

A partial equilibrium analysis of the impact of the ECOWAS-EU Economic Partnership Agreement

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Abstract

Using the partial equilibrium WITS-SMART model, we tried to assess the impact of liberalization under the EPAs, assuming full liberalization of imports from the EU into ECOWAS. We more specifically looked at trade creation and diversion results as well as the impact on tariff revenues. We also identified which products are likely to show the greatest impact, and how the results vary across countries.

Total EU exports to ECOWAS would surge by some 1.8 billion dollars, with France and the UK being the largest gainers.

Dismantling tariffs on all EU goods would be beneficial to consumers through net trade creation. However, more than 365 million dollars would be diverted in favour of less efficient EU producers. Regional producers are likely to be hit by trade diversion as 6.7% of the trade diverted originates from ECOWAS countries.

Tariff revenues will be reduced by the agreement. Some of the ECOWAS countries could face severe shortfalls in their overall budget revenues (excluding grants). For example, we showed that Guinea-Bissau and Ghana could lose approximately 19% of their budget revenues.

Several recommendations can be proposed in light of our findings. First, in order to temper the losses in budget revenues, countries should seek to diversify their tax base and should try to secure assistance in doing so. Secondly, the timing of liberalization is important and ECOWAS countries should seek to consolidate regional integration prior to liberalizing trade with the EU. Finally, if the consumers are to truly benefit of EPAs, the national capacity to limit rent capture by importers and exporters should be strengthened.

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¹ The author is a member of the Trade negotiation team of the Trade and Regional Integration Division of the United Nations Economic Commission for Africa (UNECA). The views expressed in this paper reflect those of the author and not those of the United Nations.

I) Introduction

The Cotonou Partnership Agreement (CPA) between the EU and the ACP countries expected to succeed the Lomé Agreement, envisages the signing of Economic Partnership Agreements (EPAs) by December 2007. The EPAs will be the new cooperative framework under the CPA and are expected to adopt an integrated approach based on partnership and promoting cooperation, trade and political dialogue between the EU and ACP countries. One of the essential characteristics of this multilateral partnership is that it hopes to combine trade (to respond to the challenge of globalisation), development assistance (essential to ACP countries) and a strengthened political dimension. The key CPA principles are reciprocity; differentiation; deeper regional integration; and coordination of trade and aid.

The EPAs will address trade barriers, supply-side constraints in ACP countries, and the question of compatibility to WTO rules. EPAs are aimed at putting in place free trade area (FTA) arrangements to replace the non-reciprocal trading preferences currently advanced to the ACP countries by EU in compliance to the Lomé Conventions.

The creation of such a FTA with the EU will obviously create important challenges as well as opportunities for ECOWAS countries. While EPAs will confer additional legal security to already existing preferential market access to the EU, they will also result in a major liberalisation effort for ECOWAS and other ACP countries. These countries will have to dismantle nearly all tariffs on goods imported from the EU, their main source of imports. This could have a significant impact on national producers, on the level of tariff revenues and on the level of intra-regional trade. There is therefore a need to examine in detail the potential impact of EPAs in development terms.

For lack of relevant data it is not possible to use Computable General Equilibrium tools such as GTAP for most West African countries². However, partial equilibrium analysis using models such as SMART can provide interesting information of the impact at a detailed product level.

The present article aims at making a contribution to the debate on the potential impact in development terms of the Economic Partnership Agreement between the West African countries and the EU, using a partial equilibrium analysis framework.

This paper is divided in four sections. The present introduction is followed by a brief overview of the trade relations of the ECOWAS countries. In a third section we detail the methodology used for partial equilibrium simulations and the data used. Finally a fourth section presents and analyses the results of the simulations and highlights possible useful information for West African policy makers.

² West African countries are aggregated with other Africa countries in GTAP in a “Rest of Sub-Saharan Africa” category. For an analysis of this aggregation see: “Economic and Welfare impact of the EU – Africa Economic Partnership Agreements”, ATPC work in progress No 10, March 2005, UNECA.

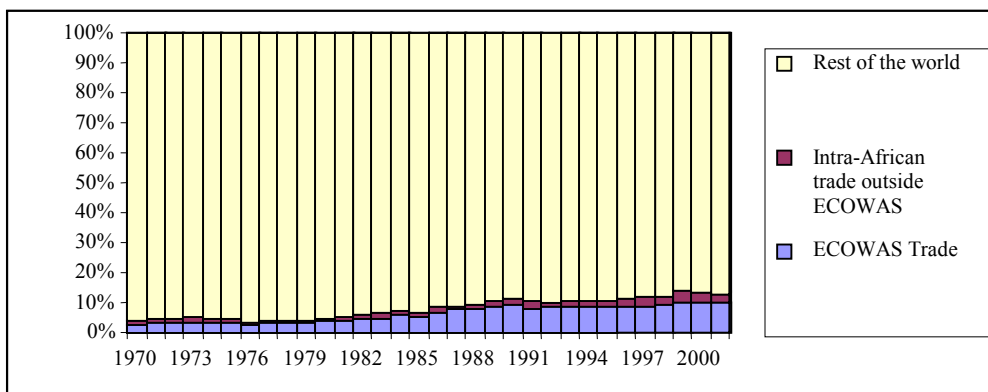
II) ECOWAS countries in international trade

This section briefly presents the status of ECOWAS countries in international trade. It looks at the share of ECOWAS in international trade, its partners and the products involved.

1) Volume and directions of ECOWAS trade

Trade among the ECOWAS countries as a proportion of their total trade increased from 3 per cent in the early 1970s to over 10 per cent in 2001. The steady growth of the share of intra-ECOWAS trade in the total trade has to be viewed against the relative stagnation observed over the same period in regard to trade between ECOWAS countries and the rest of Africa.

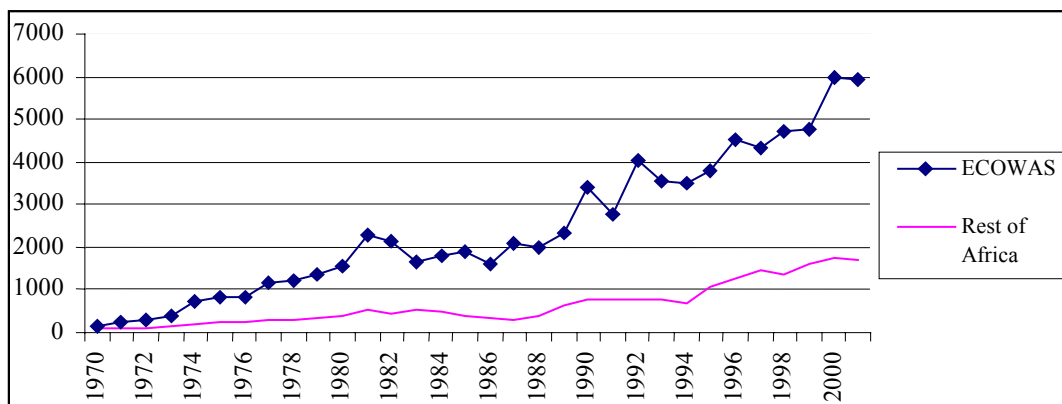
Figure 1: Share of ECOWAS trade, % (1970-2001)



Source: UNCTAD Statistical manual, authors' computations.

In terms of trade flows, trade between ECOWAS and the rest of Africa witnessed relatively robust growth during 1970-2001. (In value terms, it increased 18 times during that period). However, it is in intra-ECOWAS trade where the greatest increase was observed, with a 36-fold increase during 1970-2001 (see Fig.2).

Figure 2: ECOWAS trade in Africa in millions of dollars (1970-2001)



Source: UNCTAD Statistical manual, authors' computations.

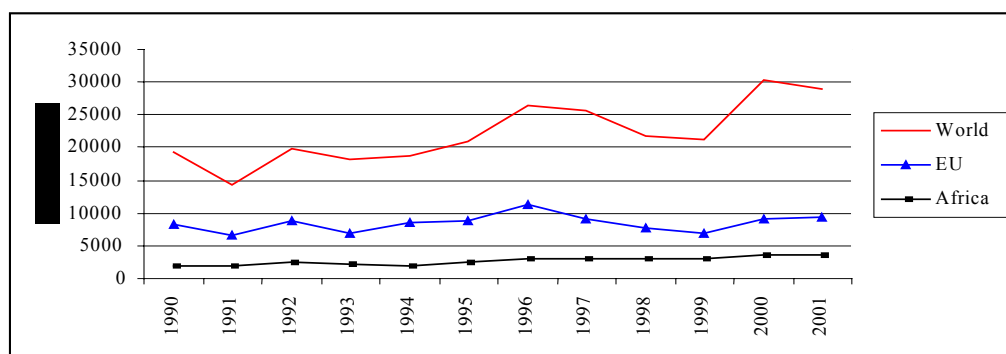
It might be supposed at first that the multilateral trade negotiations in which ECOWAS countries were involved would vitiate this trend, because of the increase in the volume of trade with other countries. However, that is not as evident as it seems. The dynamic effects of the process of “opening-up” can foster new opportunities for intraregional trade, particularly within the framework of strengthened integration.

2) Trade relations of ECOWAS by partners

The trade balance between West African countries and the EU declined sharply from around 1996. From a trade surplus of around \$US 1.7 billion in that year, it had stabilized at around \$US 2.5 billion by 2001. The overall trade balance has been very volatile. Although nearing equilibrium towards the end of the period under consideration, it witnessed significant fluctuations throughout. It is noteworthy that with regard to the rest of Africa, the region has been in equilibrium.

In terms of exports, the region did not register any significant export growth towards the EU during the 1990s. A slight decline in exports towards the EU around the mid-1990s was followed by a rallying back to the levels reached at the beginning of the decade, i.e. around \$US 3.2 billion.

Figure 3: ECOWAS exports



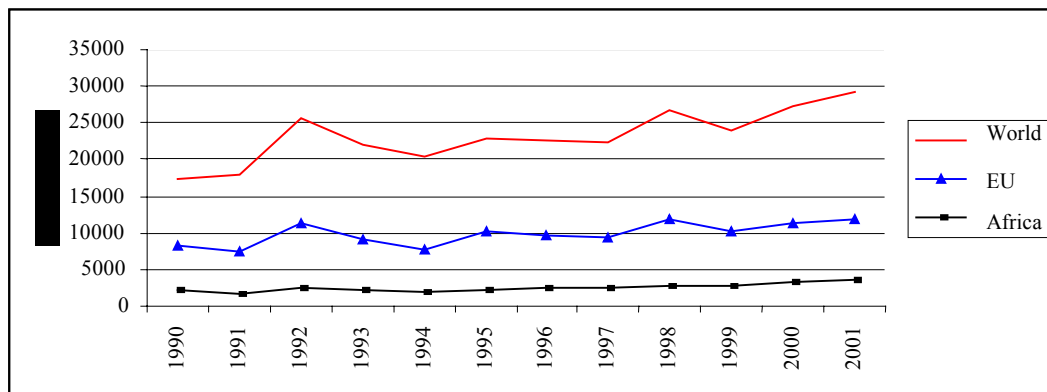
Source: UNCTAD Statistical manual, authors' computations.

Exports towards the rest of Africa remained stable at the relatively low level of around \$US 3 billion. Total exports from the region, however, increased noticeably, from over \$US 19 billion to nearly \$US 30 billion towards the end of the 1990s. Exports towards the EU remained relatively stable at around \$US 10 billion. However, while the export volumes had accounted for around half of total exports from the region during the early 1990s, the proportion had decreased to just one-third a decade later. This underscores the development of diversification of the destinations for ECOWAS exports.

ECOWAS imports from the EU increased fairly modestly (40 per cent over the whole period under consideration), from over \$US 8 billion in 1990 to nearly \$US 12 billion a decade later. A similar trend, although more marked, is observable in regard to total imports, which is easily explained by the fact that the EU is the region's main supplier.

However, as with the exports, the imports have been coming from increasingly varied suppliers.

Figure 4: ECOWAS imports



source : UNCTAD Statistical manual authors' computations

3) Trade of ECOWAS by products

COMTRADE databases allow the identification by products of the main imports and exports of ECOWAS countries. However, the years and classifications available are not the same across all the ECOWAS countries³. Table 1 on next page lists the main imports into the ECOWAS countries.

These imports mix petroleum products and other base materials such as rice, cements and wheat with more sophisticated goods such as cars, ships and other equipments. As can be seen in the last column, the imports are quite evenly distributed among products, with the largest import item – petroleum products- reaching 10% of the total imports

³ We used the following years: 2004 for Burkina Faso, Ghana, Senegal and Togo; 2003 for Cote d'Ivoire, Cape Verde, Niger, Nigeria and the Gambia; 2002 for Guinea and Sierra Leone and 2001 for Mali

Table 1: ECOWAS main imports by products

HS-4 line	Product description	Imports in US\$ '000	Share of the product in total imports
2710	Petroleum oils and oils obtained from bituminous minerals, excl. crude..	3,049,541.49	10%
8703	Motor cars and other motor vehicles (principally designed for the transport of persons)	1,109,877.64	4%
8481	Taps, cocks, valves and similar app	1,055,821.40	3%
8905	Light-vessels, fire-floats, dredgers, floating cranes...	1,000,136.21	3%
1006	Rice.	999,193.07	3%
2709	Petroleum oils and oils obtained from bituminous minerals, crude.	874,885.63	3%
1001	Wheat and meslin.	710,323.31	2%
0303	Fish, frozen, excluding fish fillets and other fish meat of heading No. 03.04.	706,961.24	2%
2711	Petroleum gases and other gaseous hydrocarbons.	643,414.63	2%
2523	Portland cement, aluminous cement, slag cement...	636,960.47	2%
Total imports	All products	30,261,677.71	100%

Source: COMTRADE, ECA 2006.

On the exports side, the main products are petroleum, cocoa (beans and paste), gold, and cotton. Table 2 on the next page shows that – contrarily to imports- exports are much more concentrated around a few items especially petroleum products, which reach 68% of total exports.

Table 2: ECOWAS main exports by products

HS-4 lines	Product description	Exports in US\$ '000	Share of product in total ECOWAS exports
2709 Total	Petroleum oils and oils obtained from bituminous minerals, crude.	23,444,833.70	68%
1801 Total	Cocoa beans, whole or broken, raw or roasted.	2,766,755.76	8%
2710 Total	Petroleum oils and oils obtained from bituminous minerals, other than crude;	789,037.02	2%
7108 Total	Gold (including gold plated with platinum) unwrought or in semi-manufactured forms, or in powder form.	704,367.31	2%
5201 Total	Cotton, not carded or combed.	562,942.04	2%
2711 Total	Petroleum gases and other gaseous hydrocarbons.	358,932.03	1%
8905 Total	Light-vessels, fire-floats, dredgers, floating cranes...	326,572.03	1%
1803 Total	Cocoa paste, whether or not defatted.	268,374.80	1%
2606 Total	Aluminium ores and concentrates.	264,566.38	1%
1604 Total	Prepared or preserved fish; caviar and caviar substitutes	230,376.86	1%
Total exports	All products	34,708,294.30	100%

Source: COMTRADE, ECA 2006.

III) Methodology

1) The partial equilibrium SMART model

a) Why a partial equilibrium analysis

General equilibrium models such as GTAP are important methodological tools in trade policy analysis, because they measure not only the direct effects of the simulated changes, but also the indirect (second-round) effects, which include inter-industry effects and macroeconomic adjustments. However, the majority of the African countries are not individually captured in GTAP due to lack of data disaggregation at the country level. Only a few countries are individually captured, while the majority are part of composites of countries, such as the “rest of SACU”, the “rest of Southern Africa”, and the “rest of sub-Saharan Africa”, which includes ECOWAS. Consequently, partial equilibrium modelling framework emerges as a second-best option for those countries that are not captured individually in the GTAP database.

Partial equilibrium models bear several limitations. One of the major limitations is that the intersectoral implications (second-round effects) of a trade policy change are not taken into account. Similarly, the inter-regional implications such as within a REC setting are also ignored in a partial equilibrium framework. It is however still possible within a partial equilibrium model to analyse the trade policy effects on trade creation and diversion, welfare and even on tariff revenues. Moreover, partial equilibrium models provide results at a very disaggregated level (HS-6 in the case of this paper). Effects are also traceable by countries. If the limitations of partial equilibrium simulations are kept in mind, they can provide useful information for the policy makers. Policy makers may for example want to have an idea of what could happen to certain sectors that they deem as crucial, for example in terms of development or poverty reduction strategies.

Milner et al. (2002⁴) provide a simple analytical framework explaining the theory behind partial equilibrium modelling. Despite its shortcomings, a partial equilibrium framework is more suitable as it allows the utilization of widely available trade data at the appropriate level of detail to capture the principle of special and differential treatment in the simulation analysis. Partial equilibrium models have the advantage of working at very fine levels of details.

b) The SMART model

The partial equilibrium SMART model was developed by UNCTAD and the World Bank during the 80's, mainly to assess the impact of GATT rounds.

⁴ Milner, Morrissey and Mc Kay, 2002 “some simple analytics of the trade and welfare effects of Economic Partnership Agreements: the case of the EU-EAC”

The SMART model is contained in the WITS software, which can be downloaded free of charge from <http://wits.worldbank.org/>.

SMART allows the user to evaluate the impact of a given trade policy change (measured in tariff) on the following variables:

- trade creation effects
- trade diversion effects
- net trade effect (aggregating trade creation and trade diversion effects)
- tariff revenue variations
- change in consumer surplus

As discussed above, partial equilibrium models fail to represent inter-sectoral links and interactions, as well as macro-level effects. The behavioural response of the market to change in tariff is represented through a set of elasticities, which vary at the HS-4 level.

The SMART model incorporates three kinds of elasticities:

- i) Supply elasticities, which are deemed to be infinite ($=99$). This means that an increase in demand for a given good will always be matched by the producers and exporters of that good, without any impact on the price of the good. This assumption is reasonably realistic in the ECOWAS-EPA case when the importer is a small African market and the importer the EU, a large industrialised zone.
- ii) Import substitution elasticities record the rate of substitution between two goods from different origins. The Armington assumption is incorporated in SMART, meaning that similar goods from different countries are imperfectly substitutable. In SMART, the import substitution elasticity is considered to be 1.5 for each good.
- iii) Import demand elasticity measures the demand response to a shift in import price. In SMART, the import demand elasticity varies at the HS-4 level and is based on a survey by Stern in “Price elasticities in International Trade”.

Another important assumption made by the model is perfect competition, which means for example that tariff cuts are fully reflected in the prices paid by consumers.

The equations of the model are shown in annex⁵.

WITS contains both trade information databases such as TRAINS, COMTRADE, WTO-IDB and trade simulations tools such as the SMART model. The SMART model runs on information contained in the UNCTAD managed TRAINS database.

SMART therefore uses TRAINS data for tariffs (applied tariffs) and trade values. For trade values, TRAINS data is based on the data collected in the COMTRADE

⁵ See “Explaining SMART and GSIM”, by Olivier Jammes and Marcelo Olarreaga, Work in Progress, World Bank April 2005, “ The UNCTAD Trade policy simulation model, a note on methodology, data, and uses”, Sam Laird and Alexander Yeats, UNCTAD discussion paper 19, UNCTAD 1986.

database. It should be noted that this data is subject to occasional changes due to upgrades. For developing countries the data often contains an element of “mirror” information, which means that the imports recorded for developing countries are often adjusted to reflect the level of exports from developed countries to these destinations. Mirror trade information is however not available for South-South trade, which could result in an underestimation of South-South trade in comparison to North-South flows. This should be kept in mind for example, when assessing the impact of the EPA on intra ECOWAS trade. The impact of the EPA on intra-regional trade might also be considerably underestimated in the present case, as a major part of flows within ECOWAS are not recorded as they are operated within the informal sector.

With regard to tariffs and as indicated above, the SMART model uses applied tariffs as recorded in TRAINS. It can be noted the ECOWAS countries that are part of the West African Economic and Monetary Union (WAEMU) do not apply tariff to each others as they are part of a custom union. They however apply a Common External tariff, which highest value reach 20%. Ghana and Nigeria apply higher tariffs, as shown in table 3 below.

The availability of data on WITS/SMART varies across years and countries. Thus some ECOWAS countries are not included in WITS-SMART for lack of data availability. This is the case of Cape-Verde, Gambia, Guinea, Liberia and Sierra Leone. The most recent year available also varies across country. The year for which data was utilised is presented in table 3 below.

Table 3 below shows the average applied tariff weighted by actual trade.

Country	Year of data for simulations	Trade weighted average tariff (%)
Benin	2004	12.68
Burkina Faso	2002	11.45
Cote d'Ivoire	2002	10.69
Ghana	2000	16.20
Guinea-Bissau	2002	13.08
Mali	2003	10.62
Mauritania	2001	9.91
Niger	2003	13.11
Nigeria	2002	16.91
Sénégal	2003	10.54
Togo	2003	14.09

Source: TRAINS ECA 2005.

j) Scenario definition

For the purpose of this paper we defined only one scenario representing a total opening of the ECOWAS market to EU imports. This should a priori not be the exact outcome of EPA negotiations. Article XXIV of the GATT, under which the WTO compliance of EPAs will be established does allow for some products to be excluded from the coverage of liberalisation⁶. However, analysing the impact of full liberalisation in a partial equilibrium framework allows distinguishing the products and sectors where the impact is greatest.

Identifying the products for which the impact of liberalisation is greatest may help ECOWAS countries to define their most “sensitive products” for which they may want to benefit from a Special and Differentiated Treatment⁷. The sensitivity parameters analysed here are trade diversion and revenue loss, they fail to encapsulate other elements of definition of sensitivity such as the importance of a product/sector in the development strategy of a country or its share of the consumption basket of the poorest social categories.

We therefore apply a 100% tariff reduction to all products at the HS-6 level.

⁶ For a detailed discussion of GATT-Article XXIV and EPAs see “Renegotiating GATT Article XXIV – A priority for African countries engaged in North-South trade agreements”, Rémi Lang, ATPC work in progress, UNECA 2006.

⁷ See “Assessment of the impact of the Economic Partnership Agreement between the ECOWAS countries and the European Union”, ATPC Work in Progress No. 29, UNECA 2005. This publication proposes for each ECOWAS countries a list of products by sensitivity.

IV) Results of the model

In this section we analyse the results of a simulation representing full liberalisation of EU imports in ECOWAS countries, using the partial equilibrium model, WITS-SMART⁸.

The section is divided in three parts. The first one describes the simulation results on the levels of EU exports to ECOWAS. A second part analyses the simulation's results on trade creation and intra-ECOWAS trade, including the products that would be most affected by trade diversion. Finally a third part looks at the results of the model on tariff revenues and welfare in the West-African countries.

1. Simulating the EPA impact on ECOWAS imports from the EU

This section looks at the potential increase in exports enjoyed by the EU countries under full liberalisation of ECOWAS. The repartition of the additional exports between EU country is analysed This may provide some useful insights to ECOWAS countries, in view of the EPA negotiations.

a) Increased EU exports to ECOWAS

For negotiations purposes, it is interesting to look at which EU countries are bound to benefit the most from the ECOWAS tariff elimination. In total, the 25 EU countries could gain more than 1.87 billion US\$ of increased exports to ECOWAS countries⁹. The source of this increase is two fold. Firstly EU exports would enjoy trade creation (the lowering of the tariffs make them cheaper and therefore more consumed). Secondly, as the EU goods would enjoy preferential treatment they might replace identical goods from third countries' producers, even though these latter might have been more efficient prior to the FTA (trade diversion effect). The added trade creation and trade diversion effects yield the net increase in EU exports.

Table 4 shows clearly that the largest gainer would be France (26% of the additional exports, at just under 500 millions US\$ of increased exports), followed by the UK (almost 17% of total export gains). Together, these two countries plus Germany (15.5%), Italy (11.4%) and Belgium (9.7%) should reap-up more than 80% of the increased exports to ECOWAS.

⁸ A detailed presentation of the WITS-SMART model is available in annex.

⁹ In this paper and when in the context of partial equilibrium analysis, we are using the denomination "ECOWAS region" for those countries of this region that have provided statistical information to the WITS database. Therefore, the denomination excludes Cape Verde, Guinea, Liberia and Sierra Leone. On the other hand it includes Mauritania, which –although not an ECOWAS Member State is associated with it in the EPA negotiation process.

On the contrary, the ten newly acceded countries, as well as Denmark, Portugal, Austria, Greece, Finland, Ireland and Luxembourg would obtain less than 1% each of this increase in exports.

Table 4: Increase in exports after EPA for individual EU countries

EU member	Total export gains in US\$ '000	Share in the total increased exports (%)	Increase in country's total exports
France	494 701.682	26.35%	0.135%
United Kingdom	317 568.463	16.92%	0.104%
Germany	290 904.736	15.50%	0.039%
Italy	214 476.41	11.43%	0.070%
Belgium	181 499.797	9.67%	0.071%
Spain	155 843.714	8.30%	0.100%
Netherlands	128 380.381	6.84%	0.050%
Sweden	21 443.278	1.14%	0.021%
Denmark	17 732.954	0.94%	0.027%
Portugal	10 302.314	0.55%	0.034%
Ireland	9 875.546	0.53%	0.011%
Greece	9 802.571	0.52%	0.074%
Austria	5 679.704	0.30%	0.006%
Poland	5 526.02	0.29%	0.010%
Czech Republic	3 605.06	0.19%	0.007%
Luxembourg	3 447.433	0.18%	0.034%
Finland	2 549.182	0.14%	0.005%
Hungary	1 838.327	0.10%	0.004%
Cyprus	799.151	0.04%	0.087%
Malta	639.962	0.03%	0.025%
Slovenia	318.949	0.02%	0.002%
Estonia	99.47	0.01%	0.002%
Lithuania	95.195	0.01%	0.001%
Slovak Republic	85.232	0.00%	0.000%
Latvia	1.045	0.00%	0.000%
Total	1 877 216.6	100.00%	0.062%

Source: simulation WITS-SMART, CEA, and UNCTAD handbook of statistics 2004.

Such information might be of interest for ECOWAS countries to identify which EU countries could have the greatest stakes in negotiating an EPA with them¹⁰. These EU countries will have a decisive role in the negotiations on the non-trade aspects of the EPA, including the aid package.

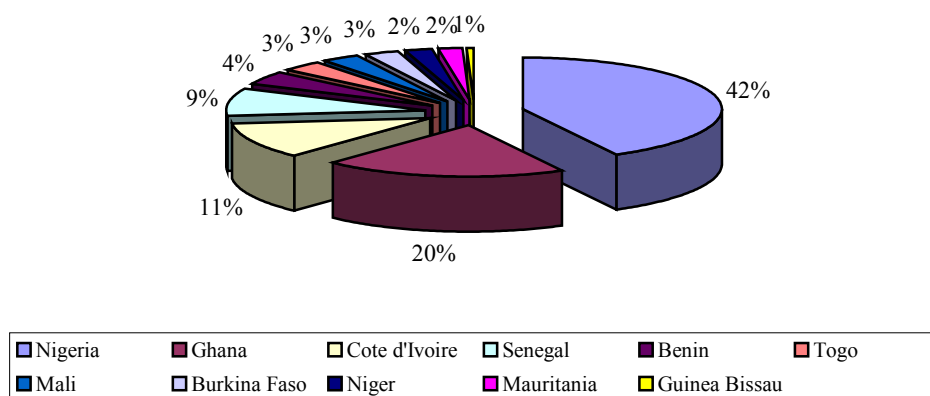
The importance of the increased exports remains very limited for EU countries. As is observed in table 4, the size of the increase in exports is marginal relatively to the overall EU exports. For example, France would only see her overall exports increase by 0.135% under an EPA.

b) Geographical repartition of EU's additional exports inside ECOWAS

It is also noteworthy to check the relative importance of each ECOWAS country in the total additional exports from the EU in case of EPA. This shows where in ECOWAS the EU country will gain additional exports. This is also informative for the negotiations process as it shows each ECOWAS country its relative bargaining power in the negotiations.

As can be inferred from figure 5, the relative importance of Nigeria is very obvious, with 42% of additional EU exports. Ghana comes second at 20% of the increased exports. Thus, Nigeria and Ghana together represent 62% of the increased exports for the EU, they will therefore probably enjoy a relatively important negotiating power in the negotiations on EPA.

Figure 5: geographical repartition of increased EU exports in ECOWAS



Source: WITS-Smart, simulation CEA.

¹⁰ On the importance of a variable approach to different EU member states see for example: “How did David prepare to talk to Goliath – South Africa’s experience of trade negotiating with the EU”. Sam Bilal and Geert Laporte, ECDPM discussion paper No. 53, September 2004.

Côte d'Ivoire and Senegal would take up respectively 11% and 9% of the EU's gains in exports to the region. The other countries joined together would represent an increase of 18% of exports to the West-African region.

This repartition may be explained by the level of tariff ex-ante (Nigeria and Ghana), as well as by the size of the markets (Nigeria, Ghana, Côte d'Ivoire).

We are also able to show the progression of EU exports to each ECOWAS country after the EPA. For the region on average, EU exports would increase by some 15%. The progression of EU exports seem to be the strongest in Ghana (37%), perhaps reflecting relatively high tariffs in that market prior to liberalisation.

Table 4: Increase in EU exports to individual ECOWAS countries after EPA (%)

Country	EU exports before EPA (US\$'000)	Increase after EPA (US\$'0001)	Increase after EPA in %
Benin	281,275.142	75,176.31	26.73%
Burkina Faso	199,397.396	49,663.50	24.91%
Cote d'Ivoire	1,054,655.75	215,269.49	20.41%
Ghana	984,692.63	369,687.10	37.54%
Guinea Bissau	49,181.79	10,974.08	22.31%
Mali	282,561.925	59,163.39	20.94%
Mauritania	158,541.664	33,808.49	21.32%
Niger	154,115.26	43,804.61	28.42%
Nigeria	8,150,738.806	793,311.17	9.73%
Senegal	772,894.729	161,531.91	20.90%
Togo	285,470.605	64,826.52	22.71%
Total/Average	12,373,525.7	1,877,216.58	15.17%

Source : simulation ECA, WITS-SMART

Among ECOWAS countries, the differences in the relative increases in EU exports are not very important (approximately 17% difference between the two extreme Ghana and Côte d'Ivoire). Apart from Ghana, the other ECOWAS countries would all experience an increase in their exports from the EU ranging between 20 and 30%.

However, it is important here to recall that for West-African countries, the largest share of imports comes from the European Union. EPA would therefore strengthen the dependence of ECOWAS countries on the EU as a source of imports.

2. Trade creation and trade diversion in ECOWAS countries

This section looks at the possible trade creation and trade diversion impacts of the EPA on ECOWAS countries. It starts with a presentation of the trade creation effect, by countries and products. I then looks at losses in intra-regional trade incurred by the ECOWAS countries, due to the substitution of intra-regional exports by EU products.

a) Trade creation impact

SMART allows to determine the trade creation impact of a change in tariff. Trade creation is traditionally viewed as positive for consumer as it represent the additional quantities that the consumers can afford thanks to the liberalisation. However, some of this increase in consumption may be at the detriment of national producers if the goods concerned were purchased from national producers ex-ante. It is therefore up to the national policy maker to balance to what extent and for which product category trade creation has an overall positive effect for his country, taking into account both the necessity to maximise the consumer benefits (especially the poorer ones) and the industrial development strategy.

Table 5 below shows trade creation by ECOWAS countries. Most the trade creation would take place in Nigeria. Niger on the other hand would experience the highest relative trade creation vis à vis the initial levels of imports (+15%).

Table5: Trade creation by ECOWAS countries

Importer	Trade Value	Trade creation	Trade creation as share of net trade effect	Repartition of trade creation across ECOWAS	Trade creation as % of initial trade
Benin	725,100.00	61,057.16	81%	4.04%	8.42%
Burkina Faso	582,626.00	40,483.27	82%	2.68%	6.95%
Cote d'Ivoire	1,893,059.00	188,827.60	88%	12.50%	9.97%
Ghana	2,903,429.00	267,762.33	72%	17.73%	9.22%
Guinea Bissau	76,569.00	8,494.17	93%	0.56%	11.09%
Mali	464,266.00	54,709.19	92%	3.62%	11.78%
Mauritania	374,051.00	28,506.81	84%	1.89%	7.62%
Niger	261,003.00	39,532.75	90%	2.62%	15.15%
Nigeria	5,653,214.00	617,735.00	78%	40.91%	10.93%
Senegal	1,363,958.00	144,594.47	90%	9.58%	10.60%
Togo	797,870.00	58,332.51	90%	3.86%	7.31%
Grand Total	15,095,145.00	1,510,035.26	81%	100.00%	10.00%

Source: WITS-SMART Simulation, ECA 2005.

It is also interesting to look at trade creation effects at the products level. SMART allows for an observation at the HS-6 level detail. The table 6 below exhibits the products for which trade creation is largest.

Table 6: products with highest trade creation effects in ECOWAS

Tariff Line Code	Product denomination	Trade Value (US\$ '000)	Trade creation effect ('000 US\$)	Share in total trade creation
870323	Other vehicles, with spark-ignition internal combustion reciprocating piston engine :-- Of a cylinder capacity exceeding 1,500 cc but not exceeding 3,000 cc	366,127	95,087.90	6.30%
271000	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils	549,148	86,614.45	5.74%
870322	Other vehicles, with spark-ignition internal combustion reciprocating piston engine :-- Of a cylinder capacity exceeding 1,000 cc but not exceeding 1,500 cc	102,233	26,557.01	1.76%
630900	Worn clothing and other worn articles.	135,870	26,117.00	1.73%
300490	Other Medicaments (excluding goods of heading No. 30.02, 30.05 or 30.06) consisting of mixed or unmixed products for therapeutic or prophylactic uses, put up in measured doses or in forms or packings for retail sale.	399,018	25,939.56	1.72%
210111	Extracts, essences and concentrates, of coffee, and preparations with a basis of these extracts, essences or concentrates or with a basis of coffee	113078	23,304.11	1.54%
870332	Other vehicles, with compression-ignition internal combustion piston engine (diesel or semi-diesel) :-- Of a cylinder capacity exceeding 1,500 cc but not exceeding 2,500 cc	65,387	21,823.42	1.45%
170199	Other cane or beet sugar and chemically pure sucrose, in solid form.	182,405	14,990.24	0.99%
870899	Other parts and accessories of the motor vehicles of headings Nos. 87.01 to 87.05.	71,297	14,260.05	0.94%
401120	New pneumatic tyres, of rubber of a kind used on lorries or buses	55,802	12,332.54	0.82%
Total				

Source: WITS-SMART simulations, ECA 2005.

Due to the level of disaggregation, trade creation is rather evenly spread evenly across tariff lines. Those products that bear the largest trade creation are varied, they include vehicles and parts, cloths, sugar products and medicine.

b) Trade diversion impact

Trade diversion is the quantity of exports from third countries that is being replaced by EU products after liberalization. Trade diversion is traditionally viewed as negative for global welfare as more efficient producers are being displaced by less efficient ones

due to the new trade preference. This results in a sub-optimal allocation of factor at the world level.

Table 7 provides information on trade diversion in ECOWAS in the case of a total liberalisation of EU imports. SMART allows to identify which countries are on the losing end of the trade diversion. In our case, and as EPAs are meant to reinforce regional integration, we find it interesting to observe to what extent trade diversion affects intra-ECOWAS trade. The last two columns of table 7 therefore looks at how much ECOWAS intra-regional trade is displaced by EU goods after the EPA.

Table 7: Trade diversion in West-Africa in case of EPA

ECOWAS member	Total trade diversion (US\$ '000)^a	Magnitude in trade diversion^b (%)	Intra-regional trade diverted^c (US\$'000)	Variation in intra-regional trade (%)
Nigeria	-175,576.17	-6.23%	-4,565.93	-4.17%
Ghana	-101,924.75	-10.08%	-23,498.09	-17.06%
Cote d'Ivoire	-26,441.89	-4.23%	-1,771.99	-4.44%
Senegal	-16,937.44	-4.14%	0.00	0.00%
Benin	-14,119.14	-4.07%	-2,695.30	-2.76%
Burkina Faso	-9,180.22	-3.00%	-2,883.31	-2.05%
Togo	-6,494.01	-2.95%	0.00	0.00%
Mauritania	-5,301.69	-3.12%	-248.05	-5.40%
Mali	-4,454.20	-4.75%	0.00	0.00%
Niger	-4,271.86	-9.20%	0.00	0.00%
Guinea Bissau	-669.02	-4.68%	0.00	0.00%
Total	-365,370.39	-7.05%	-35,662.67	-6.73%

Source: Simulation WITS-SMART, ECA

(a): Loss of exports from non-EU countries to ECOWAS; (b) Percentage of trade diverted vis à vis ex-ante imports from third countries (c): Loss of exports from ECOWAS countries to other ECOWAS countries.

In total, net trade diversion amounts to US \$ 365 millions. The part of this trade diversion that represents forgone exports of Western African countries to the rest of the region amounts to US\$ 35.6 millions, or about 9.8% of the total trade diversion. This amount is significantly higher than for other African RECs¹¹, which may mean that in the case of ECOWAS, the EPA could have a more negative impact on regional integration than in other African regions.

¹¹ According to our calculations using WITS-SMART, the share of intra-regional trade in overall trade diversion is approximately 6% in the case of ESA, 2% in the case CEMAC and only 1% in the case of SADC. See "Economic and Welfare impacts of the EU-Africa Economic Partnership Agreements", UNECA Work in progress No 10, March 2005.

A large share, nearly two third, of the loss of intra-regional trade would occur in Ghana. Moreover, as noted in the previous section, it is likely that TRAINS data underestimate South-South trade, including ECOWAS intra-regional exchanges. A large share of these exchanges take place in the informal sector and there is no mirror consolidation of data as is the case with developed countries. Hence, our measure of the fall in intra-regional trade is likely to be an underestimation.

ECOWAS policy makers may therefore want to consider measures aiming at mitigating intra-regional trade losses. This could include programmes aiming at strengthening the competitiveness of the concerned enterprises. For those most sensitive sectors, the tariff dismantlement should be conducted gradually and under a longer time schedule than for non sensitive products. Safeguards measures should also be available in ECOWAS to protect national as well as regional producers in case of a surge of imports from the EU. Finally it should be stressed again that there is scope under the multilateral rules for less than full reciprocity in the coverage of liberalisation.

Using SMART, it is also possible to view which ECOWAS countries would be most affected by losses in intra-regional trade as exporters. Table 8 presents the details of trade diversion for ECOWAS countries seen from the exporters point of view, in case of the elimination of all tariffs on EU imports. It appears that Togo would be the greatest loser, in absolute terms, of the EPA (US\$ -11.5 million), followed by Côte d'Ivoire (approximately US\$ - 9 millions).

Table 8: Diminution of intra-regional exports in ECOWAS after an EPA

Exporter	Exports to ECOWAS before the EPA in US\$'000	Variation of exports to ECOWAS after EPA in US\$ '000	Variation of exports to ECOWAS in %	Share in the overall regional exports diminution
Benin	30266.08	-3528.994	-11.66%	9.90%
Burkina Faso	33662.243	-2038.364	-6.06%	5.72%
Cape Verde	393.558	-45.704	-11.61%	0.13%
Cote d'Ivoire	179563.204	-8911.388	-4.96%	24.99%
Gambia	741.491	-31.873	-4.30%	0.09%
Ghana	25565.798	-1202.477	-4.70%	3.37%
Guinea	1476.302	-114.734	-7.77%	0.32%
Guinea-Bissau	621.682	-20.667	-3.32%	0.06%
Liberia	860.39	-126.459	-14.70%	0.35%
Mali	3540.064	-475.268	-13.43%	1.33%
Mauritania	53029.969	-1654.508	-3.12%	4.64%
Niger	27406.863	-2384.88	-8.70%	6.69%
Nigeria	40423.675	-1890.117	-4.68%	5.30%
Senegal	61478.927	-1717.134	-2.79%	4.81%

Sierra Leone	445.726	-22.296	-5.00%	0.06%
Togo	70904.469	-11497.993	-16.22%	32.24%
Grand Total	530380.441	-35662.856	-6.72%	100.00%

Source: ECA, WITS-SMART.

The fact that some countries may experience significant diminutions of exports in the region also calls for measures to hasten deeper integration as soon as possible and before the dismantlement of tariffs on EU goods.

Overall however, the magnitude of these exports losses seems relatively benign for ECOWAS countries, when compared to their total exports levels. EPAs between the EU and other African regions (CEMAC, ESA, SADC) are also likely to create trade diversion to the detriment of ECOWAS exporters in the other African regions. Further pan-African integration could be useful to prevent such potential losses.

Vulnerable products at the regional level.

Using WITS-SMART, we isolated the products that may be exposed to the steepest decline in exports to the rest of the region for ECOWAS exporters. This allows the trade authorities to consult with the concerned members of the private sector to inform them of the challenges induced by the EPA and possibly to set up measures to facilitate the adaptation of the private sector.

We gathered in table 9 on the next page the products that seem to experience the largest diminution in intra-regional trade. This group of products account for approximately 85% of the total loss in intra-regional exports. We also show some categories of products at the bottom of the table 9 for which the fall in exports is large proportionally to the volumes exported before the EPA, albeit the volumes exported are quite low and account for a small fraction of the overall total export loss. For example meat and meat offal would see their exports fall by 22%, even through they account for only 0.3% of the overall export loss.

Table 9: Most vulnerable products to trade diversion in case of EPA in ECOWAS

H.S. chapter	Description (HS-2)	Exports before EPA (US\$'000)	Change in exports (\$ '000)	Variation in exports in%	Share of each HS chapter in total export loss
HS.27	Mineral fuels, oils & product of their distillation	127699.262	-19404.009	-15.20%	54.41%
HS.03	Fish & crustacean, mollusc & other aquatic invert	54995.081	-1657.476	-3.01%	4.65%
HS.52	Cotton.	32750.892	-1318.707	-4.03%	3.70%
HS.11	Products .milling .industry; malt; starches; insulin; wheat g	6351.449	-982.784	-15.47%	2.76%
HS.38	Miscellaneous chemical products.	21112.759	-831.937	-3.94%	2.33%
HS.87	Vehicles o/t railway/tramway roll-stock, pts & access	8534.886	-783.811	-9.18%	2.20%
HS.04	Dairy prod; birds' eggs; natural honey; edible pr	3544.213	-782.353	-22.07%	2.19%
HS.21	Miscellaneous edible preparations.	18889.323	-706.943	-3.74%	1.98%
HS.63	Other made up textile articles; sets; worn clothing	6237.468	-643.097	-10.31%	1.80%
HS.39	Plastics and articles thereof.	10087.896	-591.749	-5.87%	1.66%
HS.85	Electrical machinery equip parts thereof; sound record	8835.123	-519.222	-5.88%	1.46%
HS.19	Preparation .of cereal, flour, starch/milk; pastry cooks'	4688.247	-514.768	-10.98%	1.44%
HS.24	Tobacco and manufactured tobacco substitutes	19915.278	-511.254	-2.57%	1.43%
HS.22	Beverages, spirits and vinegar.	2388.745	-336.825	-14.10%	0.94%
HS.20	Prep of vegetable, fruit, nuts or other parts of	1325.182	-280.206	-21.14%	0.79%
HS.33	Essential oils & resinoids; perfumes, cosmetic/toilet	2326.002	-262.542	-11.29%	0.74%
HS.94	Furniture; bedding, mattress, matt support, cushion	1530.945	-189.05	-12.35%	0.53%
HS.02	Meat and edible meat offal	482.668	-106.794	-22.13%	0.30%
HS.83	Miscellaneous articles of base metal.	737.472	-87.466	-11.86%	0.25%
HS.69	Ceramic products.	626.703	-77.681	-12.40%	0.22%
HS.37	Photographic or cinematographic goods.	367.785	-42.871	-11.66%	0.12%
Grand Total		530380.441	-35662.856	-6.72%	100.00%

Source: WITS-SMART simulations, ECA.

From our simulations, it appears that more than half of the overall decline in export revenue in case of an EPA would happen for fuels and oil products (HS chapter 27).

Most of this loss would occur in the market of Ghana. The HS. 6 line involved is 27 10 00¹². High trade diversion for that product is at least partly explained by the very high applied tariff (89.25%) on this product category.

Other products for which West Africa could be subject to a sizeable fall in its export revenues due to trade diversion include:

- fish and crustacean (-1.6 million \$),
- cotton (-1.3 million dollars)¹³
- products of the milling industry (almost a million dollars),
- miscellaneous chemical products (-831 000 \$US),
- vehicles (-780 000)¹⁴,
- dairy products and eggs (-782 000 \$US),
- miscellaneous edible preparation (-706 000 \$US),

Some of these products may include a significant content in local input, and their demise on local markets might very well have important negative consequences upstream in the production chain of the region (fish, edible preparations, dairy, other agro-food products). The decline in exports in these products could also have a significant negative impact on the most vulnerable categories of Western-Africans, including on rural and female workers. Such potential effects ought to be further investigated to determine the EPA's impact on poverty.

3. Impact in terms of revenues and welfare.

a) Revenue implications

As would be expected, the elimination of tariffs on imports from the EU is shown to harm the government revenues in West African countries. The extent of revenue shortfall varies across countries as indicated in table 10.

It is in the large and most protected economies that the revenue reduction is highest. Nigeria will have to forego up to US\$ 427 million and Ghana US\$194 million.

Due to lower levels of imports in smaller economies, their loss in tariff revenues is logically smaller. For example, Guinea-Bissau would forego only about US\$7 million according to our simulations.

¹² Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals.

¹³ Mainly textile products and fabrics containing cotton.

¹⁴ These are likely to be either used vehicles or re-exports.

Table 10: Revenue implications of a EU-ECOWAS EPA (US\$)

Country	Revenue Shortfall
Nigeria	-426,902,557.50
Ghana	-193,683,365.00
Cote d'Ivoire	-112,236,538.00
Senegal	-80,203,188.50
Benin	-39,523,104.00
Togo	-35,471,728.00
Mali	-33,141,747.00
Burkina Faso	-22,003,937.50
Niger	-20,487,214.00
Mauritanie	-14,572,779.00
Guinea-Bissau	-7,170,527.00
Total	-985,396,685.50

Source: simulation WITS-SMART, ECA.

It is important to note however that the revenue loss indicated by our simulations relates to imports tariff revenues. In reality, the increased imports presented earlier resulting from trade creation are in most countries subject to indirect taxes such as the VAT. As such, as long as there is rapid increase in the volume and value of imports into the ECOWAS countries, and these countries have indirect taxes such as VAT, then the revenue shortfall described will be tampered off.

The table 11 shows what proportion of their total budget revenue the West African Governments could lose after the EPA¹⁵.

Table 11 shows that on average, if the EPA entails full liberalisation of EU imports, ECOWAS countries would have to forgo tariff revenues amounting to almost 4% of their budget. However, one can also observe significant disparities among countries concerning the relative importance of their tariff revenue loss.

¹⁵ We used different sources to compile total government revenue (excluding grants), depending on availability of data matching the year selected for the simulation. Bénin: IMF 2003, Burkina Faso: IMF 2002, Côte d'Ivoire: IMF 2002, Ghana: Bank of Ghana (<http://www.bog.gov.gh/>), Guinea Bissau: IMF 2003, Mali: BCEAO: "Evolution de la situation économique, financière et monétaire dans les Etats Membres de l'UEMOA en 2004 et perspectives pour l'année 2005", Mauritania: IMF 2001, Niger: IMF 2003, Nigeria: IMF 2003, Sénégal: Ministère de l'Economie et des finances, Projet de Loi de finance 2003 (<http://www.finances.gouv.sn/loifmt03.html>), Togo: BCEAO ibid. For exchange rates, historical interbank rates have been used: <http://www.oanda.com/convert/classic>.

Table 11: reduction in total budget revenues after EPA

Country	Revenue diminution in US\$'000	Loss in total budget revenues in%
Guinea-Bissau	-7,170.53	-19.38%
Ghana	-193,683.37	-19.15%
Togo	-35,471.73	-12.53%
Niger	-20,487.21	-7.63%
Mauritania	-14,572.78	-7.08%
Benin	-39,523.10	-6.73%
Burkina Faso	-22,003.94	-6.06%
Senegal	-80,203.19	-6.00%
Cote d'Ivoire	-112,236.54	-5.62%
Mali	-33,141.75	-4.46%
Nigeria	-426,902.56	-2.34%
Total ECOWAS	-985,396.69	-3.93%

Source: simulation WITS-SMART, ECA.

Although the loss of revenue for Guinea Bissau was the lowest in our sample in absolute terms, it is the highest in terms of its share of total Government revenues: 19.38%.

Our data also shows large losses in overall budget resources for Ghana (19%). Togo also displays a significant fall in total budget resources: -12%. Most of the other countries seem to be losing between 5 and 7% of budget revenue. Nigeria would only experience a loss of 2%, due to the large share of oil royalties in the total government resources.

Other authors have carried out calculations on the revenue losses that would follow an EPA. Hinkle, Hoppe and Newfarmer propose a compilation of results by various authors of tariff revenue loss for ECOWAS¹⁶. With the exception of Ghana and Guinea Bissau, the calculations by different authors seem to congregate towards similar levels.

For most of these countries, the losses in overall budget revenue seems significant. Clearly, the countries that will commit to trade liberalisation in the EPA context will need to build a new fiscal base to be able to cope with the loss in tariff revenue. ECOWAS countries will probably need assistance from the EU in building a new

¹⁶ See: "Beyond Cotonou: Economic Partnership Agreements in Africa", Hinkle, Hoppe and Newfarmer, Available at <http://siteresources.worldbank.org/INTRANETTRADE/Resources/239054-1126812419270/22.BeyondCotonou.pdf>

fiscal system to replace the budget revenue losses incurred after the EPA. ECOWAS countries will also probably need to lower their tariffs on EU imports in a gradual way so as to smoothen the fall in their budget revenues.

b) Welfare implications

Consumer surplus is shown in table 12.

Table 12: Welfare (consumer surplus) implications of a EU-ECOWAS EPA (US\$)

Country	Consumer Surplus
Nigeria	113,346,061.50
Ghana	71,478,699.50
Cote d'Ivoire	16,206,072.00
Senegal	12,470,439.50
Benin	6,595,922.00
Togo	5,462,732.50
Mali	4,482,770.00
Niger	3,904,466.00
Burkina Faso	3,834,553.00
Mauritania	2,471,498.50
Guinea-Bissau	221,876.00

Source: WITS/SMART Simulations, ECA.

The consumers in the ECOWAS countries will derive significant gains from the EPAs as they will have access to goods at lower prices. As mentioned in the previous section, it is assumed that the EU producers and exporters will not be pricing to market. In other words, there is an implicit assumption that the EU exporters and the ECOWAS importers will pass on the benefits of the tariffs reduction to the ECOWAS consumers. If the benefits for tariff dismantlement are not passed on to the ECOWAS consumers but are captured by the exporter or the importer, it is possible that the increase in consumer welfare will be limited.

In order to ensure that the welfare is transmitted to consumers, it is therefore crucial that competition policy ensure that there is no abuse of potential dominant positions or no collusion from large importers. Competition policy capacities and the legal system supporting it should therefore be strengthened to ensure that EPA's deliver their potential benefits.

However, it should be noted that the overall economic welfare effects are not clear within a partial equilibrium modelling framework since producer surplus changes

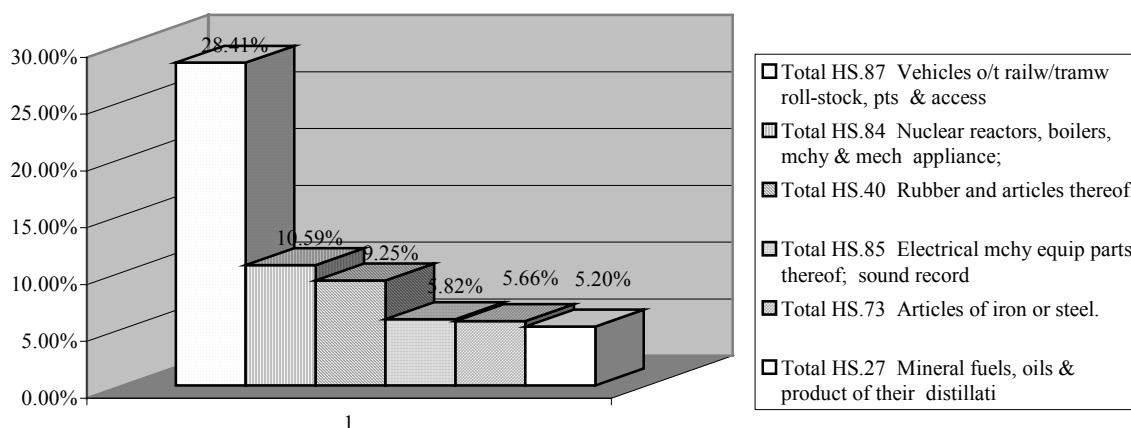
especially due to supplanting of domestic producers by the EU producers has not been captured in this analysis.

Nonetheless, the big economies of ECOWAS that is, Nigeria, Ghana and Côte d'Ivoire could experience substantial consumer surplus gains. Besides, Senegal and other countries are also likely to obtain some significant improvement in their consumer welfare.

It is also interesting to look at the role of each product in the welfare increase.

Figure 6 displays the Harmonised System chapters (HS-02)¹⁷ yielding the highest welfare gains for the ECOWAS countries plus Mauritania. Together, these 6 products groups account for more than 65% of the total welfare gains of the region, in case of liberalization of the trade with the EU.

Figure 6: Product categories yielding the largest consumer surplus in case of EPA



Sources: WITS-SMART simulations, ECA.

By far, the group of products yielding the highest welfare gains are vehicles (28.41%), followed by rubbers and articles of rubbers (10.59%).

It would be interesting to investigate further which social categories are bound to benefit most of such changes. This would imply reviewing the consumption baskets of different social categories according to revenue, and looking at the impact of the EPA on the tariff of these goods.

¹⁷ For clarity purposes, results have been aggregated at the HS-2 level. Results at the HS-6 level are available from the UNECA Secretariat (contact Rémi Lang at Rlang@uneca.org).

For example, the modest decline in food products is bound to modify in different ways the situation of the urban versus the rural poors, with the former probably benefiting more than the latter.

While recognising the weakness of the consumer surplus as a proxy for welfare implications of the EPAs, the partial equilibrium results tell only part of the story. Indeed, increased imports through trade creation do not only benefit consumers in the ECOWAS region. In addition to this are potential gains likely to emanate from embodied technologies in some of the imports, that might eventually be welfare enhancing. This will however depend on whether capital equipments and machineries and such imports that tend to have embodied technologies are already zero-rated as tends to be the case in most countries or not.

Like in the case of trade effects (creation and diversion), the outcomes through EPAs reciprocity will depend on the initial conditions. Therefore, for countries members of as WAEMU or Mauritania, which have been fast trade liberalisers, the welfare implications might seem small because the required changes in the reciprocation to the EU preferences are not as large as for other ECOWAS nations.

Ultimately though, all the ECOWAS region countries are likely to experience positive consumer welfare and whether the net welfare gain will remain positive, depends both on whether the supplanted producers in the region experience welfare gains outweighing producer surplus losses. The overall welfare will also include the losses of tariff revenues for the Governments.

Conclusions from partial equilibrium simulations:

Our partial equilibrium simulations show that imports from the EU to ECOWAS would increase by approximately 1.87 billion US\$. France and the UK would be the two main beneficiaries on the EU side, other studies have found similar results¹⁸. Nigeria and Ghana are projected to absorb the bulk (two-thirds) of the increased imports from the EU.

Trade creation effects represent 81% of the overall trade effect, largely exceeding trade diversion effects. Due to the level of their ex-ante tariffs Nigeria and Ghana would enjoy the largest share of these trade creation effects. Trade creation seem rather well spread-out across a large variety of goods, even if some concentration may be observed in cars, oil products, worn cloths and medicine. The trade diversion effects seems relatively significant (-7%). Importantly, intra-regional trade diversion is also notable (-6.7%), which shows a negative effect on regional integration. The two principles of reciprocity and deeper regional integration are likely to pull in different directions. There is therefore a case for differentiation and less than full reciprocity in the EU-ECOWAS EPA negotiations.

Although tariff revenue falls are highest in Nigeria in absolute (\$) terms, the countries that will be the most affected by them are Ghana and especially Guinea-Bissau, which could lose up to 20% of its Government budget revenues in case of a full liberalisation of EU imports.

Finally, our model shows some results, albeit incomplete concerning welfare gains. It seems that consumer surplus would mainly be improved through the lowering of price of industrial goods such as cars, machines and equipments.

¹⁸ See “The impact of ACP/EU Economic Partnership Agreements on ECOWAS countries: an empirical analysis of the trade and budget effects”, Busse, Borrmann and Grossmann, HWWA, Friedrich Ebert Institute, Hamburg 2004.

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ANNEX

The WITS/SMART Model

For the purposes of this study, it is proposed that the WITS/SMART model will be the applied partial equilibrium framework. The World Integrated Trade Solution (WITS) brings together various databases ranging from bilateral trade, commodity trade flows and various levels and types of protection. WITS also integrate analytical tools that support simulation analysis. The SMART simulation model is one of the analytical tools in WITS for simulation purposes. SMART contains in-built analytical modules that support trade policy analysis such as effects of multilateral tariff cuts, preferential trade liberalization and ad hoc tariff changes. The underlying theory behind this analytical tool is the standard partial equilibrium framework that considers dynamic effects constant. Like any partial equilibrium model, it has these strong assumptions allowing the trade policy analysis to be undertaken a country at a time. In spite of this weakness, WITS/SMART can help estimate trade creation, diversion, welfare and revenue effects for those countries whose data is available.

Trade creation

The underlying theory is summarised below for the estimation of the trade flows and revenue effects. The exposition of the WITS/SMART theory is summarised from Laird and Yeats (1986). Trade creation captures the trade expanding aspects of liberalization that leads to the displacement of inefficient producers in a given preferential trading area (a free trade area for instance). It is assumed that there is full transmission of price changes when tariff or non-tariff distortions (ad valorem equivalents) are reduced or eliminated. Laird and Yeats (1986) derive clearly the equation that can be used to estimate the trade creation effects. The derivation begins with the following basic trade model composed of simplified import demand and export supply functions and an equilibrating identity:

A simplified import demand function for country j from country k of commodity i :

$$M_{ijk} = f(Y_j, P_{ij}, P_{ik}) \quad (1)$$

The export supply function of commodity i of country k can be simplified as:

$$X_{ijk} = f(P_{ikj}) \quad (2)$$

The equilibrium in the trade between the two countries is the standard partial equilibrium equation:

$$M_{ijk} = X_{ikj} \quad (3)$$

In a free trade environment, the domestic price¹⁹ of commodity i in country j from country k would change with the change in an ad valorem tariff as follows:

$$P_{ijk} = P_{ikj}(1 + t_{ijk}) \quad (4)$$

To derive the trade creation formula, following Laird and Yeats (1986), the price equation (4) is totally differentiated to get:

$$dP_{ijk} = P_{ikj}dt_{ijk} + (1 + t_{ijk})dP_{ikj} \quad (5)$$

Equations (4) and (5) are then substituted into the elasticity of import demand equation²⁰ to get:

¹⁹ The transport and insurance costs are not reflected in the equation explicitly.

$$\frac{dM_{ijk}}{M_{ijk}} = \eta_i^m \left(\frac{dt_{ijk}}{(1+t_{ijk})} + \frac{dP_{ijk}}{P_{ijk}} \right) \quad (6)$$

From the identity in equation (3), $\frac{dM_{ijk}}{M_{ijk}} = \frac{dX_{ikj}}{X_{ikj}}$ can be used to derive the following expression for elasticity of export supply:

$$\frac{dP_{ikj}}{P_{ikj}} = \frac{1}{\gamma_i^e} \frac{dM_{ijk}}{M_{ijk}}$$

which when used in equation 6, allows the computation of the trade creation effect. From equation (3) the trade creation effect is equivalent to exporting country k 's growth of exports of commodity i to country j :

$$TC_{ijk} = M_{ijk} \eta_i^m \frac{dt_{ijk}}{((1+t_{ijk})(1-\eta_i^m/\gamma_i^e))} \quad (7)$$

If $\gamma_i^e \rightarrow \infty$, then equation (7) can be simplified as follows:

$$TC_{ijk} = \eta_i^m M_{ijk} \frac{(1+t_{ijk}^1) - (1+t_{ijk}^0)}{(1+t_{ijk}^0)} \quad (8)$$

where TC_{ijk} is the sum of trade created in millions of dollars over i commodities affected by tariff change and η_i^m is the elasticity of import demand for commodity i in the importing country from the relevant trading partner. M_{ijk} is the current level of import demand of the given commodity i . t_{ijk}^0 and t_{ijk}^1 represent tariff rates for commodity i at the initial and end periods respectively. Trade creation then depends on the current level of imports, the import demand elasticity and the relative tariff change.

Trade diversion

Trade diversion as opposed to trade creation can expand or contract trade globally. Trade diversion is the phenomenon that occurs in a free trade area for example whereby efficient producers from outside the free trade area are displaced by less efficient producers in the preferential area. Consider an EPA between ECOWAS and EU for instance. Trade diversion would result if as a result of the establishment of the EPA more efficient suppliers from the rest of the world (ROW) into ECOWAS are displaced by inefficient producers from the EU. Assuming that such an EPA is formed which leads to reduction of tariffs facing the EU without any changes in the tariffs facing the ROW exporters; the theory underlying the measurement of trade diversion in SMART is also explained in Laird and Yeats (1986). To see the derivation clearly, first the expression for elasticity of substitution is given. The elasticity of substitution can be expressed as the percentage change in relative shares of imports from two different sources due to a one per cent change in the relative prices of the same product from these two sources:

²⁰ The elasticity of import demand is $\frac{\Delta M_{ijk}}{M_{ijk}} = \eta_i^m \frac{\Delta P_{ijk}}{P_{ijk}}$

$$\sigma_M = \frac{\Delta\left(\sum_k M_{ijk} / \sum_K M_{ijK}\right) / \left(\sum_k M_{ijk} / \sum_K M_{ijK}\right)}{\Delta(P_{ijk} / P_{ijK}) / (P_{ijk} / P_{ijK})} \quad (9)$$

where k denotes imports from EU and K denotes imports from the rest of the World. Equation (9) can be expanded, and through substitutions and rearrangements be used to obtain the expression for trade diversion, which is expressed as:

$$TD_{ijk} = \frac{M_{ijk} \frac{\sum_k M_{ijk} \sum_K M_{ijK} \frac{\Delta(P_{ijk} / P_{ijK})}{P_{ijk} / P_{ijK}} \sigma_M}{\sum_k M_{ijk} \sum_K M_{ijK} + \sum_k M_{ijk} \frac{\Delta(P_{ijk} / P_{ijK})}{P_{ijk} / P_{ijK}} \sigma_M}}{\sum_k M_{ijk} \sum_K M_{ijK} + \sum_k M_{ijk} \frac{\Delta(P_{ijk} / P_{ijK})}{P_{ijk} / P_{ijK}} \sigma_M} \quad (10)$$

Equation (10) can be simplified to the case of an EPA. The relative price movement terms in the equation as noted in Laird and Yeats (1986) capture the movement due to changes in tariffs or the ad valorem incidence of non-tariff distortions for the EU and the ROW. Therefore, the trade diverted to the EU in the EPA, TD^{EPA} can be captured by reducing equation (10) above as follows:

$$TD^{EPA} = \frac{M^{EU} M^{ROW} \left(\frac{1+t_{EU}^1}{1+t_{EU}^0} - 1 \right) \sigma_M}{M^{EU} + M^{ROW} + M^{EU} \left(\frac{1+t_{EU}^1}{1+t_{EU}^0} - 1 \right) \sigma_M} \quad (11)$$

Equation (11) shows the additional EU imports into the African EPA configured region such as ECOWAS over and above the increase in ECOWAS imports as a result of trade creation. There isn't necessarily a net increase in imports into ECOWAS as this involves the displacement of ROW imports into ECOWAS. M^{EU} and M^{ROW} are the current imports into the African REC configuration for EPA purposes from the EU and ROW respectively. t_{EU}^1 and t_{EU}^0 are respectively the end and initial periods import tariffs imposed on EU imports in the destination REC with $t_{EU}^1 < t_{EU}^0$. σ_M is the elasticity of substitution between EU and ROW imports into the concerned country or REC. Trade diversion then depends on the current level of imports from the EU and ROW, the percentage change (reduction in this case) of tariffs facing EU imports with those for ROW remaining unchanged and the elasticity of substitution of the imports from the two sources. The higher the value of the elasticity of substitution, the greater will be the trade diversion effects.

Trade expansion

Adding the trade creation and diversion derives the total effect on trade. As indicated in Laird and Yeats (1986), the summation in equations (8) and (10) for an importing country can be done across products and/or across sources. It is also possible to sum the results across a group of importers for single or groups of products as well as for single sources of supply or groups of suppliers.

The revenue effect

The quantification of the revenue effect using WITS/SMART model is simple. In theory, the tariff revenue is given as the product of the tax rate (tariff rate in this case) and the tax base (the value of imports). Thus, before the change in the ad valorem incidence of the trade barriers, the revenue is given as:

$$R_0 = \sum_i \sum_k t_{ijk}^0 P_{ijk} M_{ijk}$$

After the change in the tariff rate, the new revenue collection will be given by:

$$R_1 = \sum_i \sum_k t_{ijk}^1 P_{ijk} M_{ijk}$$

The revenue loss as a result of the implementation of an EPA would then be the net effect between R_1 and R_0 which is the same as:

$$RL = \sum_i \sum_k \Delta t_{ijk} P_{ijk} M_{ijk} \quad (12)$$

The welfare effect

The WITS/SMART model estimation of welfare effects is quite simple. This is unlike the equivalent variations measurement in general equilibrium models. Essentially, the welfare effect is mainly ascribed to the consumer benefits in the importing country as a result of lower import prices²¹. This allows them to substitute more expensive domestic or imported products with the cheaper imports that are affected by the relevant tariff reduction. Increased imports leads to a net welfare gain that can be thought as the increase in consumer welfare and is measured as follows:

$$w_{ijk} = 0.5(\Delta t_{ijk} \Delta M_{ijk}) \quad (13)$$

The coefficient of 0.5 captures the average between the ad valorem incidence of the trade barriers before and after their elimination/reduction. Equation (13) assumes that the elasticity of export supply is infinite. If this is not the case, the import prices in the importing countries fall by less than the full reduction in trade barriers. Therefore, while the equation can be used to measure welfare effect, it is no longer a representation of consumer surplus alone but has some element of producer surplus (see Laird and Yeats 1986).

²¹ As emphasized in Laird and Yeats (1986), in the case of pre-existing level of imports, there is no net welfare gain in the country as the tariff reduction simply means a reallocation/transfer of revenue from the government to the consumers.