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Can Reciprocal Tariff Elimination Reduce the Welfare Losses Due to Lagging Labor Productivity?: An Analysis of Reciprocal Preferential Trade Access between Sub-Saharan Africa and Industrialized Countries

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Abstract:

This paper employs General Equilibrium framework modeling and estimates the effects of reciprocal preferential trade liberalization between Sub-Saharan Africa (SSA) and the European Union (EU-25) and all industrialized countries by taking differences in labor productivity into account. We use standard GTAP 7.1 version, with eight aggregated sectors and ten aggregated regions. Simulation results show that prior to reciprocal tariff elimination, when econometric estimates of labor productivity growth are included, SSA loses by USD 12.6 billion annually because of lagging productivity growth, especially in its manufacturing sector. Elimination of tariffs between SSA and all industrialized countries in agriculture and manufacturing sectors improves SSA's welfare by USD 2 billion, as a result of an increase in endowment and allocative efficiency effects. The gains, however, are not substantial. Results also show that a minimal annual average growth rate of 3 per cent in labor productivity in manufacturing sector will lead to positive allocative and endowment efficiency effects and counter SSA welfare losses.

Keywords: Labor productivity, Reciprocal trade preference; Trade policies, Sub-Saharan Africa, Welfare

1. Introduction

Differences in rates of productivity growth may widen income and welfare gaps among trading partners, and this fuels the debate on whether further trade liberalization would reduce or exacerbate these welfare gaps. Taking into account the lagging labour productivity growth in Sub-Saharan Africa, we present a computational analysis of the economic effects of reciprocal tariff eliminations between Sub-Saharan Africa and the industrialized countries. Trading arrangements such as the Economic Partnership Agreements (EPAs) or African Growth and Opportunity Act (AGOA) have been negotiated between Sub-Saharan African countries and the Industrialized nations to foster mutual benefits from trade and eventually to achieve more general development goals. Concerns have been expressed that the reciprocity of trade preference especially under the EPA may impact welfare adversely because many of the Sub Saharan African countries' domestic sectors lack competitiveness in both domestic and foreign markets. More importantly, there is a fear that reciprocal preferential access reduces employment and worsens Sub-Saharan Africa's lack of competitiveness. Because of those concerns, negotiations under the Economic Partnership Agreement (EPA) on the reciprocal preferential trade between the EU and African countries have been slow. Only 4 countries (Madagascar, Mauritius, Seychelles, and Zimbabwe) have concluded negotiations on a bilateral basis prior to 2012, and in February 2014 a group of West African countries, which includes Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo, (all in the ECOWAS bloc) has made progress into finalizing an agreement with the EU. These countries have yet to formally sign the agreement.

The analysis of the distributional impact of trade reforms plays an important role in the assessment of EPA, i.e. who is paying the welfare costs of adjustment, what are the instruments that could be used to alleviate these burdens, and at what aggregate economic costs? We specifically address these issues and employ a computable general equilibrium (CGE) modeling approach to examine how eliminations of reciprocal tariffs between and the EU and other industrialized countries will affect Sub-Saharan Africa's welfare losses caused by its lagging labor productivity. A contribution of the paper is the use of econometrically estimated parameters of labor productivity by sector and by region to examine the net effect of reciprocal preferential trade (like in the case of EPA between the EU and Sub-Saharan African countries) on factor employment and prices as welfare as welfare distribution in partner countries. The model, which includes eight sectors and ten regions, compares two scenarios of reciprocal tariff eliminations with and without inclusion of the difference in labor productivity growth for all regions and all sectors. We also examine the impacts by sub-regions and FTAs and simulate the spillover effects of trade on labor productivity. Our aim is to provide policy implications for strategies to improve welfare especially in key sectors, such agriculture and manufacturing.

2. The Economic Partnership Agreements and past studies

In 2000, the European Union (EU) committed itself to ensure its preference schemes with African, Caribbean and Pacific (ACP) countries complied with World Trade Organization (WTO) rules by 1 January, 2008. Economic Partnership Agreements (EPAs) should help ACP countries including those in Sub-Saharan Africa to foster their integration in international trade. The genesis of EU and the African,

Caribbean Pacific (ACP) bloc cooperation can be traced back to 1975 when 46 developing countries signed the Georgetown Agreement, which formed the basis for the signing of the first Lome´ Convention in 1975 between the then nine member states of the EU and the 46 ACP countries. The Convention was subsequently renegotiated at five-yearly intervals, in 1980 (Lome´ II), 1985 (Lome´ III), 1990 (Lome´ IV) and finally in 1995 (Lome´ IV - bis). The successive Lomé Convention Agreements were the framework under which non-reciprocal duty-free access to the European market was granted to products originating in ACP countries. The Lomé Convention Agreement was replaced by the Cotonou agreement in 2000, under which the EU and ACP countries agreed to negotiate arrangements that would, due to their incompatibility with World Trade Organization (WTO) rules, lead to the elimination of non-reciprocal preferences granted by the EU. This led to negotiations on the Economic Partnership Agreements (EPAs) which were concluded in 2007, within the grouping of Caribbean Forum of African Caribbean and Pacific States (CARIFORUM), primarily to avoid distortions of EU-ACP trade (especially between the EU and the ACP non-LDCs). The EPAs between the EU and each of the six regional ACPs aim to support ACP regional integration to create larger regional markets and foster their integration into world markets, and in doing so are new approaches to promote trade and to achieve more general development goals at the same time. The EPAs, are thus reciprocal agreements between the EU and ACP countries that have to open their market to a limited extent (on average 80 percent within 15 years) in return for access to EU markets. The long-term goal of these regional agreements is quasi duty-free and quota-free market access and more simple rules of origin in the EU.

In recent years, the issue of the unrestricted market access (UMA) for African and least developed countries (LDCs) has been studied using various angles and methodologies. Ianchovichina, Matoo & Olarreaga (2001) tested five liberalization scenarios of African exports to the Quad, using the Global Trade Analysis Project (GTAP) and version 4 of the GTAP database. Bora, Cernat & Turrini (2002) also focused on the issue of unrestricted market access for the LDCs to the Quad. Using version 5.4 of the GTAP database, the study analyzed the existing preferential schemes and the pattern of the world protection, as well as the economics of non-reciprocal agreements through partial equilibrium analysis. Two scenarios were tested: (a) full liberalization of the exports from the LDCs to the EU, corresponding more or less to the Everything But Arms (EBA) initiative, and (b) duty-free access of all the exports from the LDCs to the Quad countries. According to the estimations, which assume that all Sub-Saharan African countries belong to the least developed countries category and thus benefit from the duty-free access privileges, the enlargement of the EBA's benefits the Quad markets. Results show that the global welfare gains of the EBA initiative increases, from US$0.1 billion to US$1 billion. Sub-Saharan Africa shares most of the gains with Bangladesh. The welfare gains of Sub-Saharan Africa would roughly equal the welfare losses the Quad undergoes due to terms of trade deterioration (US$1.3 billion). Most of the African welfare gains result from the terms-of-trade effects.

Earlier studies that analyzed the effects of EU-FTAs use GTAP 5 or CGE models, such as those on South Africa (Lewis , Robinson, & Thierfelder, 1999; McDonald & Walmsley, 2003), Turkey (Alessandri, 2000; Harrison, Rutherford, & Tarr, 1996), and Egypt (Dessus & Suwa-Eisenmann, 1998) assumed full liberalization between partner countries. Other studies analyzed the impact of non-reciprocal preferences and these employed PE models which showed that EU exporters were the main

beneficiaries of EPAs, because their exports to ACP markets increased substantially after implementation of such agreements (Scollay, 2002; COMESA Secretariat, 2003; Ndlela and Tekere, 2003; Busse, Borrmann & Großman, 2004; Karingi et al., (2005). Kerkala, Niemi & Vaittinen (2000) used a multiregional general equilibrium model to examine the consequences for African ACP countries of a post-Lomé world. Nilsson (2002) analyzed the effect of the Lomé Convention and the European GSP on developing country exports. Milner, Morrissey & MacKay (2005) used a partial equilibrium model to analyze trade and welfare effects of EPA in Kenya, Tanzania and Uganda but the model did not take into account the productivity gap between the trading partners.

3. Modelling approach and scenarios

3.1 Model structure and scenarios simulated

This paper uses GTAP database version 7.1 (Narayanan and Walmsley, 2008) and the standard GTAP model (Hertel, 1997) to analyze welfare, macroeconomic and trade impacts. We focus on the estimation of the impact of such reciprocal trade preferences (mainly on Sub-Saharan Africa's factor allocation and factor prices and terms of trade) by taking into account different labor productivity trajectories of all trading partners. The aim is to analyze how the inclusion of labor productivity affects the trade impacts and, through sensitivity analysis, to assess what rate of labor productivity is required in Sub-Saharan Africa to enable countries to benefit from trade. The model includes 10 regions, 8 sectors and 5 factors.

The regions are: European Union (25 countries in the EU); Asian Tigers (Hong Kong, Singapore, South Korea, Taiwan); the Rest of Industrialized countries (the US, Canada, and Australia); Brazil; China; Latin America (without Brazil); India; Developing Asian economies (Vietnam, Malaysia, Indonesia, Thailand); Sub Saharan Africa; and Rest of the world.

Sectors include: Agriculture (incl. forestry and fisheries); Extraction; Construction; Manufacturing; Transport, storage and communications; Wholesale and retail trade; Finance and Insurance (also includes real estate and business services); and Other Services (Personal and Government Services).

Factors are: Land; Natural resources; Skilled labor; Unskilled labor; and Capital.

Table 1 presents the following main scenarios, which are simulated.

Table 1: Scenarios

	Scenario 1: Labor productivity shocks	Scenario 2: Labor productivity and Trade policy shocks Sub-Saharan Africa vs. all	Scenario 3: Labor productivity and Trade policy shocks Sub-Saharan Africa vs. EU
Main Closures:	-Unemployment of unskilled labor except in Industrialized countries -Fixed trade balance except in emerging and developed countries	-Unemployment of unskilled labor except in industrialized countries -Fixed trade balance except in emerging and developed countries	-Unemployment of unskilled labor except in industrialized countries -Fixed trade balance except in emerging and developed countries
Shocks:			
Labor productivity growth*	Projection estimates	Projection estimates	Projection estimates
Tariffs EU25 vs. SSA	Tariffs remain (No change)	Zerol tariff (reciprocal)	Zero tariff (reciprocal)
Tariffs SSA vs the rest of Industrialized countries	Tariffs remain (No change)	Zero tariff (reciprocal)	Tariffs remain (No change)

Note: *Labor(both skilled and unskilled) productivity shocks are based on the parameters in Table 3

Scenario 1 aims to assess total welfare in Sub-Saharan Africa and the other regions when each region operates with estimated rates of labor productivity growth as highlighted later in Table 2 (below). No trade policy shocks are introduced in Scenario 1.

Scenario 2 takes into account trade impact under the same rate of labor productivity growth but includes reciprocal elimination of tariff between EU_25 and SSA and between all industrialized countries and SSA).

Scenario 3 is similar to Scenario 2, except that we look into the SSA-EU reciprocal tariff elimination only. The comparison between scenario 1 and the other two scenarios then assesses how trade policies (reciprocal elimination of tariff) affect Sub Saharan Africa's trade and welfare.

3.2   Closure assumptions and shocks

Closures

As summarized in Table 1, the model assumes that for all scenarios, there is unemployment of unskilled workers in Sub-Saharan Africa, Latin America, 'Asia Developing', Brazil, China, India and in 'Rest of the World'. Moreover, we also borrow the standard assumption that trade balance is fixed (the 'price' of saving becomes endogenous) in developing countries (Sub-Saharan Africa, Asia Developing, Latin America and Rest of the World). For the rest, i.e. in industrialized and emerging economies, we assume

that trade balance is flexible. Since export minus import must equal saving minus investment, these closures on trade balance ensure that capital (investment) flows from the developed and emerging economies to the less developed countries. Similar to the study by MacDonald and Walmsley (2003), our model allows savings as a proportion of income to change so that the ratio of trade balance to income is fixed for developing countries and regions and the rest of the world.

Labor productivity shocks

The shocks to labor productivity have been estimated by van Dijk (2013), as shown in Table 3, which affect all 8 sectors and 10 regions in our model.[1]

Table 2: Labor productivity growth: Trend and Projection 2006-2050 (% per year)

Sector	Rest of Industrialized countries	EU	China	India	Asian Tiger	Asian Developing	Brazil	Latin America	Sub-Saharan Africa	Rest of the World
Agriculture	3.43	3.43	4.11	1.48	4.23	2.59	4.87	2.39	2.14	2.59
Construction	-1.05	-1.05	3.96	-0.18	0.38	-1.49	0.29	-0.64	-2.69	2.59
Finance, Insurance and real estate business	1.32	1.32	1.72	-4.86	0.28	-1.14	- 1.52	-1.55	-0.57	-
Manufacturing	1.74	1.74	7	1.59	4.55	1.82	- 0.98	0.46	-6.30	1.82
Transport, storage and communication	2.37	2.37	5.4	4.22	3.05	0.86	- 2.17	1.17	2.04	1.82
Wholesale and retail trade	1.41	1.41	3.11	2.96	2.29	-1.81	- 2.04	-2.34	-4.89	0.95
Other Services	-0.63	-0.63	4.58	3.42	0.89	0.95	0.27	0.05	-4.00	-
Overall	1.17	1.17	5.46	3.17	2.38	1.53	- 0.14	0.42	0.37	1.53

Source: van Dijk, 2013

Note: The 'Extraction' sector is the only sector where shocks in productivity growth were not included because this sector was not included in van Dijk's estimation

Table 2 shows the lagging labor productivity growth in Sub-Saharan Africa compared with those of other countries and regions in the model, and especially in key sectors such as manufacturing and agriculture. In agriculture, for instance, Sub-Saharan Africa exhibits 2.14% labor productivity growth per year, which is among the lowest. Labor productivity gap is higher in manufacturing for which country like China

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[1]In fact these shocks are projections based on current trend of how the rate of labor productivity growth will evolve.

leads at annual rate of 7 % compared to -6.3% for Sub-Saharan Africa. The lack of growth in labor productivity affect also other sectors such as 'Services', 'Wholesale and Retail Trade', and even construction. Our analysis takes into account these significant gaps in labor productivity by sector and by trading partners in the model.

Trade policy shocks

GTAP tariff data shows that the bulk of any trade liberalization between Sub-Saharan Africa and the EU and other industrialized countries would be the elimination of tariffs on products from the agriculture and manufacturing sectors. Some tariffs still need to be eliminated in the 'Transport' sector but these tariffs are not as high as in the agriculture and manufacturing sectors. Table 3 presents average tariff levels (*ad valorem*) for key sectors.

Table 3: Average tariff levels (%)

Sector	Import from Sub-Saharan Africa to EU	Import from EU to Sub-Saharan Africa	Import from Sub-Saharan Africa To rest of Ind. Countries	Import from rest of Ind. Countries to Sub-Saharan Africa
Agriculture	4.38	15.73	6.64	10.72
Manufacturing	None	7.69	None	8.78
Transport, storage, and communication	None	none	None	3.86

Source: GTAP 7.1

4. Impacts of labor productivity and trade shocks

4.1 Effects of the inclusions of the trend and projection of labor productivity growth

The benchmark is the *status quo* i.e., no productivity and no trade policy shocks occur, so any welfare changes in the scenario are the changes related to this *status quo*. Table 4 decomposes welfare from scenario 1 as a result of the inclusion of labor productivity growth estimated for all regions and sectors but without any trade policy shock, i.e. in the absence of reciprocal elimination of tariff. Results show that Sub-Saharan Africa, and the whole of Latin America are at a disadvantage compared with the other regions as they cannot keep up with the pace at which labor productivity for their trading partners increases. For Sub-Saharan Africa, in particular, welfare losses amount to USD 12.6 billion which come from negative allocative and endowment effects and mainly from the loss in technical efficiency effect. Terms of trade, however, improve under this first scenario.

Table 4: Welfare effects of the inclusion of labor productivity trends and projection before reciprocal tariff elimination (billion USD)

	Total Welfare Effects	Allocative Efficiency effect	Endowment effect	Technical efficiency effect	Terms of trade effect	Investment and Saving effect
Regions						
Ind. Countries (except EU)	83.61	9.63	0.00	69.24	3.79	0.95
European Union	59.77	12.96	0.00	50.34	-2.91	-0.62
Brazil	-7.69	-1.87	-3.45	-2.08	-0.26	-0.02
China	126.12	8.40	48.97	78.36	-11.21	1.60
Latin America (without Brazil)	-0.79	0.26	-2.24	-0.43	1.95	-0.33
India	15.22	1.50	5.85	9.40	-1.04	-0.50
Asia Tiger	18.47	2.59	0.00	18.03	-1.61	-0.54
Asia Developing	3.44	0.29	0.56	2.27	0.51	-0.19
Sub Saharan Africa	-12.55	-2.43	-5.43	-7.56	3.00	-0.12
Rest of the of the World	39.36	5.06	6.06	20.69	7.78	-0.22
Total	324.97	36.39	50.32	238.27	0.00	0.00

For Sub-Saharan Africa, the loss in technical efficiency is attributed to primary factors, especially labor whose productivity growth rates are low, especially in the manufacturing sector. Similarly, the negative of endowment effects (-USD 5.43 billion) are due to the low growth rate of productivity for unskilled labor. Terms of trade improve because export prices rise, except in the agriculture and transport sectors. The welfare effects described in Table 4 and based on scenario 1 will be discussed in detail as they often serve as a useful basis of comparison when assessing the welfare effects of reciprocal tariff elimination.

4.2 Effects of tariff elimination between Sub-Saharan Africa and all industrialized countries

Total welfare effects

The results of welfare changes based on scenario 2 with elimination of tariffs between Sub-Saharan Africa and all industrialized countries (including the EU) relative to the status quo are summarized in all the left sub-columns of Table 5. The table shows that despite reciprocal tariff elimination, the EU, the "Rest of the Industrialized nations', and 'Asia Developing' are still the net beneficiaries while Sub-Saharan Africa, Latin America continue to lose even more. For Sub-Saharan Africa in particular, this is disappointing especially as its terms of trade deteriorate. We also note that loss in technical efficiency persists for Sub Saharan Africa with or without trade liberalization. In other words, reciprocal tariff

elimination cannot do much to remove the welfare losses caused by lagging labor productivity growth in Sub-Saharan Africa.

Table 5: Welfare changes with and without tariff elimination

	Total Welfare effect		Allocative Efficiency effect		Endowment effect		Technical efficiency effect		Terms of trade effect		Investment and Saving effect	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
Regions												
Industrialized Count (except EU)	85.34	83.61	9.83	9.63	0.00	0.00	69.24	69.24	5.30	3.79	0.97	0.95
European Union	63.22	59.77	13.62	12.96	0.00	0.00	50.34	50.34	-0.01	-2.91	-0.73	-0.62
Brazil	-8.20	-7.69	-2.01	-1.87	-3.61	-3.45	-2.08	-2.08	-0.50	-0.26	0.00	-0.02
China	125.26	126.12	8.29	8.40	48.74	48.97	78.36	78.36	-11.71	-11.21	1.58	1.60
Latin America (without Brazil)	-1.06	-0.79	0.25	0.26	-2.28	-2.24	-0.43	-0.43	1.75	1.95	-0.35	-0.33
India	14.47	15.22	1.24	1.50	5.69	5.85	9.40	9.40	-1.26	-1.04	-0.59	-0.50
Asia Tiger	18.21	18.47	2.54	2.59	0.00	0.00	18.03	18.03	-1.81	-1.61	-0.55	-0.54
Asia Developing	3.19	3.44	0.26	0.29	0.51	0.56	2.27	2.27	0.33	0.51	-0.19	-0.19
Sub Saharan Africa	-10.54	-12.55	-0.83	-2.43	-3.13	-5.43	-7.56	-7.56	0.84	3.00	-0.14	-0.12
Rest of the of the World	38.28	39.36	4.92	5.06	5.87	6.06	20.69	20.69	7.08	7.78	-0.27	-0.22
Total	328.16	324.97	38.11	36.39	51.78	50.32	238.27	238.27	0.00	0.00	0.00	0.00

To assess how trade policies (reciprocal elimination of tariffs) alone affect Sub-Saharan Africa trade and welfare, a close comparison of scenario 1 with scenario 2 is required. Such comparison allows the examination of the effect of trade liberalization while taking into account the current and forecast estimates of labor productivity growth for all of the regions. Table 6 shows the difference between welfare changes with the combination of the inclusion of labor productivity growth and tariff eliminations (Scenario 2) and the welfare changes under the inclusion of labor productivity growth only (scenario 1). Table 6 shows that reciprocal tariff elimination only cuts the losses by US 2 billion but does not erase the US 12.6 billion loss of the trailing productivities for Sub-Saharan Africa. This gain from the tariff elimination comes from increases in allocative efficiency and in endowment effects. Table 6 also shows that with reciprocal elimination of tariffs, Sub-Saharan Africa's terms of trade decline sharply, costing total welfare about USD 2.16 billion.

Table 6: Welfare changes due to Reciprocal Tariff Eliminations between Sub-Saharan Africa and all Industrialized Countries (billion USD)

	Total Welfare Effects	Allocative Efficiency	Endowment efficiency	Technical efficiency	Terms of trade	Investment and Saving
Regions						
Ind. Countries (except EU)	1.73	0.20	0.00	0.00	1.51	
European Union	3.45	0.66	0.00	0.00	2.90	
Brazil	-0.52	-0.14	-0.16	0.00	-0.24	
China	-0.87	-0.11	-0.23	0.00	-0.51	
Latin America (without Brazil)	-0.28	-0.01	-0.04	0.00	-0.20	
India	-0.75	-0.27	-0.16	0.00	-0.22	
Asia Tiger	-0.26	-0.06	0.00	0.00	-0.20	
Asia Developing	-0.25	-0.03	-0.05	0.00	-0.18	
Sub Saharan Africa	2.01	1.60	2.31	0.00	-2.16	
Rest of the of the World	-1.08	-0.14	-0.19	0.00	-0.70	
Total	3.19	1.72	1.46	0.00	0.00	

The increase in Sub-Saharan Africa endowment effects comes from the gain due to the increased employment of unskilled labor. The increase in allocative efficiency comes from the gain of the resources moving more freely to less distorted sector such as transport, storage and communication and to the agriculture and manufacture where tariffs are eliminated. Moreover, the decline in terms of trade results in losses of competitiveness especially in manufacturing sector. The next sections will elaborate more on the welfare decomposition.

4.3 Allocative efficiency and endowment effects

Allocative efficiency

Based on our simulation results, the total gain in allocative efficiency from trade liberalization for Sub-Saharan Africa is USD 1.6 billion. Table 7 shows that the largest allocative efficiency gain from the reciprocal tariff elimination comes from unskilled labor contributing USD 588 million to the welfare changes. Such significant contribution is due to the increase in demand for labor in agriculture and also to the move of unskilled labor to sectors such as Transport and Services.

Table 7:. Increase in allocative efficiency due to reciprocal tariff eliminations (million USD)

	With reciprocal tariff eliminations	Without reciprocal tariff eliminations	Change
	(Scenario 2)	(Scenario 1)	
1 Land	0	0	0
2 Unskilled labor	-742.68	-1330.23	587.55
3 Skilled Labor	8.94	8.44	0.5
4 Capital	3.89	2.72	1.17
5 Natural Resources	0	0	0
6 Agriculture	353.3	-82.54	435.84
7 Extraction	23.05	13.21	9.84
8 Construction	-8.62	-77.82	69.2
9 Manufacturing	-171.55	-657.81	486.26
10 Transport, storage and communication	-22.6	-49.27	26.67
11 Wholesale and retail Trade	-64.08	-62.38	-1.7
12 Finance and Insurance	-67.6	-93.01	25.41
13 Other Services	-142.25	-103.41	-38.84
Total	-830.2	-2432.11	1601.91

Because the bulk of the tariff elimination between Sub Saharan Africa and the industrialized countries is in the agriculture and the manufacturing sectors it is no surprise that these two sectors produce most of the welfare gain in allocative efficiency, contributing USD 435 million and USD 486 million, respectively to welfare change. It is also no surprise because according to GTAP database half of unskilled workforce in Sub-Saharan Africa is employed in these two sectors (38% of unskilled labor is in Agriculture and 12% in manufacturing). These allocative efficiency gains in agriculture and manufacturing are prompted by the combinations of, on the one hand, the increase in exports (for agriculture: 25 % to EU, and 38% to other Industrialized countries; and for manufacturing: 1.34 % and 1.57% as Table 10 will show later) due to the elimination of the tariff for manufacture and agricultural goods entering the EU, and, on the other hand, the decrease in the prices of inputs imported from the industrialized countries' agricultural and manufacturing sector.

Endowment effects for Sub Saharan Africa

Endowment effects for Sub-Saharan Africa are mainly the welfare gain from previously unused primary factors, especially unskilled labor and capital that are now hired in various sectors. This entry to production can be traced through the increase in demand in each sector. Table 8 shows that with tariff elimination, employment of unskilled labor increases by 2.24 % (which is 1.07% higher than without

tariff elimination) in Extraction sector, and similarly by 0.45% (which is 3.7% higher than without tariff elimination) in the Construction sector. Such non-negligible employment increases in Extraction and Construction are not surprising as these two sectors use unskilled labor intensively; the increase in welfare and household income prompt an increase in demand especially of Construction and boost hiring of unskilled labor. This is confirmed by the relative increase in output (table 9) when tariffs are removed.

Table 8: Change in the demand for factors in Sub Saharan Africa (%)

	Land		Unskilled labor		Skilled labor		Capital		Nat. resources	
	With tariff eliminations	Without	with	without	with	without	with	without	with	without
Agriculture	0	0	-1.61	-2.33	-1.3	-1.54	-0.93	-0.99	-0.01	-0.01
Extraction	2.08	1.38	2.24	1.17	2.35	1.43	2.19	1.33	0	0
Construction	1.38	0.54	0.45	-3.2	1.18	-1.39	1.18	-0.97	-0.01	-0.01
Manufacturing	-0.58	0.08	-4.56	-4.55	-3.91	-2.92	-3.23	-1.88	-0.01	-0.01
Transport, storage and communication	0.33	-0.14	0.07	-3.06	0.91	-0.96	-1.6	-3	-0.01	-0.01
Wholesale and retail trade	1.4	1.77	-1.71	-2.7	-0.83	-0.52	1.2	2.01	-0.01	0
Finance and Insurances	0.38	0.31	-0.91	-2.56	-0.24	-0.91	-1.06	-1.36	-0.01	-0.01
Other Services	1.12	1.45	-0.12	-0.85	0.53	0.78	0.61	1.22	-0.01	-0.01
Capital goods formation	0.4	-0.83	-0.48	-4.1	0.04	-2.81	-0.73	-3.28	-0.01	-0.01

Reciprocal elimination of tariffs also slightly boosts employment of unskilled and skilled labor in Agriculture but in manufacturing it has no impact on employment of unskilled labor. In the manufacturing sector, demand for skilled labor drops further by 1% as a result of the combination of the decline in the demand of domestically produced manufactured goods (manufacturing output already shrinks by 6%under the current trend projection in labor productivity growth, but shrinks even more (by7%), under tariff elimination) and the decline in demand for skill-intensive export. More important, the demand in capital in manufacturing sector has dropped further from -1.9% to -3.2%. Overall, reciprocal tariff elimination leaves Sub-Saharan Africa's manufacturing sector less skilled and less capital intensive. These skilled workers have moved to Construction and especially Extraction where returns are relatively high because prices have not fallen (see Table in Annex C).

Table 9: Effects on Output (% change)

	Sub Saharan Africa		EU-25		Other Industrialized Countries	
	With tariff elimination	Without	With	Without	With	Without
Agriculture	0.07	-0.38	0.85	0.85	0.66	0.69
Extraction	1.49	0.88	0.55	0.65	0.37	0.43
Construction	-0.41	-3.2	0.33	0.33	0.5	0.5
Manufacturing	-6.79	-6	0.51	0.45	0.21	0.19
Transport, storage and communication	0.26	-1.86	0.43	0.54	0.59	0.58
Wholesale and retail trade	-3.16	-3.24	0.69	0.69	0.66	0.66
Finance and Insurances	-1.13	-1.86	0.46	0.47	0.56	0.56
Other Services	-2.07	-1.96	0.01	0.02	0.11	0.11
Capital goods formation	-0.45	-3.4	0.36	0.35	0.6	0.6

4.4.   Trade and Terms of trade effects

Trade effects

Under reciprocal tariff eliminations, Sub-Saharan Africa's exports to the EU and other Industrialized countries grow less than its imports from these group of countries, especially in the manufacturing sector. In other words, Sub-Saharan Africa trade deficits with regards to these two regions widen. The combination of the decreases in tariff (from 4.3 -6.64% to nothing for ag.) facing Sub-Saharan Africa exports and decreases in tariff for imports to Sub-Saharan Africa from rich countries (10.7-15.7% in ag and 7.7-8.8% to nothing for manufacturing) leads to an increase in Sub-Saharan Africa's agriculture export from 1.4 to 15 % and to a decrease in its manufacturing import from 9.3 to 4.6%. In agriculture, the export rise is mainly due to the increase in Sub-Saharan Africa's export to the EU and the rest of the industrialized countries.

Table 10 shows that Sub-Saharan Africa's agricultural export to the EU increases only by 1.5% and to industrialized countries by 2%. However, Sub-Saharan Africa's agricultural import from the EU rises sharply by 48% and that from industrialized countries by 30%. Manufacturing follows a similar pattern as manufacturing imports from the EU and from other industrialized countries rise by 28% and 34% respectively.

Table 10- Sub-Saharan Africa's Exports and Imports (%)

	With reciprocal tariff elimination				Without reciprocal tariff elimination			
	Import from		Export to		Import from		Export to	
	EU	Rest of industrialized countries	EU	Rest of industrialized countries	EU	Rest of Industrialized countries	EU	Rest of Industrialized countries
Agriculture	48.1	29.78	25.15	38.73	-1.47	-2.12	1.56	1.99
Extraction	-6.76	-6.91	1.39	1.11	-5.48	-5.72	0.55	0.35
Construction	-3.74	-4.51	5.83	6.12	-3.2	-4.09	-0.63	-0.23
Manufacturing	27.79	34.42	1.57	1.34	0.55	-0.1	-9.45	-9.58
Transport, storage and communication	-7.19	10.76	9.43	9.27	-2.11	-1.68	-0.22	-0.36
Wholesale and retail trade	-1.79	-1.82	-0.29	-0.15	1.1	0.96	-5.84	-5.59
Finance and Insurances	-3.91	-2.93	6.08	5.65	-2.23	-1.38	0.98	0.64
Other Services	-4.28	-4.35	3.19	3.14	-1	-1.22	-2.43	-2.37

The increasing trade deficit becomes apparent when comparing figures in Table 11 with those in Table 12. Following reciprocal tariff eliminations, agriculture trade deficit with regards to the EU and the rest of the industrialized countries widens by USD 330 million and USD 100 million, respectively. Similarly, in manufacturing sector, the trade deficit vis a vis EU and the rest of industrialized countries increases by USD 820 and USD 396 million respectively. Under the assumption of fixed trade balance, these trade creations are at the expense of other trading partners: trade among Sub Saharan Africa countries suffers and countries like Brazil, China, and the Asian Tiger countries lose some of their exports to Sub Saharan Africa.

Table 11: Sub-Saharan Africa's Trade Balance with reciprocal tariff elimination (million USD)

Sector	Rest of Indust	EU_25	China	India	Asian Tiger	Asian Dev	Brazil	Latin America	Sub Saharan Africa	Rest of the World	Total
Agriculture	-382.43	-990.03	-177.95	-65.09	-143.26	-117.37	-84.14	-210.03	-588.58	-188.11	-2946.97
Extraction	-63.71	-33.67	-11.55	-4.07	-8.25	-6.73	-0.85	-2.58	-686.19	-469.99	-1287.61
Construction	0	0	0	0	0	0	0	0	0	0	0
Manufacturing	-1537.65	-3816.24	-195.2	-1324.81	-44.65	-390.1	-391.99	-227.4	-1323.11	-628.63	-9879.78
Transport, storage and communication	-49.17	-38.39	-2.39	-45.08	-0.18	-45.2	-129.46	-4.39	-17.64	-9.34	-341.23
Wholesale and retail trade	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurances	0	0	0	0	0	0	0	0	0	0	0
Other Services	0	0	0	0	0	0	0	0	0	0	0
Total	-2032.95	-4878.34	-387.08	-1439.05	-196.35	-559.39	-606.44	-444.4	-2615.52	-1296.07	-14455.6

Table 12- Sub-Saharan Africa's Trade Balance without tariff elimination (million USD)

Sector	Rest of Indust	EU_25	China	India	Asian Tiger	Asian Dev	Brazil	Latin America	Sub-Saharan Africa	Rest of the World	Total
Agriculture	-287.89	-657.18	-212.81	-78.42	-173.96	-140.95	-101.98	-253.63	-656.15	-228.51	-2791.48
Extraction	-64.53	-34.13	-11.66	-4.12	-8.35	-6.79	-0.86	-2.61	-688.85	-475.25	-1297.16
Construction	0	0	0	0	0	0	0	0	0	0	0
Manufacturing	-1140.55	-2997.93	-247.6	1662.99	-57.22	489.13	-498.33	-289.74	-1511.27	-803.53	-9698.27
Transport, storage and communication	-43.61	-40.51	-2.49	-47.11	-0.19	-46.9	-135.77	-4.6	-16.83	-9.78	-347.8
Wholesale and retail trade	0	0	0	0	0	0	0	0	0	0	0
Finance and Insurances	0	0	0	0	0	0	0	0	0	0	0
Other services	0	0	0	0	0	0	0	0	0	0	0
Total	-1536.58	-3729.74	-474.57	1792.66	-239.72	683.78	-736.94	-550.57	-2873.1	-1517.05	-14134.7

Terms of trade effects

Under reciprocal elimination of tariff and current trend in labor productivity, the EU and industrialized countries' terms of trade will improve while Sub Saharan Africa's terms of trade further deteriorate. The welfare loss due to the declining terms of trade, when tariffs are eliminated among Sub-Saharan Africa, EU and the other Industrialized countries, is USD 2.16 billion. The main reason is that Sub-Saharan Africa cif import prices do not change much (just decline slightly) but SSA export prices especially of agricultural goods fall noticeably (Table 13). With the exception of Extraction goods whose export price does not change much (not affected by trade agreement or tariff elimination), the f-o-b export prices go down by about 1.5% point on average in each sector. Agriculture is where the decrease in percentage is largest (–3.19% under liberalized trade). The decline in fob prices in general and in agriculture in particular is the combination of the declining domestic prices due to the increased imports and also to increased exports. It is noted that Brazil, China and India's agricultural exports in fob prices declines because the share of Sub Saharan Africa to the industrialized increases, thereby leaving some export competitors with higher excess supply which tends to reduce world prices.

Although the changes in export prices are moderate, Sub-Saharan Africa's welfare loss due the deteriorating terms of trade is relatively high and cancelling out more than half of the USD 3.9 billion of the welfare gain from the allocative efficiency and endowment effects. The reason is that Sub-Saharan Africa's trade volumes increase significantly under reciprocal tariff elimination especially in agriculture, so that an even slight decline in export prices may cause a significant revenue loss.

Table 13: Effects on Sub-Saharan Africa Import and Export Prices

	Average Cif price change (%) of Sub Saharan Africa Import		Average Fob price change %) of Sub Saharan Africa export	
	With reciprocal tariff elimination	Without reciprocal tariff elimination	With reciprocal tariff elimination	Without reciprocal tariff elimination
Agriculture	-1.60	-1.39	-3.19	-1.58
Extraction	0.50	0.57	0.43	0.57
Construction	-0.80	-0.59	-1.55	0.1
Manufacturing	-0.88	-0.69	-0.93	0.66
Transport, storage and communication	-1.25	-1.05	-2.51	-0.85
Wholesale and retail trade	-0.76	-0.57	-0.49	0.92
Finance and Insurance	-0.58	-0.40	-1.92	-0.63
Other Services	-0.84	-0.66	-0.67	0.68

Elimination of tariff between Sub-Saharan Africa and all industrialized countries leads to declining manufacturing fob prices. The main reason (as shown earlier in Table 8) is that manufacturing sector becomes less skilled and less capital intensive, and also because of the sharp increase in imports from the industrialized countries. It is important also to note that although Sub-Saharan Africa's export fob prices (especially in agriculture and manufacturing) decline, its export volumes increase. The reason is that lower fob prices imply also lower cif prices (because of the model's Armington assumption) for the import destinations (mainly the EU and Industrialized countries), which induce these importers to import more of agricultural and manufacturing goods from Sub-Saharan Africa.

4.5 Effects of tariff elimination between Sub-Saharan Africa and EU-25

Impact on Sub-Saharan Africa as a region

What would happen if labor productivity growth rates continue to follow current trend and projection as in van Dijk (2013) but that the reciprocal tariff elimination is limited to trade between Sub-Saharan Africa and EU only, i.e. excluding tariff elimination between Sub-Saharan Africa trade with the rest of the Industrialized countries. This is actually the concern under the EPA and what scenario 3 would show. Table 14 summarizes the effects of the reciprocal tariff, and the figures in table are the differences between the welfare effects under scenario 3 and those under scenario 1.

Table 14: Welfare changes due only to reciprocal elimination of tariff between Sub-Saharan Africa and the EU (billion USD)

	Total welfare Effects	Allocative efficiency effect	Endowment effect	Technical efficiency effect	Terms of trade Effect	Investment and saving effect
Regions						
Industrialized countries (except EU)	-0.66	-0.04	0.00	0.00	-0.41	
European Union	4.24	0.76	0.00	0.00	3.48	
Brazil	-0.35	-0.09	-0.11	0.00	-0.17	
China	-0.45	-0.05	-0.12	0.00	-0.32	
Latin America (without Brazil)	-0.17	-0.01	-0.02	0.00	-0.14	
India	-0.45	-0.17	-0.08	0.00	-0.13	
Asia Tiger	-0.07	-0.04	0.00	0.00	-0.06	
Asia Developing	-0.16	-0.02	-0.03	0.00	-0.12	
Sub Saharan Africa	1.27	1.09	1.54	0.00	-1.54	
Rest of the of the World	-0.77	-0.06	-0.10	0.00	-0.59	
Total	2.43	1.36	1.08	0.00	0.00	

As expected, the main beneficiaries in terms of total welfare change will be the EU and Sub-Saharan Africa, but Sub Saharan Africa's welfare increase of USD 1.27 billion is much smaller than the USD 2 billion welfare effects under reciprocal tariff eliminations with both EU and the rest of the industrialized countries. Again, the allocative efficiency and endowment gains, totaling US 2.6 billion, are cut by the USD 1.5 billion losses due to declining terms of trade.

Disaggregated impacts by regional groups in Sub-Saharan Africa

Because of the importance of the need to understand the welfare effects of EPA vis-à-vis sub-regions in Sub-Saharan Africa, we divide Sub-Saharan African region in the model into 4 regional groups as indicated in Table 15. These regional groups loosely approximate the Regional Trading Areas with which the EU has negotiated the EPA.

Table 15: The models' regional groups of Sub Saharan African countries

Regional group	Countries
Economic Community of West African States (ECOWAS)	Benin; Burkina Faso; Côte d'Ivoire; Ghana; Guinea; Nigeria; Senegal; Togo; Rest of Western Africa
Central Africa (CA)	Cameroun; Central African Republic; South Central Africa
Eastern Africa (EA)	Ethiopia; Kenya; Rwanda; Tanzania; Uganda; Rest of Eastern Africa
Southern Africa Development Community (SADC)	Botswana; Madagascar; Malawi; Mauritius; Mozambique; Namibia; South Africa; Zambia; Zimbabwe; Rest of South African Customs

Impacts of introducing labor productivity growth only (prior to tariff elimination)

Earlier we found that trading under its current labor productivity growth, which is among the lowest among all regions, costs Sub-Saharan Africa as a whole more than USD 12.6 billion per year. How these losses are distributed among regional SSA groups is now shown in the simulation results in Table 16.

Table 16. Welfare effects of the diverging labor productivity (million USD)

	Total welfare Effects	Allocative efficiency effect	Endowment effect	Technical efficiency effect	Terms of trade effect
Regions					
Industrialized countries (except EU)	83628.97	9617.55	0	69238.2	3805.09
European Union	59750.34	12918.22	0	50338.54	-2910.2
Brazil	-7676.42	-1873.72	-3451.97	-2077.78	-248.65
China	126017.2	8382.92	48907.2	78362.16	-11258.5
Latin America (without Brazil)	-758.88	260.96	-2255.57	-429.1	1986.32
India	15203.56	1503.06	5835.59	9402.53	-1043.94
Asia Tiger	18453.61	2588.05	0	18031.39	-1636.47
Asia Developing	3440.71	287.24	551.74	2269.42	514.04
ECOWAS	-396.36	-149.04	-658.45	-664.77	1073.62
CA	-581.3	-92.21	-299.76	-876.82	961.82
EA	-1958.94	-399.5	-866.85	-969.88	228.67
SADC	-8841.93	-1533.15	-2840	-5051.11	590.08
Rest of the of the World	39493.24	5037.39	6039.09	20692.32	7938.08

Table 16 shows that the distribution of Sub-Saharan Africa's welfare losses among the four regional groups ECOWAS, CA, EA, and SADC is strikingly uneven. While all the four regional groups in Sub-Saharan Africa lose because of the lagging productivity, SADC alone incurs a loss of USD 8.8 billion, which is about 75%, of the total losses. Moreover, 5 out of the USD 8.8 billion welfare loss in SADC comes from technical inefficiency. Technical inefficiency effects are also the largest source of welfare loss in ECOWAS, CA, and EA but the losses are not as bigger as in SADC. The main reason is that in our model, SADC is the largest economy with largest agriculture and manufacturing sectors; and the lack of growth of labor productivity especially in manufacturing sector (where the current estimate of labor productivity growth rate is about -6%) hit its production and welfare more severely.

Effect of reciprocal tariff between EU and SSA regional groups

How these losses due to lagging productivity are affected by the elimination of reciprocal tariff as in agreement under EPA? Taking into account the diverging trends of labor productivity growth among trading partners, simulation results summarized in Table 17 show that reciprocal elimination of tariffs with the EU-25 improves total welfare of countries in Central Africa, Eastern Africa and SADC by about USD 768, 345 and 182 million respectively. For Central Africa and Eastern Africa regions, the largest gain comes from the increase in allocative efficiency (labor and capital moving to sectors with less distortions such as agriculture and manufacturing), while for SADC, about 80% of the positive welfare changes comes from endowment effect, i.e. job creation for unskilled labor. These gains however are hampered by the negative terms of trade effects.

Table 17. Welfare changes due only to elimination of tariff between SSA sub groups and EU-25 (million USD)

	Total welfare Effects	Allocative efficiency effect	Endowment effect	Technical efficiency effect	Terms of trade effect
Regions					
Industrialized countries (except EU)	-724.74	-38.58	0	0.00	-432.63
European Union	4320.73	975.44	0	0.00	3393.64
Brazil	-416.54	-111.08	-128.09	0.00	-198.11
China	-484.52	-53.62	-111.33	0.00	-328.22
Latin America (without Brazil)	-174.82	-16.79	-7.74	0.00	-144.72
India	-426.13	-162.81	-69.97	0.00	-125.41
Asia Tiger	-68.51	-29.12	0	0.00	-47.87
Asia Developing	-155.92	-12.68	-21.65	0.00	-125.79
ECOWAS	-130.15	148.39	238.55		-495.11
CA	768.03	327.01	160.81		-255.14
EA	346.96	444.83	249.31		-217.37
SADC	182.42	73.2	484.23	0.00	-359.15
Rest of the of the World	-850.18	-51.54	-100.11	0.00	-664.12

While all the four Sub-Saharan Africa regional groups suffer from terms of trade deterioration, ECOWAS countries suffer the most. ECOWAS's negative terms of trade effect (about USD 0.5 billion) on welfare is so severe that it outstripped the combined gains from allocative efficiency and endowment effects. Consequently, under reciprocal tariff elimination with the EU, the ECOWAS countries are the only Sub Saharan African countries incurring a net welfare loss (USD 130 million) mainly because of the large negative terms of trade effect.

The loss due to terms of trade effects in the four Sub-Saharan Africa regional groups come as no surprise. Initial ad valorem tariff levels of agriculture and manufacturing products imported from the EU by these regional groups are far higher that the tariffs applied by these RTA's on goods from the EU (see Appendix). Thus, the import price effect weighs more on the change in the terms of trade (McDougall 1993). Reciprocal elimination of tariff reduces import prices and, more important, increases import volume of manufacturing and agricultural goods as well as the share of agriculture and manufacturing imports with respect to total imports. As a result, the weighted import share of manufacturing price increases faster than the decrease in import price, triggering the deterioration of terms of trade, especially when export price and export volume do not increase much. The decline in terms of trade translates into reduction of export revenue and increase in import spending, and thus into reduction of total welfare.

But, ECOWAS's welfare loss from the terms of trade deterioration is particularly heavier than that of any of the 3 other groups because of ECOWAS's higher exposure to the EU market. About 30% of its agricultural imports and 40% of manufacturing imports come from the EU; and with the reciprocal tariff elimination between ECOWAS and EU, the import prices of EU agriculture and EU manufacturing products into ECOWAS decline by 5 and 4.4% and the import volumes climb by 42 and 39% respectively.

Overall, we note that there is no improvement in technical efficiency as we have assumed so far that elimination of tariffs does not have spillover effects on Sub-Saharan Africa. More important, we note that in none of the three Sub-Saharan Africa regional groups where welfare improves does the elimination of reciprocal preferential trade with the EU remove the loss from lagging productivity growth.

Impacts of elimination of internal tariffs

Despite the difficulties in harmonizing complex and overlapping regional policies in Sub Saharan Africa, the talks and efforts to develop Free Trade Areas at regional and even continental levels continue. For this reason, we analyze how reciprocal tariff elimination in combination with elimination of internal tariffs within each regional group may affect welfare and contribute to recovering the losses due to the lack of labor productivity growth.

Data (see appendix A and B) show the level of internal tariffs within the four regional groups in Sub-Saharan Africa. The gains from removing these internal tariffs and removing the reciprocal tariff between each of these regional groups and the EU are summarized in table 18. The results show that under elimination both type of tariff, the total welfare improvement for all four regional groups is about

USD 3.21 billion. In other words, by eliminating internal tariff, the four groups improve welfare by an additional USD 2 billion (on top of the USD 1.2 billion welfare gain under reciprocal tariff elimination).[2]

Table 18.Welfare effects following elimination of tariffs within SSA's regional groups and tariffs between the regional groups and the EU (million USD)

	Total welfare Effects	Allocative efficiency effect	Endowment effect	Technical efficiency effect	Terms of trade effect	Investment and saving effect
Regions						
Industrialized countries (except EU)	-822.42	-39.84	0	0.00	-504.35	-278.23
European Union	4087.87	940.06	0	0.00	3201.63	-53.8
Brazil	-453.17	-122.02	-146.29	0.00	-207.63	22.78
China	-611.57	-70.17	-166.7	0.00	-396.76	22.05
Latin America (without Brazil)	-159.12	-12.5	-20.64	0.00	-121.85	-4.13
India	-528.95	-188.69	-103	0.00	-164.33	-72.95
Asia Tiger	-109.09	-37.03	0	0.00	-88.21	16.15
Asia Developing	-177.91	-15.01	-34.77	0.00	-134.25	6.13
ECOWAS	810.39	455.98	774.49		-398.13	-21.95
CA	798.93	336.97	173.52		-244.49	532.93
EA	652.47	534.42	418.34		-181.58	-118.7
SADC	947.3	278.58	881.76	0.00	-197.29	-15.75
Rest of the of the World	-798.23	-69.81	-131.13	*0.00*	-562.75	-34.54

Moreover, Table 19 shows that more than 50% of the gain comes from endowment effect, which in our model indicates an increase in employment for unskilled labor. Similarly, we note that elimination of internal tariff yields positive terms of trade effect on welfare because of trade creation within each sub regional group. However, the total gains from the eliminations of these two types of tariffs are still far short of covering the USD 12.6 billion welfare losses from trade.

Table 19: Additional gains from adopting zero internal tariffs within Sub-Saharan Africa' regional groups (million USD)

	Total welfare Effect	Allocative efficiency effect	Endowment effect	Terms of trade effect	Investment and saving effect
ECOWAS	940.54	307.59	535.94	96.98	0.03
CA	30.9	9.96	12.71	10.65	-2.44
EA	305.51	89.59	169.03	35.79	11.11
SADC	764.88	205.38	397.53	161.86	0.11
Total	2041.83	612.52	1115.21	305.28	8.81

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[2] Within this effect, Narayanan, Hertel & Horridge (2009) dissociates trade diversion (hurting trading partners

Sensitivity analyses

From the results of our analysis so far, we have shown that the gains from reciprocal tariff eliminations both within the Sub Saharan Africa regional groups and between these groups and the EU and other industrialized nations are not enough to reverse the USD 12.6 billion welfare loss due to trade under Sub-Saharan Africa's lagging labor productivity growth. To reverse the loss, countries in Sub-Saharan Africa need to devote major efforts to reach some rates of labor productivity growth in all sectors, especially in agriculture and manufacturing where they are currently the lowest. There is a need to determine what these growth rates of labor productivity should be.

Moreover, past studies often ignore the spillover effect of the trade policy changes on labor productivity. However, in light of the literature (e.g. Coe, Helpman 1995; Coe, Helpman & Hoffmaister, 1997) on endogenous growth theory and its modeling application (e.g. van Meijl and van Tongeren, 1999), increased trade affects technological progress through knowledge embodied in the input and output traded. Technology spillover can be for instance captured by various channels such as imitation and learning. Trading countries however require some absorptive capacity to capture these spillover effects and one of the important required capacities is human capital embodied in workers. Having high level of human capital increases the chance of capturing technological advances. Even under a neutral technological shift, an increase in the sector's productivity allows input to be more productive. And if the technological change spilled over by trade is an input-biased technological change, input (capital or labor) productivity will increase further.

For all these reasons, we perform a few sensitivity analyses taking into account spillover effects of trade on productivity to examine what productivity growth rates are required in order for SSA to benefit from trade liberalization. Our focus is mainly on the agriculture and manufacturing sectors where Sub-Saharan Africa is lagging behind in terms of productivity growth. To start with, we consider as the benchmark the situation where internal tariffs within the ECOWAS, CA, EA and SADC groups are eliminated and that the reciprocal tariffs between these countries and the EU and all industrialized countries (including the EU) are removed. Beside the benchmark, we examine four specific cases described as follows.

a) Doubling labor productivity growth rate in agriculture to 4.28% and halving the lack of labor productivity growth in manufacturing to -3%.
b) No change in labor productivity growth rate in agriculture and moderate growth (3%) in labor productivity in manufacturing.
c) No change in labor productivity growth rate in agriculture but big increase (6%) in manufacturing.
d) Doubling labor productivity in agriculture to 4.28%, a moderate 3% increase in manufacturing and 1% increase of output augmenting technological shift in both sectors. It can be assumed that these 1% increases are from the spillover effects of trade on technological change.

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outside the regional group) effects from domestic penetration.

The results of the analyses are summarized in Table 20 which shows that even with moderate improvement in productivity as in case (b), Sub-Saharan Africa can reverse the loss from trade liberalization. Doubling agriculture labor productivity growth rate in case (a) leads to a positive welfare change for Sub-Saharan Africa, but it is only when coupled with a noticeable increase in labor productivity in manufacturing as in case (d) that the increase in agriculture labor productivity yields a significant total welfare effect for all the four regional groups.

Table 20: Sensitivity analysis: Total welfare effects under various rates of productivity (million USD)

	(0) Current trend	(a) Agricultural emphasis	(b) Moderate manufacturing emphasis	(cl) Strong manufacturing emphasis	(d) Mixed with trade spillover
Productivity shocks Labor Agri. Labor Manuf. Output Agri. Output Manuf.	2.14% -6.3% None None	4.28% -3.15% None None	2.14 % 3% None None	2.14% 6% None None	4.28% 3% 1% 1%
ECOWAS	381.83	3097.62	1771.64	2219.96	5202.04
CA	372.78	839.1	885.31	1050.64	1987.53
EA	-1116.14	266.48	577.39	1123.68	3075.34
SADC	-7237.61	-5320.62	-2784.25	-1347.69	3172.26
Total (SSA)	-7,599	-1117.42	450.09	3046.59	13437.17

Note: These results are based on zero internal tariffs within regional group and zero reciprocal tariff between each group and all industrialized countries.

For all the regional groups in Sub-Saharan Africa, productivity shock parameters used in these sensitivities analyses are within the feasible ranges. These improvements can be achieved by increasing agricultural capacity, investments in learning and training of the workforce. Our results show that

benefitting from reciprocal preferential trade with the EU and the rest of industrialized countries can be within their reach, not a myth.

5 Conclusions

It is widely known that over the years, Sub-Saharan Africa's lagging labor productivity has hampered its competitiveness in the world market and created welfare losses. Knowing how trade liberalization affects the welfare losses from trading under such lagging labor productivity has remained puzzling. In this paper, we have asked whether elimination of reciprocal tariffs between Sub-Saharan Africa and the EU and other industrialized countries will exacerbate or on the contrary reduce the losses caused by these lagging productivities. We employed a general equilibrium model approach and introduced econometrically estimated parameters of labor productivity growth rates by regions and by sector from recent literature. These labor productivity estimates confirmed existing gaps in productivity growth rates between developed and developing countries and specifically pointed to the lack of labor productivity growth in key sectors such as agriculture and manufacturing for Sub-Saharan Africa.

Results showed that for Sub-Saharan Africa, elimination of reciprocal tariffs with either the EU or and with all Industrialized countries (including the EU) would reduce trade losses. But the magnitude of this reduction was small. Main findings that emerge were:

- Sub-Saharan Africa would lose about USD 12.6 billion per year if the region continues to trade under its current growth rate of labor productivity
- Elimination of reciprocal tariff with the EU would cut the loss but only by USD 1.2 billion; the loss would be further cut by USD 2 billion if Sub-Saharan Africa agreed to a reciprocal tariff with not just the EU, but all the industrialized countries.
- Sub-Saharan Africa' gains from tariff elimination would mainly come from endowment and allocative efficiency effects, but these gains are severely hampered by negative effects of terms of trade deterioration
- The terms of trade effects were the results of a sharp increase in import volume especially in agriculture and manufacturing while export prices would only decline slightly.

Additionally, disaggregating the impacts on Sub-Saharan Africa and splitting the region into four regional groups (West Africa, East Africa, Central Africa, and Southern Africa) has shown large negative terms of trade and negative technical efficiency effects. This was due to lack of productivity growth, and losses were largest in Southern Africa due to its large agriculture and manufacturing sectors relative to the three other regional groups. Moreover, we simulated a scenario where all the four regional groups would become Free Trade Areas and found that elimination of internal tariffs would bring an additional USD 2 billion welfare increase to Sub-Saharan Africa. Results showed that trade liberalization policies remained insufficient to cover the USD 12.6 billion losses under lagging labor productivity.

Lastly, sensitivity analyses were performed to find out what productivity growth rates would be required for Sub-Saharan Africa to benefit from trade as all their trading partners are way ahead in overall productivity performances. Combining this analysis with the assumption that R&D spillover from trade liberalization would raise output productivity in agriculture and manufacturing by 1%, simulation results

showed that a growth rate of 3% or higher of labor in the manufacturing sector would be required to achieve a positive welfare change from trade liberalization.

Data and methods and are not without caveats, and the authors are conscious that this would require improvement and shall guide future research. Two major caveats are worth mentioning. First, though we employed different labor productivity growth rates among sectors and in each region, we assumed that these rates were the same for every country within a region. This undermines the differences in productivity among countries within the same region. Only better and detailed country data would compensate for such bias. Second, we looked only at labor productivity but it is worth pursuing research using total factor productivity estimates when such data become available.

Nevertheless, the findings in this paper have important implications on Sub-Saharan Africa's perspective and approach in dealing with the impacts of the elimination of preference. It is not reciprocal preferential trade per se that blocks the increase in welfare for Sub-Saharan Africa but mainly its low labor productivity in key sectors such as agriculture and manufacturing. Efforts should target such a handicap through increased training and education to workforce as well as better extension services and R&D capacity. With higher increases in labor productivity in agriculture and especially manufacturing, the gains from allocative efficiency and endowment (mainly employment) effects will be secured while the losses in technical inefficiency and terms of trade are minimized to yield a significant total welfare gain.

Appendix

A- Initial taxes on agricultural products imported from row country to column country (%)

rTMS	1 Industrialis	2 EU25	9 ECOWAS	10 CA	11 EA	12 SADC
1 Industrialis	11.18	7.02	8.86	12.51	13.37	10.84
2 EU25	12.63	0	13.28	16.05	49.06	7.64
9 ECOWAS	0.58	0.51	6.18	17.97	17.83	3.13
10 CA	1.43	0.1	12.03	10.55	14.03	1.16
11 EA	7.63	1.28	10.76	20.43	6.8	3.65
12 SADC	11.23	10.55	15.17	19.25	41.09	2.58

B- Initial taxes on manufacturing products imported from row country to column country (%)

rTMS	1 Industrialis	2 EU25	9 ECOWAS	10 CA	11 EA	12 SADC
1 Industrialis	0.88	1.65	9.67	8.04	12	7.88
2 EU25	2.28	0	9.53	10.28	9.48	5.03
9 ECOWAS	0.18	0	8.78	12.24	16.08	0.08
10 CA	0.32	0	10.71	2.22	11.32	1.7
11 EA	0.69	0	8.53	20.23	3.92	2.69
12 SADC	1.32	0.1	8.5	11.98	7.67	3.63

C Market price effects in Sub Saharan Africa: (%)

	With reciprocal tariff eliminations	Without reciprocal tariff eliminations	Difference
	(Scenario 2)	(Scenario 1)	
Land	-3.72	-3.04	-0.68
Unskilled labor	-2.44	-0.59	-1.85
Skilled labor	-2.96	-1.88	-1.08
Capital	-2.19	-1.41	-0.78
Natural resources	7.78	4.59	3.19
Agriculture	-3.19	-1.58	-1.61
Extraction	0.43	0.57	-0.14
Construction	-1.55	0.1	-1.65
Manufacturing	-0.93	0.66	-1.59
Transport, storage and communication	-2.51	-0.85	-1.66
Wholesale and retail trade	-0.49	0.92	-1.41
Finance and Insurance	-1.92	-0.63	-1.29
Other Services	-0.67	0.68	-1.35
Capital goods formation	-2.09	-0.07	-2.02

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