	Rest of Western Africa	zaf	South Africa
xcf	Central Africa	xsc	Rest of South African Customs
xac	South Central Africa	eth	Ethiopia