CREDIT Research Paper

No. 15/04

The Effects of the Tripartite Free Trade Area: Towards a New Economic Geography in Southern, Eastern and Northern Africa?

by

Andrew Mold and Rodgers Mukwaya

Abstract

This study evaluates the economic impact of the proposed COMESA-SADC-EAC Tripartite Free Trade Area (TFTA) on 26 African countries. It uses the global trade analysis project (GTAP) computable general equilibrium (CGE) model and database to measure the static effects of the establishment of the TFTA on industrial production, trade flows and consumption in the tripartite region. The results indicate a significant increase in intra-regional exports as a result of tariff elimination, boosting intra-regional trade by 29 percent. Particularly encouraging is the fact that the sectors benefiting most are manufacturing ones, such as light and heavy manufacturing, and processed food. Concerns have been raised that industrial production in the TFTA would concentrate in the countries with highest productivity levels - namely, Egypt and South Africa. Simulation results suggest that these fears are exaggerated, with little evidence of concentration of industries in the larger countries.

JEL Classification: F15, F47

Keywords: Tripartite free trade area, EAC, COMESA, SADC

Centre for Research in Economic Development and International Trade, University of Nottingham

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Outline

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1. Introduction

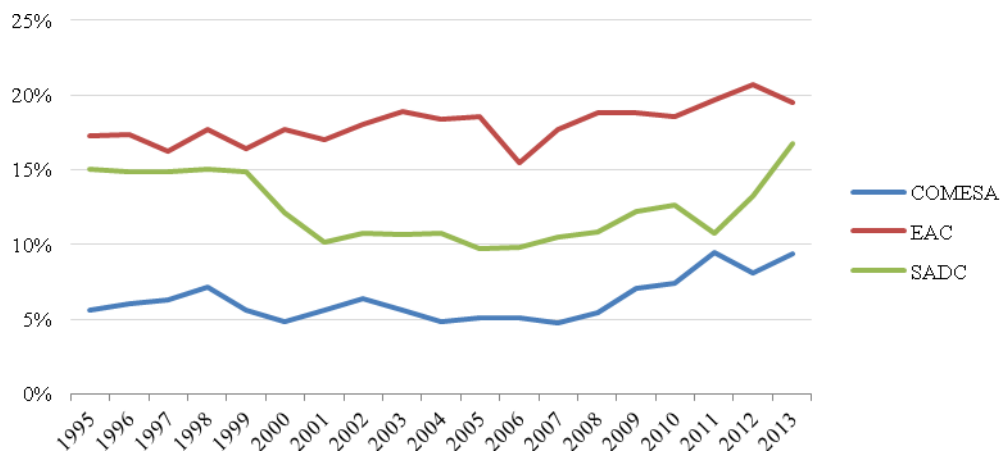
Negotiations for the formation of a Tripartite Free Trade Area (TFTA) between three existing regional economic communities - the East African Community (EAC), the Common Market for Eastern and Southern Africa (COMESA), and the Southern African Development Community (SADC) – have been ongoing since the first TFTA summit held in Kampala in October 2008. At a meeting in June 2015 in Egypt, the 26 members of the three blocks agreed to move forward to the establishment of a TFTA, coming into force in January 2016. The TFTA agreement will need to ratified by the 26 member states, and enter into force upon the ratification of the text by two-thirds of members. As of July 2015, 16 countries had signed the TFTA agreement.

The implications in economic terms are potentially enormous - it involves 26 (almost half of all Africa) countries, spanning the whole Eastern side of the continent from the Cape to the North African coast and will create Africa's largest free trade area. The TFTA area would have a total population of 638 million people and a total Gross Domestic Product (GDP) of USD 1.2 trillion at market exchange rates of 2013. As with most regional integration schemes, the underlying economic rationale of the agreement is to provide greater opportunities to reap economies of scale, greater competition, a more attractive internal market for investment (both foreign and domestic), and an acceleration of intra-regional trade. In this sense, the TFTA represents a decisive move to escape from the constraints of the balkanized economies of Africa's past. Beyond that, the agreement also has a great symbolic importance – the TFTA is expected to serve as the basis for the completion of a Continental Free Trade Area (ostensibly to be completed by 2017), with the aim of boosting trade within Africa by 25-30 per cent in the next decade, and ultimately establishing a continental-wide African Economic Community.

As stressed by the EAC Position Paper (2014), "*in opening our markets to each other, the development of regional value chains will be enhanced. We would increase intra-Africa trade, stimulate economic growth and lift people out of poverty*". It needs stressing that the current levels of intra-regional trade are low – in COMESA, intra-regional trade has oscillated in recent years between just 5-10 percent of total trade, and for SADC, intra-regional trade was actually declining in the early 2000s (from around 15-11 percent) (principally due to the sharp rise in commodity exports from the SADC region to the rest of the world) (Figure 1). Only in the EAC has there been a clear trend of rising intra-

regional trade (now in excess of 20 percent of total trade). By 2011, intra-regional trade within the TFTA accounted for just 10.7 percent of total trade of the 26 TFTA members. Compared with an integrated area like the European Union, where intra-regional trade already represented 65 percent of total trade at the onset of the European Single Market in 1993, it can be appreciated that, regardless of the differences in geography (above all, the much larger geographic span of the TFTA) and the constraints to trade because of serious infrastructural deficits, there is the potential for a significant increase in the volume of intra-regional trade under the TFTA. But what will be the economic geography implications of these changes?

Figure 1: Intra-Regional Trade as a percent of Total Trade, 2000-2013



Source: UNCTADStat, 2015

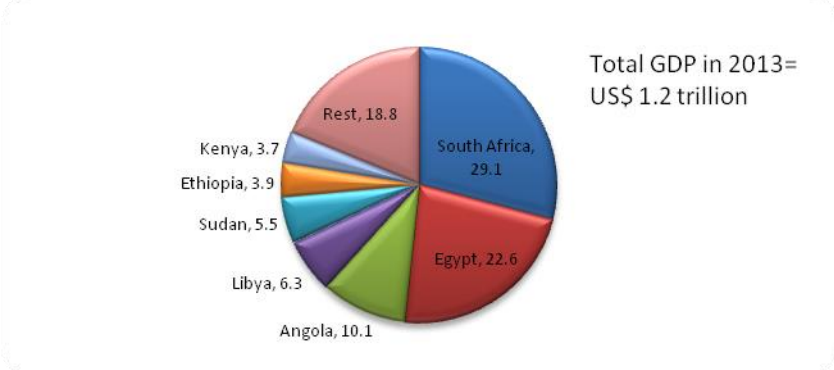
The combined GDP of the 26 countries amounted to USD 1.2 trillion in 2013, representing slightly more than half (52.5 percent) of the Africa's total GDP.[1] The combined populations of 638 million people represented 59 percent of Africa's population in 2013 (WDI, 2014). This constitutes a very significant market by any standards and collectively places the TFTA as the 16th largest economy in the world.

Not only does the TFTA span an enormous geographic area, the existing economic geography of the TFTA is highly uneven. The GDP within the TFTA is not evenly distributed – indeed, the two largest economies (South Africa and Egypt) together account for more than 50 percent of the TFTA's total GDP. The seven largest economies (South Africa, Egypt, Angola,

[1]The corresponding figures for 2011 (the year of the data included in the GTAP database 9.0 used for the subsequent simulation work in this paper) was USD 1083 billion for the GDP for the TFTA and 59.4 percent of

Libya, Sudan, Ethiopia and Kenya) together account for more than 80 percent of the GDP of the total area, the remaining 19 countries accounting for just one-fifth (Figure 2).

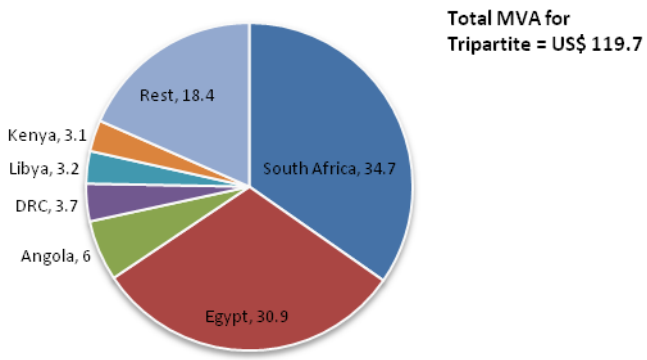
Figure 2: Distribution of GDP between 26 Members of the Tripartite Area, 2013



Source: Own Elaboration from WDI (2014)

Perhaps even more striking from an economic geography perspective is the extent to which manufacturing capacity is unevenly distributed across the TFTA. Nearly two thirds of manufacturing value added produced within the TFTA are accounted for by South Africa and Egypt (Figure 3). This raises fears that the free trade area could result in a polarization of the benefits at the two geographical extremes, at the expense of the relatively weak and undeveloped manufacturing sectors in rest of the TFTA.

Figure 3: Tripartite Manufacturing Value Added, percent Distribution, 2012



Source: UNIDO (2014)

Compounding such concerns is the fact that average productivity differences (as reflected in average GDP per capita) between the richest and poorest members of the TFTA are enormous. The richest TFTA member in 2013 (Seychelles) had an average GDP per capita

the African population.

more than 60 times that of the poorest member (Malawi) (Table 1). South African and Egyptian per capita GDP was 29 and 15 times larger than Malawi's. If we compare these differences with those existing in the EU-12 at the time of the formation of the Single Market Programme (SMP) in 1993, it will be noted that the scale of the gap is several multiples in the TFTA (Table 2).

Table 1: Per Capita GDP TFTA, 2013

Country	GDP per capita (current USD)	Multiple of lowest country
Malawi	**226.5**	**1**
Burundi	267.5	1.2
Congo, Dem. Rep.	453.7	2
Madagascar	471	2.1
Ethiopia	498.1	2.2
Eritrea	543.8	2.4
Uganda	571.7	2.5
Mozambique	593	2.6
Rwanda	632.8	2.8
Tanzania	694.8	3.1
Comoros	894.4	3.9
Zimbabwe	904.8	4
Kenya	994.3	4.4
South Sudan	1221.4	5.4
Zambia	1539.6	6.8
Djibouti	1668.3	7.4
Sudan	1752.9	7.7
Swaziland	3034.2	13.4
Egypt	3314.5	14.6
Namibia	5461.5	24.1
Angola	5668.1	25
South Africa	6617.9	29.2
Botswana	7316.9	32.3
Mauritius	9209.6	40.7
Libya	12167.4	53.7
Seychelles	14219.8	62.8

Source: Own elaboration from WDI (2014)

Table 2: Per Capita GDP EU-12 1992

Country	GDP per capita (current USD)	Multiple of lowest country
Portugal	10600	**1**
Greece	10700	1
Ireland	15400	1.5
Spain	15700	1.5
United Kingdom	19200	1.8
Netherlands	22100	2.1
Italy	22400	2.1
Belgium	23100	2.2
France	23300	2.2
Austria	24600	2.3
Germany	25600	2.4
Denmark	29000	2.7
Luxembourg	39200	3.7

Source: Own elaboration from World Bank (2014)

The purpose of this paper is to evaluate the economic effects of the proposed TFTA on industrial production, trade, and consumption in the 26 African countries. The paper will focus on the effects of the TFTA on the economic geography of the region. While several studies have explored the welfare effect of trade integration in Africa, very few specifically study the impact of integration on economic geography. The paper aims to improve our understanding of the economic impact of the TFTA in the region, as well as the distribution of benefits among member countries. The results have important implications for regional trade and industrial policy.

The paper is organised as follows: the second section provides an overview of the theoretical literature regarding industrial geography focussing on recent contributions collectively know as the 'new economic geography' and discussing its possible implications to the TFTA. The third section reviews the relevant empirical literature studying the impact of regional integration within the African continent. The fourth section describes the computable general equilibrium (CGE) model and methodology used for the simulations. The fifth section presents the results of the simulation and discusses the results. The final section makes some concluding obserations.

2. The "New Economic Geography" and its relevance to Eastern Africa

In the 1990s there were a number of interesting attempts to formalise models which analyse spatial patterns of economic activity, attempts which collective became known as the "New Economic Geography" (NEG). Contributions to this literature (e.g. Krugman and Venables 1995, Baldwin 1999) developed an (ostensibly) novel approach to the way we think about location - the emphasis being on agglomeration, on the way in which firms tend to cluster together and how regions are formed. The distinctive trait of these models was that, in contrast to the partial equilibrium models which characterised most previous analysis of industrial location, these newer contributions involved full general-equilibrium models. Wherein resource constraints were incorporated, the geographical distributions of population, demand and supply were made endogenous. The two-way feedback between location decisions by individual agents and these distributions became the focal point of interest (Krugman, 1998).

Krugman's (1991) model explicitly addresses itself to the likely impact that economic integration can have on the geographical distribution of industry, emphasising the trade-off between fixed costs, economies of scale and transport costs. It is developed in a general equilibrium framework with linear demand, cost functions and resources endowments, plus imperfect competition as a justification for trade. The specifications of the model, together with some comments on the effect of changes in some of the parameters, can be found in the aforementioned article.

The general conclusions which can be drawn from the model are, however, easily resumed. Krugman distinguishes between two regions, a centre and periphery. Before integration, trade costs are presumed to be high, and thus the distribution of manufacturing industry is dispersed between the two regions. After integration, however, trade costs fall, and this will provoke a relocation of industry. Exactly how industry reacts depends on the relative importance of trade costs and prevalence of scale economies. Were trade costs to fall to negligible levels, then the periphery may well benefit from the process of integration. Firms would be attracted to the lower costs of the periphery and would not have to face any additional access costs from being located there. But the outcome is more complicated at intermediate levels of transport costs.

If regional integration is an imperfect process, and trade costs remain considerable, Krugman hypothesizes a situation whereby it may pay to concentrate production at the location with higher costs, but better access, so as to take advantage of scale production economies. Because of the difficulty of reducing trade costs to a negligible level, Krugman foresaw the possibility of a sizeable re-allocation of industry in favour of the centre, and away from the periphery, when trade liberalisation is incomplete. Although peripheral countries are unlikely to lose overall from the formation of the Single Market (because the impact of lower consumer prices is felt no matter where the production of goods characterised by economies of scale takes place), there is thus a possibility that richer regions will gain most because of their enhanced attractiveness as locations for those industries (Barry, 1996: 348).

The conclusion that some authors (for example, Corado, 1990) drew from this is that it is necessary to deepen the integration process, so as to lower the costs of market access from the periphery and thereby make peripheral regions more attractive. Crucially, however, this interpretation relies on one's conception of whether or not trade or non-trade barriers can be eliminated, or at least minimised so as to have a negligible effect. If it is believed that significant barriers will remain, then, following the "*second-best theorem*", it may be better for peripheral countries to resist further integration.[2]

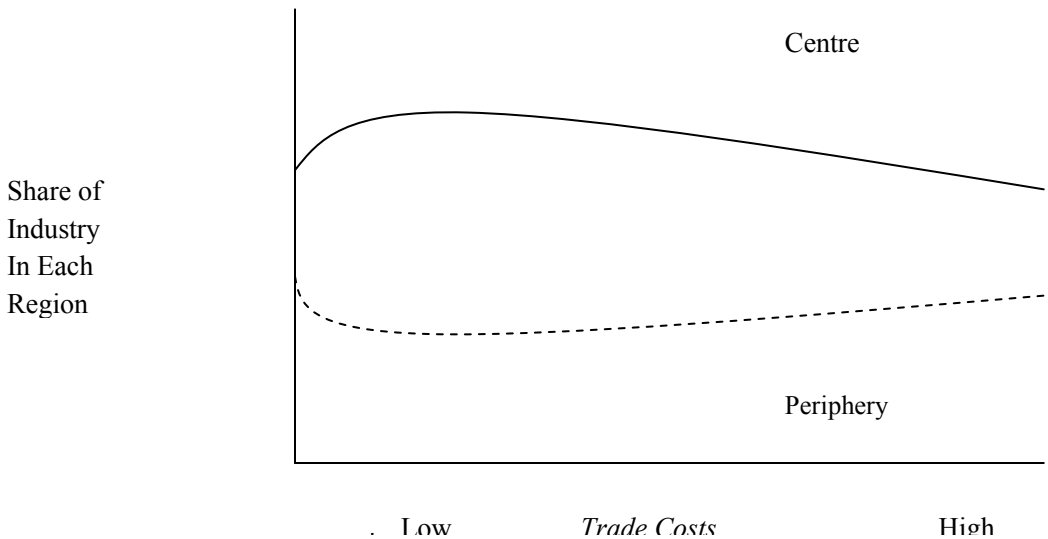
Indeed, other authors (e.g. Barry, 1996; Dignan, 1995) draw a quite different conclusion to that of Corado, warning that dedicating too many resources towards the development of transport infrastructure in the periphery could theoretically have a negative impact on the locational advantages of the peripheral regions. The advantages of a central location for industries where increasing returns are dominant would still not be overcome, and the improvement of transport provision in peripheral areas would simply facilitate access for centrally-located firms to sell their goods there.[3] This represents a powerful and polemical argument: the reasoning is born out to a certain extent by the empirical findings of Martin and Rodgers (1994) who note that, while there is a strong correlation within the regions

2 See Lipsey and Lancaster (1956). On an intuitive level, the second-best theorem infers that, if an economy suffers from two or more distortions, their effects could be partially or wholly to neutralise each other. Removal of one of them (in our case, high transport costs) could thus result in an even more inefficient outcome.

3 This argument is not in fact by any means new. In an extensive empirical study by Stöhr and Tödtling (1977), it was found that the establishment of improved transport infrastructure for peripheral regions tends to benefit central areas more by facilitating access to those areas by the larger, more competitive firms located in the central areas.

of the EU between GDP per capita, telecommunications, educational infrastructure, and the share of intra-industry trade (which they identify with the location of increasing-returns industry), there is only a weak correlation with the provision of transport infrastructure.

Figure 4. Distribution of Manufacturing Industry between Centre and Periphery



Source: Adapted from Krugman and Venables, 1990

Although most of the initial applications of the 'new economic geography' were confined to European integration, the findings have some direct relevance to Eastern Africa. Countries in the region are actively engaged in trying to reduce both transport costs, through improved infrastructure, and reducing trade costs, particularly those related to 'non-tariff barriers'. For instance, approximate estimates, by comparing FOB and CIF cost of imports suggest that trade and transport costs add 22 percent to the cost of goods for landlocked Rwanda.[4], This compares with reported estimates of international transport costs of 12.6 percent of the delivered value of exports for Africa as a whole, and a world average of 6.1 percent (UNCTAD, 2015:40). Reducing such costs has thus become a government priority, both through actions domestically and attempts to pressure trading partners to remove the impediments to the free movement of goods.

4 Authors calculations from MacroFramework_Public_Dataset-June_2015.xlsx, available at the MINECOFIN website http://www.minecofin.gov.rw/index.php?id=173 (accessed 7/7/2015)

The lessons of the new economic geography, however, suggests that one should not presuppose that such a strategy will meet with the desired impact. The reduction in 'distance costs' may help attract mobile investments, but equally it runs the risk of facilitating market access from producers based in other countries, with larger domestic markets and a greater ability to reap scale economies.

A recent World Bank (2012) report on the economic geography of the East African Community (EAC) argues just that "*implementing and deepening the current program of regional infrastructure improvements would ensure that consumers and producers throughout the region are better connected to each other and to global markets*". The same paper argues that policies should aim at "*facilitating greater economic activity in the coastal areas"* so that the EAC could '*take advantage of the global demand for manufactured goods and thus to promote employment*.' In order to emulate the example of successful 'outward oriented' trade strategies such as those adopted in East Asia, the World Bank suggests that only the coastal areas of East Africa offer a viable option with regards to the ability to build up successful export processing zones. It is affirmed that such 'clusters' would create greater demand for services and agricultural inputs from the great 'economic interior' of the EAC, so that all member countries would ultimately benefit. But it does give an impression of economic 'defeatism' with regard of the potential of the three landlocked partners (Burundi, Rwanda and Uganda) to attract a greater share of mobile investments in industrial capacity.

The other concern in a larger TFTA market is that economic activity would polarise at the extreme ends in the countries with the largest domestic markets, and therefore with greater capacity to attract increasing return industries where proximity to the bulk of clients is important. In other words, industrial activity would concentrate in Egypt and South Africa. These fears materialised themselves in different ways. Tanzania actually left COMESA in 2000 precisely because of fears that it would open the 'floodgates' to cheaper more competitive imports from Egypt (East African Trade Review, undated, accessed 7/7/2015). In any case, the new economic geography does at least alert policymakers to the possibility of 'unexpected outcomes', and that a reduction in distance costs, in all their manifestations, does not necessarily lead to the desired outcomes, in terms of ability to cataylse structural transformation and attract a greater share of industrial capacity.

3. Previous Empirical Studies on the Impact of Economic Integration in Africa

Empirical studies of regional economic integration can be divided into partial equilibrium analyses, computable general equilibrium (CGE) models and econometric studies. Although not without their detractors, CGEs are widely used because of the way they attempt to capture the interactions between sectors[5]. In a partial equilibrium setting, such interactions on relative prices and factor utilization between sectors are lost. CGE models use economic data to estimate how an economy or region might react to changes in policy or to external shocks. CGE models adopt a multi-sector and multi-region general equilibrium framework, and are able to capture interactions of different sectors and markets in a given economy and at the international level. In this brief review, given the nature of our own empirical analysis, we will focus on CGE studies on African economies.

A number of authors have focused on the effects of African continental trade agreements and customs unions. Mevel and Karingi (2012) explore the effects of the African continental free trade area and Customs Union (CU). They use the MIRAGE CGE model to study the potential effects of the FTA and the CU. They found that a continental FTA would significantly contribute to increasing trade within the African continent. They also found that the formation of a continental CU would not result in any additional increase in intra-African trade, as compared to the FTA.

Cheong et al. (2013) also used the MIRAGE CGE model to assess the economic impacts of establishing the continental FTA, with a focus on the effects of regional integration on agricultural production and employment. The results indicate that, for Africa as a whole, the establishment of regional FTAs would increase continental exports, real income, and real wages for all categories of workers, although the estimated changes are small. The formation of a larger FTA at the continental level would amplify these gains. In particular, agricultural and food exports would be significantly stimulated following the removal of relatively high tariff barriers, and unskilled workers employed in agriculture would see their purchasing power enhanced. Intra-African trade as a share of Africa's

5 Because the framework tends to focus on the long run, which often abstracts from short-run realities of structural rigidities in developing countries, such as 'missing' or inefficient factor markets, some scholars have argued that they may not be appropriate for analysing the problems of the typical developing country (e.g., De Maio et al., 1999: Charlton and Stiglitz, 2004).

total trade would increase by about 50 percent over a 12-year period, from 10.2 percent in 2010 to 15.5 percent in 2022.

Minor and Mureverwi (2013) use the GTAP CGE model to determine the impacts of several proposed trade agreements – such as the completion of the regional integration with SADC, the TFTA and the African Continental Customs Union - on Mozambique's poorest households. They find that the poorest agricultural households gained real income because of increased sugar prices, as exports to Kenya increased. The top two quintiles in both rural and urban areas also gain real income because of higher rents on capital in the agricultural sectors. In contrast, poor urban households (second and third quintiles) experience a negative impact on real incomes. With respect to the African Continental-wide CU, they found a negative impact on Mozambique, with poor households (those in the first three quintiles) bearing a disproportionate burden.

Hallaert (2007) uses a CGE model to evaluate the impact of the SADC FTA on Madagascar's economy. He finds that the SADC FTA would have a limited impact on Madagascar’s real GDP. However, Madagascar’s trade and production pattern would change, benefiting the textile and clothing sector. Dimaranan and Mevel (2008) estimate the potential impact of the formation of a COMESA customs union through the use of the MIRAGE CGE model and the GTAP database. They find that the customs union would result in overall expansion of trade in the region. However, the customs union would also hurt some members in terms of lost revenue and large terms of trade losses. Mashayekhi et al. (2012) analyse the impact of further regional trade liberalisation on the SADC region. They use the GTAP CGE model to analyse the effects of further regional integration, finding a positive welfare effect on the region and a positive employment effect from the elimination of intra-SADC tariffs.

In one of the most comprehensive recent analyses specifically focused on the TFTA, Willenbockel (2013) estimates the welfare effect, using a GLOBE CGE model and the GTAP database. Assuming a complete tariff liberalization between the three blocs, he finds that the FTA leads to a welfare benefit of USD 578 million. However, under the most ambitious TFTA scenario, which combines complete tariff liberalization for intra-TFTA trade with a reduction in non-tariff trade barriers, the projected aggregate net benefit for the TFTA group rises to over USD 3.3 billion per annum. This represents

more than five times the gains resulting from full intra-TFTA tariff liberalization alone. In this most ambitious scenario, the total volume of intra-TFTA trade is boosted by USD 7.7 billion, an increase of nearly 20 per cent. Significant sectoral production effects with corresponding significant implications for sectoral employment are concentrated in a sub-set of sectors, including primarily sugar products with backward linkage effects to sugar cane production, beverages and tobacco and light manufacturing, and to a lesser extent for some TFTA countries in textiles, metals and metal production, and chemicals.

It is worth stressing that all these CGE models are highly sensitive to the parameters used and the model closures employed. For example, smaller Armington trade elasticitiesresult in lower welfare gains from liberalization, while the larger trade elasticities result in larger gains (Hertel, 2002)[6]. Likewise, differences in CGE model closures can have significant effects on the model results, i.e. in closures that fix the trade balance, or real wages to proxy for unemployment.

Because all the studies discussed above have used different versions of the database and variations in the model closure, the results from these studies vary. Dimaranan and Mevel (2008); Mevel and Karingi (2012); Cheong et al. (2013); Minor and Mureverwi (2013); and Willenbockel (2013) used the fixed balance of trade model closures. In this model, investment is fixed, and the supply of savings is also fixed. According to Burfisher (2011), this type of closure is suitable for the study of countries in which government policies influence savings rates to achieve targeted investment levels. In this model, simulation results will show increased demand for consumer goods, like groceries, apparel, and consumer electronics. The savings-driven model will result in an increase in production of goods preferred by investors, such as machinery and equipment.

The choice between full employment and unemployment closures also has implications for the results. In a model with an unemployment closure, the wage rate is fixed, and TFTA can lead to a change in the labour supply. In this model, an increase in the size of the labour force implies that previously unemployed workers find new employment

[6] An *Armington elasticity* represents the elasticity of substitution between products of different countries, and is based on the assumption made by Armington (1969) that products traded internationally are differentiated by country of origin. The Armington assumption has become a standard assumption of international computable general equilibrium models.

(Burfisher, 2011). The full employment closure assumes that all workers are fully employed, before and after any economic shock because wages adjust to clear the market. Mashayekhi et al. (2012), Hallaert (2007) and Minor and Mureverwi (2013) use the unemployment closure, which allowed for unemployment in unskilled labour, while the other papers discussed assumed full employment in the region. Because there is no theoretical framework for choosing between closures, the choice of closure should be justified by the structure of the economy under investigation.

4. Model Data and Specification

We use the GTAP 9 data base which describes global bilateral trade patterns, production, consumption and intermediate use of commodities and services. The underlying data in the GTAP 9 database refers to a 2011 baseline. This represents a marked improvement on the previous GTAP 8 database, which included less regional detail and was based on 2007 input-output data. The model is run using an aggregation that includes the 16 regions included within the GTAP model, countries which make up the TFTA region and 10 aggregated sectors.[7]

The standard GTAP model assumes perfect competition and constant returns to scale in production (Hertel et al., 2007). The functional forms are nested constant elasticities of substitution (CES) production functions. Land, labour (skilled and unskilled) and capital substitute for one, and composite intermediates substitute for value added at the next CES level (with fixed proportions applying in the standard model). Land is specific to agriculture in the GTAP database, and has imperfect mobility amongst alternative agricultural uses. A Constant Elasticity of Transformation (CET) function is employed to allow land to be transformed from one use to another. The closer the transformation elasticity is to zero, the more unresponsive land supply is to changing relative returns to land across agricultural uses. In the default GTAP closure, labour and capital are assumed to be mobile across all uses within a country and immobile internationally. Bilateral international trade flows are modeled to follow the Armington specification by which

[7] All countries in the TFTA are covered by the current GTAP database, but some are included as 'composite' regions (e.g. South Central Africa includes both Angola and the Democratic Republic of Congo). See the AppendixTable 3 for a list of the different GTAP regional groupings.. The only country for which results have not been simulated in Libya – Libya is included in a composite region called 'Rest of North Africa' which includes Algeria (which is not a member of the TFTA). .

products are differentiated by country of origin. These Armington elasticities are the same across regions but are sector-specific, and the import elasticities have been estimated at the disaggregated GTAP commodity level.

The standard GTAP closure assumes that the levels of each region's employment of productive factors is fixed in aggregate, and that the regional balance of trade is determined by the relationship of regional investment and savings, where international capital mobility seeks to equalize rates of return across regions. Our study uses the unemployment closure - fixed wages - for the TFTA and the Rest of Africa regions, while allowing for flexible wages in high income countries. This way the model mimics the high levels of underemployment prevalent within Africa. The simulation involves completely eliminating tariffs on trade between TFTA members.[8] We also use the standard GTAP savings-driven model where changes in savings rates drive investment.

5. Simulation Results and Discussion

The simulation results suggest that the benefits from the full implementation of the TFTA could be highly significant, resulting in a boost to intra-regional trade of nearly a third (29.2 percent). Total intra-regional trade would rise by USD 8.5 billion. Increases in intra-regional trade would be particularly strong in heavy manufacturing, light manufacturing and processed foods, which would see intra-regional trade increase by 3.3, 2.6 and 1.8 billion USD respectively (Figure 5). In percentage terms, these represent very significant boosts to intra-regional trade, raising the share of intra-TFTA exports from approximately 9.3 to 11.8 percent of total exports.[9]

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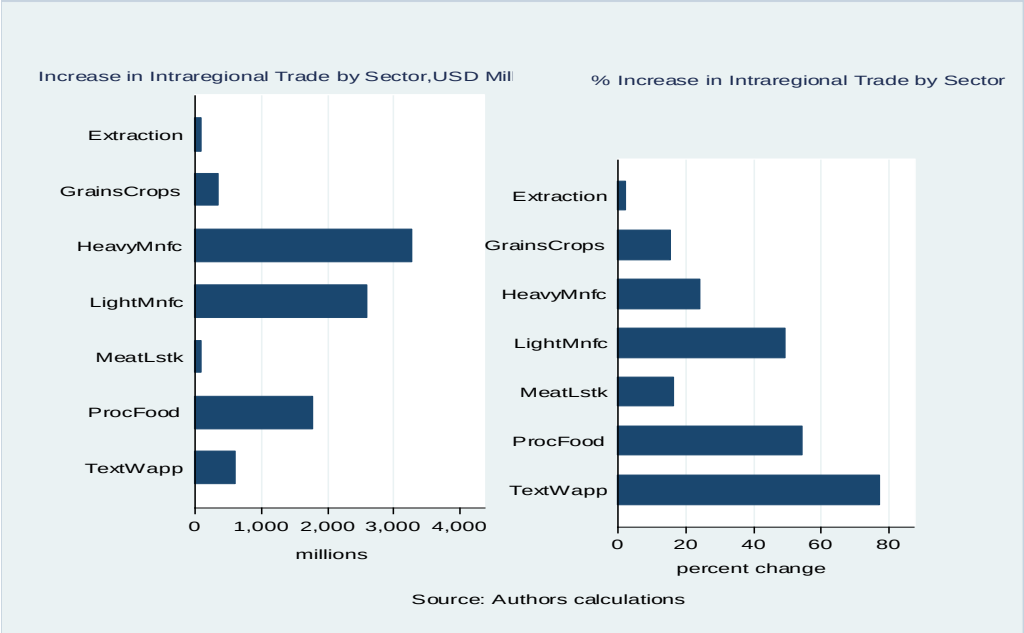
[8] No adjustments are made to existing external tariffs on trade - although there is of course the possibility of eventually negotiating a common external tariff, because of uncertainty about how these would be set, for simulation purposes it was considered better to maintain the tariffs which exist in the model for 2007.

[9] These figures are somewhat at variance with the figures presented by Andriamananjara (2015). The magnitudes in his analysis of merchandise exports, derived from the World Bank WITS database, broadly concurs with our own. He notes among the members of the TFTA have steadily increased from $2.3 billion to $36 billion between 1994 and 2014—more than a 12-fold increase over 20 years. But his share of intra-regional trade in total exports, at 25 percent for 2014, is way out of line with the data provided in the GTAP database, and also the earlier data cited in Figure 1 from UNCTADStat, which suggests an intra-regional TFTA trade of 10.7 percent for 2011 - closer in line with our initial figure of 9.3 percent from the GTAP base data. UNCTADStat numbers do in fact reveal a sharp increase in intra-TFTA trade in 2013, up to 14.4 percent. But even still, a jump to 25 percent in one year is not really plausible. The problem resides in the way direction of trade statistics vary sharply according to the source. Often intermediate destinations are confused with final destinations. So, for instance, Rwandan tea sent for auction to Mombasa (Kenya) for sale, are often classified as an export to Kenya - yet in fact the ultimate purchaser may well be in Europe. Problems like this plague direction of trade statistics.

Moreover, the cost of the removal of tariffs, in terms of government revenue foregone, would be relatively modest. This reflects the fact that a lot of intra-regional trade is already facing low average tariffs, due to the gradual implementation of EAC, COMESA and SADC (Table 3). Tariff revenue for the whole of the TFTA in 2011 amounted to USD 21.736 billion, but intra-tripartite accounted for only 6.3 percent (or USD 1.45 billion) of that total (Figure 6).

Figure 5: Changes in Aggregate Intra regional trade



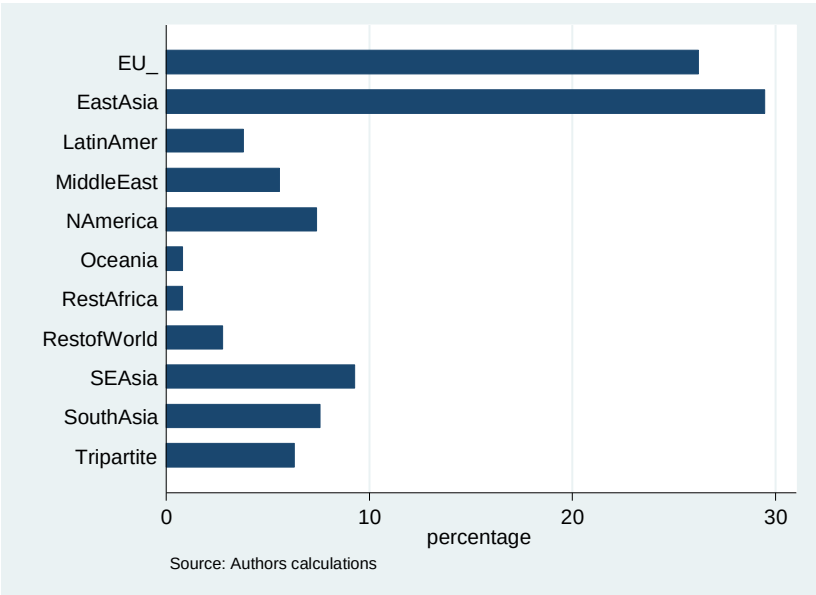
Most tariff revenue is currently coming from imports from the European Union and East Asia, and this revenue of course would be unaffected by the tariff reductions. The sectors that would benefit most from the elimination of tariffs on intra-regional trade are precisely the ones that consensus opinion believes are the ones that would help create more employment and a vibrant domestic industry, i.e. light and heavy manufacturing, processed foods, and textiles and apparel. In other words, the removal of tariffs in these sectors could give a renewed impetus towards the objective of structural transformation within the TFTA.

Table 3: Pre-Simulation Tariffs according to source of imports

rTMS	1 Tripartit	2 Oceania	3 EastAsia	4 SEAsia	5 SouthAs	6 NAmeric	7 LatinAm	8 EU_25	9 MiddleE	10 RestAfr	11 RestofV
1 GrainsCrops	3.1	1.0	52.0	7.6	12.7	2.8	9.4	1.0	5.2	10.9	9.1
2 MeatLstk	2.5	0.7	15.0	2.6	4.6	0.6	1.8	0.7	1.8	15.8	117.0
3 Extraction	0.3	0.1	0.6	0.8	0.8	0.0	1.6	0.0	1.2	5.1	0.6
4 ProcFood	11.5	2.5	8.7	7.8	31.1	4.5	12.1	1.9	7.8	14.3	7.2
5 TextWapp	8.6	7.1	8.2	6.4	10.3	6.3	14.5	0.0	0.9	13.2	8.9
6 LightMnfc	6.7	19.4	2.4	3.0	8.4	0.4	9.8	0.0	1.7	10.6	3.3
7 HeavyMnfc	3.5	2.5	0.9	1.2	9.0	0.2	6.0	0.0	1.0	8.8	0.2
8 Util_Cons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
9 TransComm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10 OthServices	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Simple Average	5.2	4.7	12.5	4.2	11.0	2.1	7.9	0.5	2.8	11.2	20.9

Source: Authors Calculations

Figure 6: Share of Total Tariff Revenue according to origin of imports, Pre-Simulation

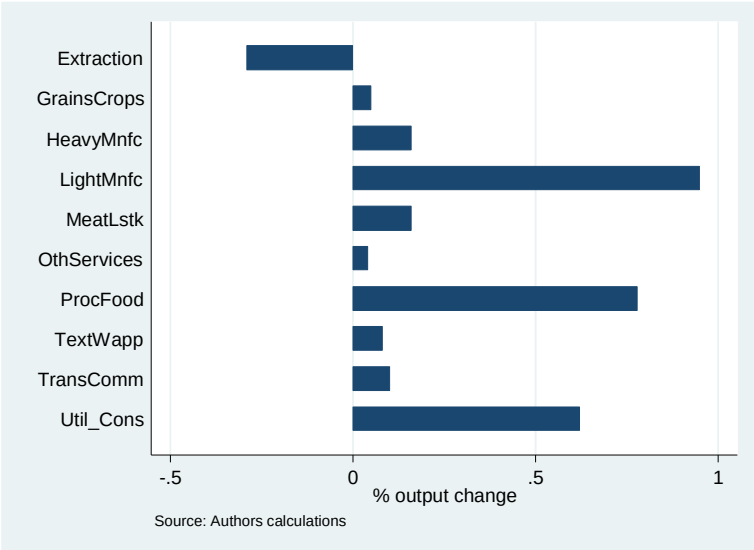


Shifts in total output after the implementation of the TFTA would be more modest than the increases in export, for the simple reason that a relatively small share of total output is currently exported in most sectors (we will discuss this more later). But once again, those increases would be most marked in the manufacturing sectors, whereas the extractive sector would actually see its output contract, as resources are reallocated towards the sectors favoured by the implementation of the TFTA (Figure 7). Again, this is desirable from the perspective of contributing to the structural transformation of the region.

In a sense, this follows the line argumentation of Cooper and Massell (1965), who postulated that by forming a trade block, developing countries could retain protection

against the 'North' in order to achieve a target level of industrialization, while reducing the cost of this industrialization by liberalizing trade amongst each other.[10]

Figure 7: Changes in Output, by Sector (%), Post-Simulation



Of course, there is a 'cost' to the implementation of the TFTA, in terms of reducing trade with external trading partners, who do not benefit from the tariffs eliminations (Figure 8). The principal 'losers' are the principal existing trading partners - the EU-25 (who loose USD 562.7 billion of exports to the TFTA member countries) and East Asia (USD 505.9 million). As a consequence, although there is an increase in intra-regional trade of USD 8.5 billion, there is also a decline of USD 2.1 billion in external trade (imports from outside the block) which needs to be considered. Thus, approximately a quarter of the increase in intra-regional trade could be defined as 'trade diversion' (Viner, 1950) from current trading partners. Simultaneously, part of the TFTA's existing external trade with partners outside the block would be diverted towards TFTA member states. This is where the Cooper and Massell-type arguments come into play - whereby a dollar of imports from a neighbouring country may be valued in welfare and development terms more

10 The Cooper-Massell argument presumed the exploitation of scale economies by developing countries within the Customs Union specializing in different industries. In essence they were arguing that the dynamic gains from intra-regional trade, in terms of building up industrial capacity, more than compensated for any static losses from preferential liberalisation. The theoretical basis of this hypothesis is questioned by Krishna and Bhagwati (1997). In practice, however, there is a set of quite compelling empirical evidence that suggests that the 'regional route' to industrialisation is a valid one, and that the trade costs may be assumable if the industrialisation objective is to be realisable. See, inter alia, UNCTAD (2009).

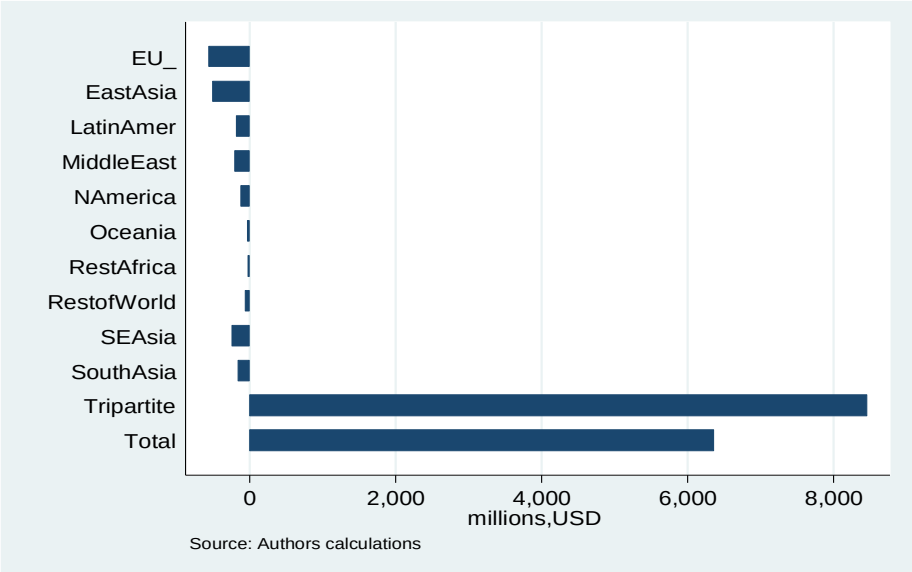
favourably than a dollar of imports from an external, higher income or more industrialised partner.

Table 4: Change in Exports (Mlns USD), post-Simulation, by Geographic Area

Exports from\to	1 Tripartit	2 Oceania	3 EastAsia	4 SEAsia	5 SouthAs	6 NAmeri	7 LatinAm	8 EU_25	9 MiddleE	10 RestAfr	11 Restof\	Total
1 Tripartite	8458.2	-45.6	-861.7	-142.2	-292.7	-653.9	-74.7	-1238.7	-293.8	-135.8	-296.9	4422.5
2 Oceania	-29.7	-2.8	23.8	-8.2	6	-3	-0.8	-0.3	1.8	0.4	0.1	-12.8
3 EastAsia	-505.9	22.3	147.1	43.8	41.3	121.1	8.9	161.7	59.3	32.8	51.6	184
4 SEAsia	-239.5	9	64.2	16.1	16.7	26.8	1.2	45.6	13.9	6.6	9.3	-30
5 SouthAsia	-157.6	2.1	22.4	4.6	8.2	34.4	2.1	54	30.3	5.8	6.6	12.8
6 NAmerica	-124.2	7.8	36.6	1.8	8.4	90.4	-3.9	91.7	31.4	16.2	23	179.3
7 LatinAmer	-178.6	1.4	55.8	0.8	6.1	38.1	8.8	54.4	15	8.9	12.5	23.2
8 EU_25	-561.7	5.4	-17.7	-3	11.5	6.2	-11.3	272.9	50.3	47.8	120.5	-79
9 MiddleEast	-207.5	-0.1	53.1	-4.6	30	11.8	-1.8	3	1	2.9	2.4	-109.8
10 RestAfrica	-23.9	-0.1	1.4	-1.6	3.1	7.4	-1.5	-4.7	-1.9	0.4	-1.2	-22.6
11 RestofWorld	-60.8	-0.6	1	-7.5	0.4	-13.5	-5.9	-2.1	-0.2	2.5	-2.3	-89
Total	6368.9	-1.2	-474	-100.1	-160.9	-334.3	-78.9	-562.5	-92.7	-11.3	-74.3	4478.7

Sources: Authors' Calculations

Figure 8: Trade Creation and Diversion through the Formation of the TFTA (mlns USD)



The result of all this is a significant rise in the share of intra-regional exports in total exports within the TFTA - albeit from very low average levels. On average, intra-regional trade within the TFTA will rise from 9.2 to 11.7 percent of total trade - and in some of the manufacturing sectors, intra-regional trade reaches around a third of all trade (Table 5). This revindicates the role of regional integration as an important engine of industrialisation (UNECA, 2015), something that is underscored by the recent experience of countries like Tanzania, who have managed to buck the regional trend of stagnation in

manufacturing precisely through exploiting regional markets (in this case, the EAC market) (IMF, 2013).

Table 5: Percentage share of Regional Exports in Total Exports, Base data (BD) and Post Simulation (PS)

	BD	PS
1 GrainsCrops	13.6	15.6
2 MeatLstk	23.1	26.5
3 Extraction	2.7	2.7
4 ProcFood	27.1	36.7
5 TextWapp	9.3	15.7
6 LightMnfc	23.5	31.7
7 HeavyMnfc	14.4	17.6
8 Util_Cons	28.3	28.6
9 TransComm	0.9	1.0
10 OthServices	1.3	1.3
Total	9.2	11.7

Source: Authors' calculations

Finally, what does this all mean in terms of welfare impact? Generally speaking, in this kind of CGE modelling, the concept of 'Equivalent Variation' is to be preferred to changes in GDP, for reasons explained in Hertel (1997). The welfare results reveal a net welfare gain of USD 2.4 billion for the TFTA through the reduction of tariffs (Table 6). Driving these results are marked improvements in both the terms of trade and endowments. The latter stems from changes in the availability of primary factors— for example, increases in the stock of agricultural land (the endowment effect). Improvements in allocative efficiency also play a significant role.[11] However, the distribution of these gains would be skewed, with nearly three quarters (72.5 percent) of welfare gains going to consumers in South Africa (Figure 9). Nonetheless, for the vast majority of countries in the TFTA welfare benefits are positive (with the exception of Kenya and Zimbabwe).[12]

[11] These results are comparable to the CGE study by Willenbockel (2013), who also found a positive welfare effect the tripartite. However, there are significant differences in his study, which estimates a welfare increase of only USD 578 million. The difference in magnitudes are mainly due the differences in model closures.

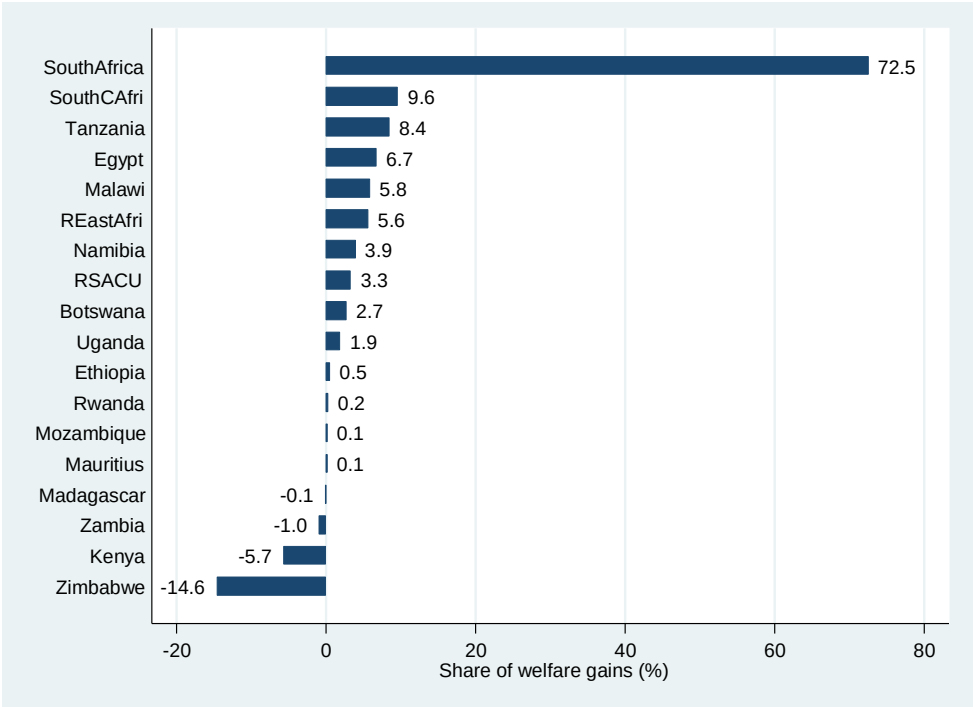
[12] While both Kenya and Zimbabwe see modest gains in allocative efficiency due to the trade liberalisation, they are also negatively impacted by terms of trade and investment/savings effects, which outweigh allocative efficiency or endowment effects.

Table 6: Breakdown of Improvements in Equivalent Variation (Welfare)

	Allocative Efficiency	Endowment effect	Terms of trade effect	Investment savings	Total
Tripartite	478.5	1096.3	727.6	45.9	2348.3
Oceania	-0.4	0	21.2	0	20.8
EastAsia	-68.9	0	-345.3	23.6	-390.6
SEAsia	-5.2	0	-47.4	3.5	-49.1
SouthAsia	-36	0	-86.9	-19.6	-142.4
NAmerica	-7	0	-108.2	-55.7	-170.9
LatinAmer	-15	0	-1.3	1.1	-15.2
EU_	-40.3	0	-285	-9.6	-334.9
MiddleEast	4.3	0	67.1	7.1	78.5
RestAfrica	-6.3	-7.9	16.6	-0.4	2.1
RestofWorld	14.9	0	40.4	3.9	59.2
Total	318.7	1088.4	-1.3	-0.1	1405.7

Source: Authors' calculations

Figure 9: Share of welfare gains by country



The Sub-Regional Dimension - Who Gains Most?

As discussed in Section 2, intrinsic to the work of authors like Krugman (1990) and Venables (1995) is the idea that the gains from regional integration are not necessarily evenly distributed - indeed, under low trade costs, regions within the regional block may undergo a process of deindustrialisation, and a concentration of the benefits in the 'core' areas of the integrated area. What is the evidence on the geographic concentration of production from the simulations with respect to the TFTA?

A key concern for smaller countries in the TFTA is that manufacturing would essentially polarise at the extreme ends of the TFTA in the countries with the largest domestic markets and highest productivity levels, namely Egypt and South Africa. Nearly two thirds of manufacturing value added produced within the TFTA are already accounted for by South Africa and Egypt. And the top five manufacturers, in value-added terms, constitute more than 80 percent of all manufacturing in the region. Would the formation of the TFTA simply exaggerate this pattern of uneven industrial development?

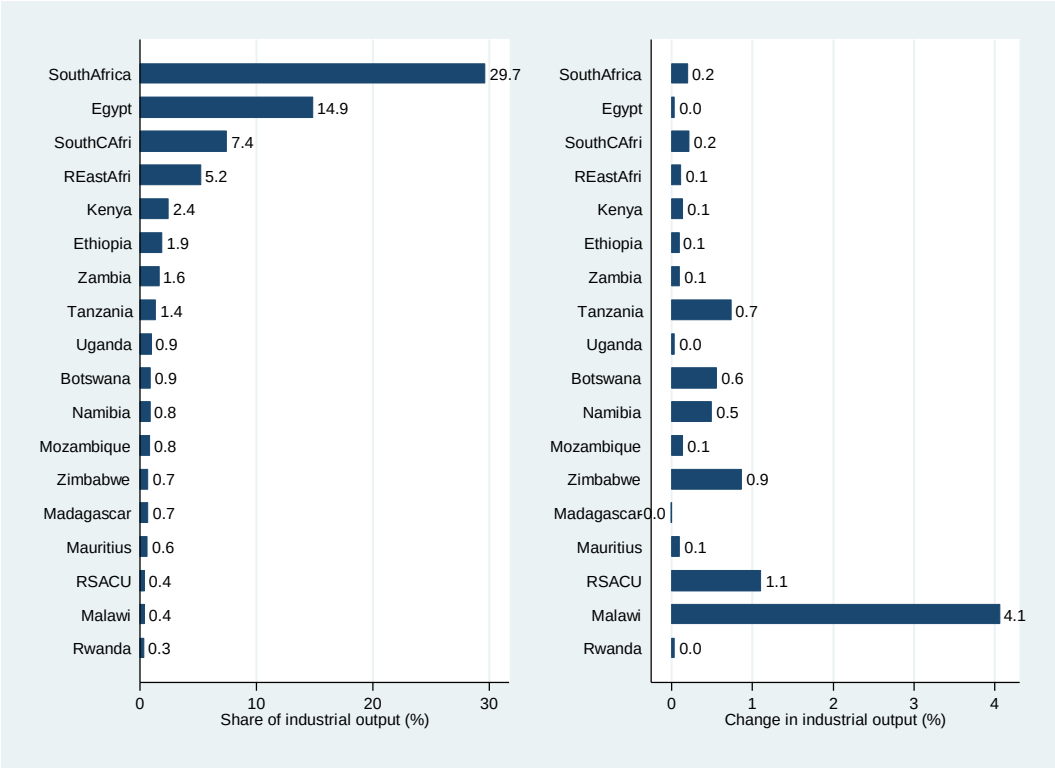
In fact, the changes in the patterns of industrial output are modest. The simulations suggest that the total volume of industrial output in the region would increase by only 0.28 percent. Relatively small changes are experienced in the largest countries in the region - in South Africa and Egypt output increases marginally by 0.21 percent and 0.06 percent, respectively (Figure 11). Industrial output in Malawi and RSACU (Lesotho and Swaziland) would increase the most – by 4.1 percent and 1.1 percent respectively.

Why are the changes in output on average so modest? The answer is quite straightforward. Even after the elimination of tariffs on intra-TFTA trade, the simulation results suggest that the level of intra-regional trade will still be low (barely 12 percent of total trade). And because, with the exception of commodity-exporting activities, traded output in many sectors is still a relatively small share of total output, it implies that the tariff changes on intra-TFTA trade alone have a relatively limited potential to change the overall pattern of growth. This in itself should allay fears of a dramatic concentration of industrial activity through the elimination of tariffs on TFTA trade. But it also highlights the fact that more would need to be done to incentivise intra-TFTA trade beyond the removal of tariff barriers. More will be said on this in the conclusions.

What about changes at the sectoral level? Which countries are likely to be affected most by sectoral shifts in industrial activity? As noted in Figure 7, changes in some sectors are more marked than for total industrial output. From the full set of results, we highlight changes in the *textile industry*, *processed foods* and *light manufacturing* because they are important in the early stages of industrial development and structural change. For example, according to UNIDO (2013), the least developed countries have great potential for industrialisation in *textiles and apparel* and *the agro-processing* industries. For

processed foods, there are significant changes (< or > 3 percent) in production in 6 of the 19 GTAP regions which comprise the TFTA. Malawi, Namibia, Botswana experience notable increases in production of *processed foods* while Uganda, Zimbabwe and Tanzania experience declines (Table 7 and appendix).

Figures 10 and 11: The share of regional Industry output by country, and the % change in volume of Industry output



For *textiles and apparel*, four countries experience significant increases in production (Botswana, RSACU[13], Tanzania and Namibia), while only two experience notable falls (Malawi and Zimbabwe). Finally, for *light manufacturing* Namibia and South-Central Africa register a significant increase in output, while Malawi experiences a significant decline. In all the other cases, the shifts in production predicted by the simulation are of relatively small magnitudes. In sum, the simulation seem to allay fears of industrial concentration - indeed, neither South Africa nor Egypt appear to be the principal beneficiaries in any of these sectors.

13 RSACU refers to the rest of South African customs union in the GTAP database - an aggregate of Lesotho and Swaziland.

Table 7: Shifts in Industrial Production within the TFTA (percent Change)

	Botswana	Egypt	Ethiopia	Kenya	madagascar	malawi	Mauritiu	Mozambique	Namibia
processed food	3.3	0.5	-0.3	-2.0	-0.1	15.4	2.3	0.4	6.0
Textiles	131.4	0.0	-0.2	2.5	0.2	-11.6	0.4	1.4	4.5
Light Mnfc	1.5	0.1	-0.3	1.8	0.0	-6.9	0.6	-0.3	6.1

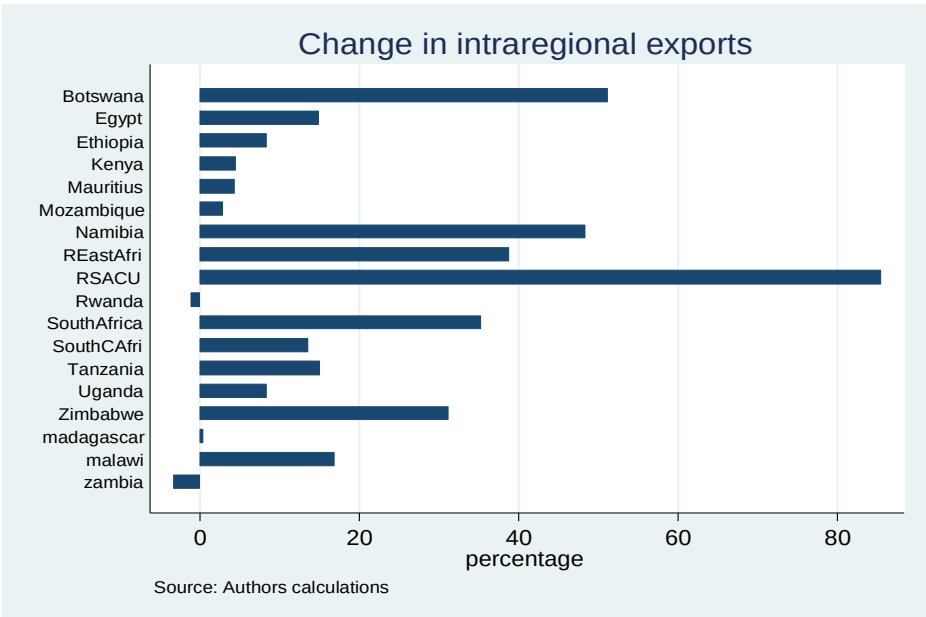
	REastAfri	RSACU	Rwanda	SouthAfrica	SouthCAfri	Tanzania	Uganda	zambia	Zimbabwe
processed food	-0.9	1.2	-0.4	2.4	-0.7	-5.4	-3.3	-0.6	-4.0
Textiles	0.2	7.1	-0.6	0.3	-0.7	6.0	-1.0	-0.2	-37.7
Light Mnfc	0.0	-0.4	-0.6	0.6	3.6	0.4	-1.4	-0.4	-0.9

Note: green and red arrows imply significant changes(< or > 3 percent)

Source: Authors' Elaboration

Once again, however, the changes in intra-regional exports are far more pronounced than the changes in output. As noted earlier, intra-regional exports increase by 29.2 percent as a result of the TFTA, driven particularly by the increase in South African exports (which accounts for 19.5 percent of total intra-regional exports). However, the distribution of the changes is not uniform - the RSACU region (Lesotho and Swaziland) register the highest increase in intra-regional exports, followed by Botswana and Namibia (Figure 12). In contrast, exports from Zambia and Rwanda to the TFTA region decrease marginally as a result of the TFTA, probably reflecting a combination of both the intense resource-based nature of their exports and relatively low productivity. None of this should detract from the fact that, at this stage at least, the principle objective of the TFTA is to promote intra-regional trade, and these simulation results suggest highly significant positive impact on intra-regional exports.

Figure 12: Percentage change in value of intra-regional exports



Trade Elasticities

Finally, CGE model results of this kind can be sensitive to assumptions relating to Armington elasticities (the elasticity of substitution between products differentiated by country of origin). The analysis of free trade areas using CGE models could result in welfare losses or gains depending on the value of the elasticities used. For example, in two studies of the USA-Australia free trade area, assumptions about the Armington elasticities led to one study reporting positive welfare effects, while the other reported welfare losses (Stoler, 2003).

The standard GTAP model uses trade elasticities econometrically estimated by Hertel et al. (2007). These elasticities are based on imports from the world into seven countries (Argentina, Brazil, Chile, Paraguay, USA, Uruguay and New Zealand) and the estimates for each product category are assumed to apply to all countries in the world. According to Valenzuela et al. (2008), poor countries may have higher trade elasticities than richer countries because they import greater amounts of less-differentiated products. To test the sensitivity of our model to different trade elasticities we changed the Armington elasticities by 100 percent (plus or minus) from the baseline values (Table 6). The results indicate robust welfare gains at the 95% confidence interval for the tripartite area, with upper limit gains of 3.5 billion USD, and lower limit of 1.4 billion USD.

Table 8: Comparison of welfare effects; standard trade elasticities vs. adjusted trade elasticities (USD, millions)

	EV (Standard Baseline Elasticity)	EV(trade elasticity varied by 100%)	Upper limit(95% CI)	Lower limit(95% CI)
Tripartite	2348.3	2415.1	3480.3	1349.8
Oceania	20.8	22.7	62.6	-17.2
EastAsia	-390.6	-415.7	-103.9	-727.5
SEAsia	-49.1	-51.3	26.2	-128.7
SouthAsia	-142.4	-149.4	-62.6	-236.2
NAmerica	-170.9	-180.2	-43.5	-317.0
LatinAmer	-15.2	-14.9	60.1	-89.9
EU_25	-334.9	-348.1	-108.6	-587.6
MiddleEast	78.5	84.5	202.2	-33.2
RestAfrica	2.1	3.4	47.7	-40.8
RestofWorld	59.2	62.6	148.3	-23.0

Source: Authors' calculations

5. Concluding Comments

This paper analysed the effect of the proposed COMESA-SADC-EAC TFTA on production and trade flows within the region using the GTAP 9.0 computable general equilibrium model. The paper focused specifically on the potential impacts on the industrial geography of the region. We started the analysis by reviewing the findings of the 'new economic geography' literature of the 1990s, and how it might relate to the process of regional integration within the TFTA area. This literature was originally directed towards discussions over the ongoing process of European integration. But because of concerns of an uneven share of the benefits from the TFTA, the literature is also particularly relevant and can hold some important insights into the prospects for the TFTA. That literature highlighted the risk that, within a process of regional integration, industrial activity could concentrate in the 'core' parts of the integrated area, to the detriment of poorer 'peripheral' countries.

Our simulation work found no evidence of that being the case (in the admittedly very different circumstances) of the Tripartite block. The results indicate a significant increase in intra-regional exports as a result of tariff elimination, boosting intra-regional trade by 29 percent (or USD 8.5 billion). Particularly encouraging is the fact that the sectors benefiting most are manufacturing ones, such as *light* and *heavy manufacturing*, and *processed food*. This would all be achieved by sacrificing USD 1.45 billion of existing tariff revenue from the intra-TFTA trade. That figure may seem large, but in reality it represents just 6.5 percent of all tariff revenue, 0.7 percent of total tax revenue, or 0.1 percent of TFTA GDP. Policymakers may well feel that that is a small price to pay in order to further their regional trade and industrialisation agendas.

The paper also addresses concerns raised that industrial production in the TFTA may concentrate in the countries with highest productivity levels - namely, Egypt and South Africa. Our simulation results suggest that these fears are exaggerated, with little evidence of concentration of industries in the larger countries. Average total volume of industrial output in the region would increase only modestly (by 0.27 percent). The results also show that smaller countries in the TFTA do not have to worry about larger countries causing reduced industrial production in their own economies. In other words, industries do not appear to shift significantly from the smaller countries to South Africa or Egypt as a result of the TFTA, as the new economic geography literature might suggest.

The welfare implications of the TFTA, on the other hand, do appear to suggest a degree of concentration of the benefits - with South African consumers being among the main beneficiaries (with an aggregate share of 72.5 percent of the welfare gains). Total welfare increases by an estimated USD 2.4 billion. Other principal beneficiaries include South-Central Africa (Angola and DRC), Tanzania and Egypt.

As interesting as they are, a few important caveats need to be placed on these simulation results. The elephant in the room with this kind of CGE simulation result is that, in the grand scheme of things, the simulation results are still delivering relatively small results. This was something observed by Fosu and Mold (2008), who noted a gradual secular decline in the magnitudes of welfare estimates produced by CGE models from trade liberalisation. The reasons are complex, but are tied up with i) more comprehensive models and databases ii) the inclusion of existing preferential market access schemes within the modelling framework iii) preference erosion. For Africa, in particular, Fosu and Mold (2008) argued that the tangible benefits from further multilateral liberalisation were likely to be quite meagre.

On the other hand, it should also be pointed out that simulations like this are likely to underestimate the benefits of the TFTA, principally because they only eliminate tariffs for intra-regional trade for TFTA members, and do not simulate any of the other (perhaps more serious) impediments to regional trade, such as infrastructure deficits and non-tariff barriers (NTBs). For the TFTA to work effectively, there is a general consensus that the elimination of NTBs is crucial.

In addition, the simulations are based on a static analysis. Benefits could be larger if economies of scale were modelled, but the distribution of benefits could also be more highly skewed, particularly in sectors where economies of scale are important. Industrial geography outcomes can be highly sensitive to presence of sector- or firm-level economies of scale, and these can be difficult to model within a CGE framework.

Finally, it needs stressing that the results are also dependent on the full implementation of the free-trade area, and contingent on resolving outstanding issues such as regional-wide rules of origin. For the rules of origin, members are yet to agree on a general value addition

rule with a threshold of 35 per cent. Issues like this need to be resolved if the TFTA is to reach its full potential. Nonetheless, our research the TFTA provides an excellent opportunity for countries in the region to increase intra-regional trade, and create a more attractive market for both foreign and domestic investment. It is an opportunity which deserves to be seized.

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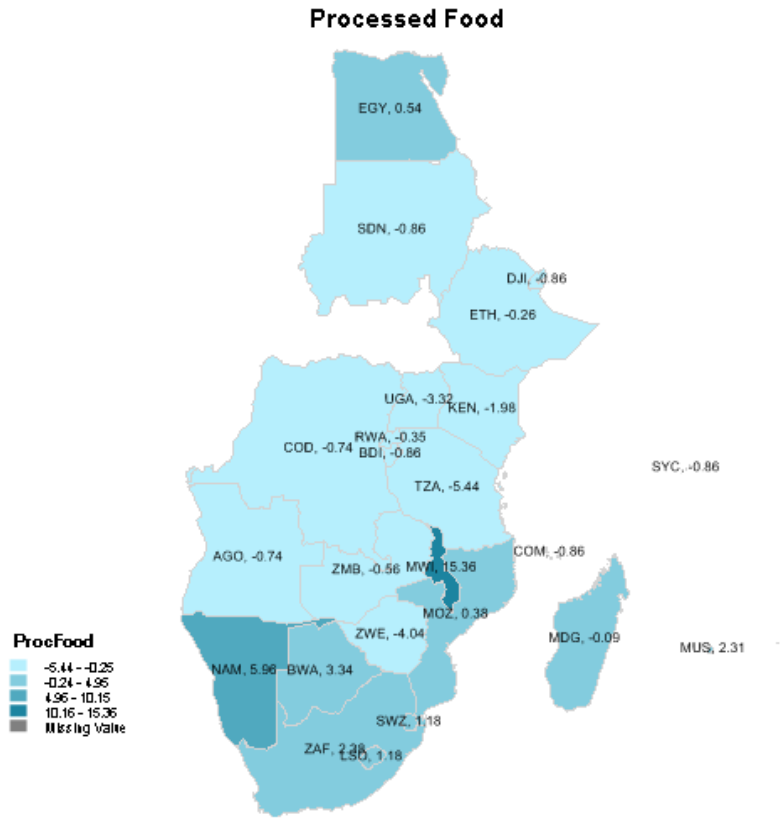
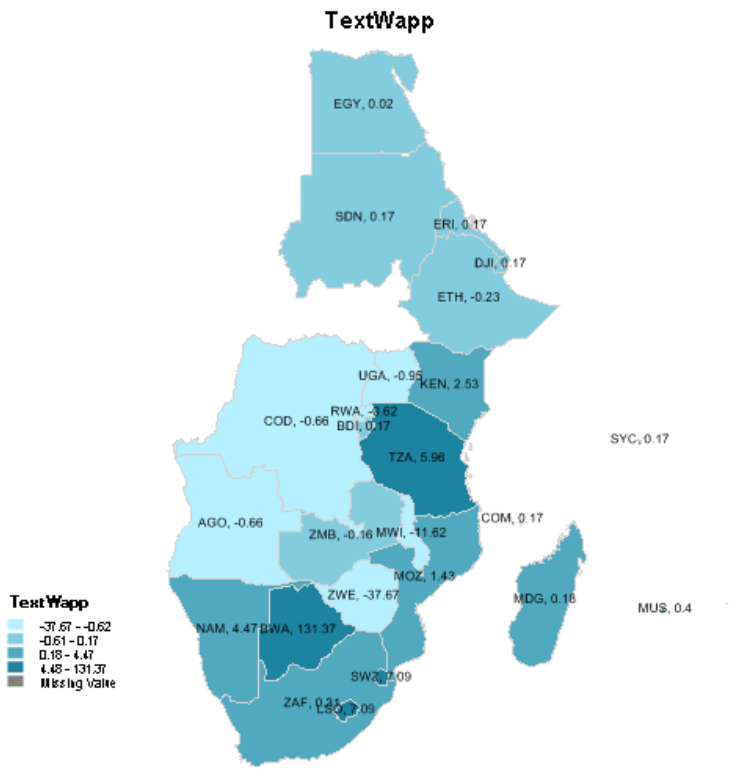
Appendix

Table 1: Changes in industry output post-Simulation (%)

qo	GrainsCrops	MeatLstk	Extraction	ProcFood	TextWapp	LightMnfc	HeavyMnfc
Botswana	0.9	-0.2	-1.1	3.3	131.4	1.5	-0.9
Egypt	0.0	0.0	-0.1	0.5	0.0	0.1	0.0
Ethiopia	0.2	0.2	0.2	-0.3	-0.2	-0.3	-0.3
Kenya	0.7	-0.2	0.5	-2.0	2.5	1.8	3.0
madagascar	0.0	0.0	0.0	-0.1	0.2	0.0	0.1
malawi	-4.0	14.9	-2.5	15.4	-11.6	-6.9	-14.8
Mauritius	1.0	-0.1	0.2	2.3	0.4	0.6	-2.3
Mozambique	0.9	-2.1	-0.1	0.4	1.4	-0.3	-0.2
Namibia	1.5	-2.8	-1.2	6.0	4.5	6.1	-4.2
REastAfri	-0.1	0.2	0.1	-0.9	0.2	0.0	0.5
RSACU	0.2	0.2	-1.7	1.2	7.1	-0.4	3.7
Rwanda	0.1	-0.2	0.2	-0.4	-0.6	-0.6	-0.1
SouthAfrica	0.0	0.3	-0.8	2.4	0.3	0.6	-0.6
SouthCAfri	-0.1	0.2	0.0	-0.7	-0.7	3.6	-1.0
Tanzania	0.6	1.1	0.8	-5.4	6.0	0.4	3.2
Uganda	1.2	-2.1	0.3	-3.3	-1.0	-1.4	1.3
zambia	-1.4	0.4	0.2	-0.6	-0.2	-0.4	0.8
Zimbabwe	7.0	-2.8	8.8	-4.0	-37.7	-0.9	20.9

Figures 1-3 Sectoral Shifts in Output post-Simulation (%)





Light Manufacturing

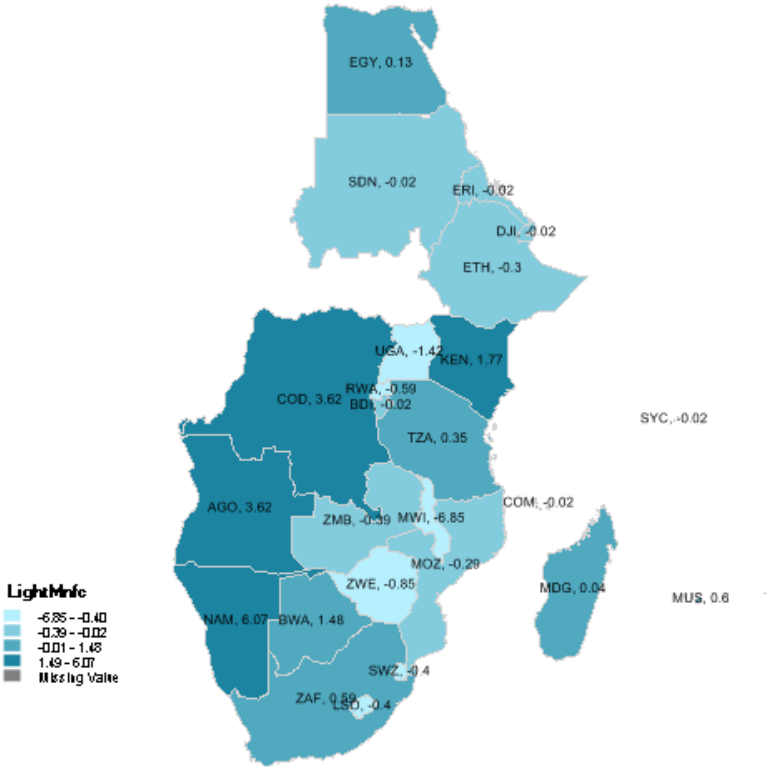


Table 2: Sector Mapping

No.	Old sector Code	Description	No.	New sector Code	Description
1	pdr	Paddy rice	1	GrainsCrops	Grains and Crops
2	wht	Wheat	1	GrainsCrops	Grains and Crops
3	gro	Cereal grains nec	1	GrainsCrops	Grains and Crops
4	v_f	Vegetables, fruit, nuts	1	GrainsCrops	Grains and Crops
5	osd	Oil seeds	1	GrainsCrops	Grains and Crops
6	c_b	Sugar cane, sugar beet	1	GrainsCrops	Grains and Crops
7	pfb	Plant-based fibers	1	GrainsCrops	Grains and Crops
8	ocr	Crops nec	1	GrainsCrops	Grains and Crops
9	ctl	Cattle,sheep,goats,horses	2	MeatLstk	Livestock and Meat Products
10	oap	Animal products nec	2	MeatLstk	Livestock and Meat Products
11	rmk	Raw milk	2	MeatLstk	Livestock and Meat Products
12	wol	Wool, silk-worm cocoons	2	MeatLstk	Livestock and Meat Products
13	frs	Forestry	3	Extraction	Mining and Extraction
14	fsh	Fishing	3	Extraction	Mining and Extraction
15	coa	Coal	3	Extraction	Mining and Extraction
16	oil	Oil	3	Extraction	Mining and Extraction
17	gas	Gas	3	Extraction	Mining and Extraction
18	omn	Minerals nec	3	Extraction	Mining and Extraction
19	cmt	Meat: cattle,sheep,goats,horse	2	MeatLstk	Livestock and Meat Products
20	omt	Meat products nec	2	MeatLstk	Livestock and Meat Products
21	vol	Vegetable oils and fats	4	ProcFood	Processed Food
22	mil	Dairy products	4	ProcFood	Processed Food
23	pcr	Processed rice	4	ProcFood	Grains and Crops
24	sgr	Sugar	4	ProcFood	Processed Food
25	ofd	Food products nec	4	ProcFood	Processed Food
26	b_t	Beverages and tobacco products	4	ProcFood	Processed Food
27	tex	Textiles	5	TextWapp	Textiles and Clothing
28	wap	Wearing apparel	5	TextWapp	Textiles and Clothing
29	lea	Leather products	6	LightMnfc	Light Manufacturing
30	lum	Wood products	6	LightMnfc	Light Manufacturing
31	ppp	Paper products, publishing	6	LightMnfc	Light Manufacturing
32	p_c	Petroleum, coal products	7	HeavyMnfc	Heavy Manufacturing
33	crp	Chemical,rubber,plastic prods	7	HeavyMnfc	Heavy Manufacturing
34	nmm	Mineral products nec	7	HeavyMnfc	Heavy Manufacturing
35	i_s	Ferrous metals	7	HeavyMnfc	Heavy Manufacturing
36	nfm	Metals nec	7	HeavyMnfc	Heavy Manufacturing

37	fmp	Metal products	6	LightMnfc	Light Manufacturing
38	mvh	Motor vehicles and parts	6	LightMnfc	Light Manufacturing
39	otn	Transport equipment nec	6	LightMnfc	Light Manufacturing
40	ele	Electronic equipment	7	HeavyMnfc	Heavy Manufacturing
41	ome	Machinery and equipment nec	7	HeavyMnfc	Heavy Manufacturing
42	omf	Manufactures nec	6	LightMnfc	Light Manufacturing
43	ely	Electricity	8	Util_Cons	Utilities and Construction
44	gdt	Gas manufacture, distribution	8	Util_Cons	Utilities and Construction
45	wtr	Water	8	Util_Cons	Utilities and Construction
46	cns	Construction	8	Util_Cons	Utilities and Construction
47	trd	Trade	9	TransComm	Transport and Communication
48	otp	Transport nec	9	TransComm	Transport and Communication
49	wtp	Sea transport	9	TransComm	Transport and Communication
50	atp	Air transport	9	TransComm	Transport and Communication
51	cmn	Communication	9	TransComm	Transport and Communication
52	ofi	Financial services nec	10	OthServices	Other Services
53	isr	Insurance	10	OthServices	Other Services
54	obs	Business services nec	10	OthServices	Other Services
55	ros	Recreation and other services	10	OthServices	Other Services
56	osg	PubAdmin/Defence/Health/Educat	10	OthServices	Other Services
57	dwe	Dwellings	10	OthServices	Other Services

Table 3: Regional Mapping

No.	Old Code	Region Description	No.	New Code	region Description
1	aus	Australia	2	Oceania	Australia, New Zealand
2	nzl	New Zealand	2	Oceania	Australia, New Zealand
3	xoc	Rest of Oceania	2	Oceania	Australia, New Zealand
4	chn	China	3	EastAsia	East Asia
5	hkg	Hong Kong	3	EastAsia	East Asia
6	jpn	Japan	3	EastAsia	East Asia
7	kor	Korea	3	EastAsia	East Asia
8	mng	Mongolia	3	EastAsia	East Asia
9	twn	Taiwan	3	EastAsia	East Asia
10	xea	Rest of East Asia	3	EastAsia	East Asia
11	brn	Brunei Darassalam	4	SEAsia	Southeast Asia
12	khm	Cambodia	4	SEAsia	Southeast Asia

13	idn	Indonesia	4	SEAsia	Southeast Asia
14	lao	Lao People's Democratic Republ	4	SEAsia	Southeast Asia
15	mys	Malaysia	4	SEAsia	Southeast Asia
16	phl	Philippines	4	SEAsia	Southeast Asia
17	sgp	Singapore	4	SEAsia	Southeast Asia
18	tha	Thailand	4	SEAsia	Southeast Asia
19	vnm	Viet Nam	4	SEAsia	Southeast Asia
20	xse	Rest of Southeast Asia	4	SEAsia	Southeast Asia
21	bgd	Bangladesh	5	SouthAsia	South Asia
22	ind	India	5	SouthAsia	South Asia
23	npl	Nepal	5	SouthAsia	South Asia
24	pak	Pakistan	5	SouthAsia	South Asia
25	lka	Sri Lanka	5	SouthAsia	South Asia
26	xsa	Rest of South Asia	5	SouthAsia	South Asia
27	can	Canada	6	NAmerica	North America
28	usa	United States of America	6	NAmerica	North America
29	mex	Mexico	6	NAmerica	North America
30	xna	Rest of North America	6	NAmerica	North America
31	arg	Argentina	7	LatinAmer	Latin America
32	bol	Bolivia	7	LatinAmer	Latin America
33	bra	Brazil	7	LatinAmer	Latin America
34	chl	Chile	7	LatinAmer	Latin America
35	col	Colombia	7	LatinAmer	Latin America
36	ecu	Ecuador	7	LatinAmer	Latin America
37	pry	Paraguay	7	LatinAmer	Latin America
38	per	Peru	7	LatinAmer	Latin America
39	ury	Uruguay	7	LatinAmer	Latin America
40	ven	Venezuela	7	LatinAmer	Latin America
41	xsm	Rest of South America	7	LatinAmer	Latin America
42	cri	Costa Rica	7	LatinAmer	Latin America
43	gtm	Guatemala	7	LatinAmer	Latin America
44	hnd	Honduras	7	LatinAmer	Latin America
45	nic	Nicaragua	7	LatinAmer	Latin America
46	pan	Panama	7	LatinAmer	Latin America
47	slv	El Salvador	7	LatinAmer	Latin America
48	xca	Rest of Central America	7	LatinAmer	Latin America
49	dom	Dominican Republic	7	LatinAmer	Latin America
50	jam	Jamaica	7	LatinAmer	Latin America
51	pri	Puerto Rico	7	LatinAmer	Latin America
52	tto	Trinidad and Tobago	7	LatinAmer	Latin America
53	xcb	Caribbean	7	LatinAmer	Latin America
54	aut	Austria	8	EU_25	European Union 25
55	bel	Belgium	8	EU_25	European Union 25
56	cyp	Cyprus	8	EU_25	European Union 25
57	cze	Czech Republic	8	EU_25	European Union 25
58	dnk	Denmark	8	EU_25	European Union 25

59	est	Estonia	8	EU_25	European Union 25
60	fin	Finland	8	EU_25	European Union 25
61	fra	France	8	EU_25	European Union 25
62	deu	Germany	8	EU_25	European Union 25
63	grc	Greece	8	EU_25	European Union 25
64	hun	Hungary	8	EU_25	European Union 25
65	irl	Ireland	8	EU_25	European Union 25
66	ita	Italy	8	EU_25	European Union 25
67	lva	Latvia	8	EU_25	European Union 25
68	ltu	Lithuania	8	EU_25	European Union 25
69	lux	Luxembourg	8	EU_25	European Union 25
70	mlt	Malta	8	EU_25	European Union 25
71	nld	Netherlands	8	EU_25	European Union 25
72	pol	Poland	8	EU_25	European Union 25
73	prt	Portugal	8	EU_25	European Union 25
74	svk	Slovakia	8	EU_25	European Union 25
75	svn	Slovenia	8	EU_25	European Union 25
76	esp	Spain	8	EU_25	European Union 25
77	swe	Sweden	8	EU_25	European Union 25
78	gbr	United Kingdom	8	EU_25	European Union 25
79	che	Switzerland	11	RestofWorld	Rest of World
80	nor	Norway	11	RestofWorld	Rest of World
81	xef	Rest of EFTA	11	RestofWorld	Rest of World
82	alb	Albania	11	RestofWorld	Rest of World
83	bgr	Bulgaria	11	RestofWorld	Rest of World
84	blr	Belarus	11	RestofWorld	Rest of World
85	hrv	Croatia	11	RestofWorld	Rest of World
86	rou	Romania	11	RestofWorld	Rest of World
87	rus	Russian Federation	11	RestofWorld	Rest of World
88	ukr	Ukraine	11	RestofWorld	Rest of World
89	xee	Rest of Eastern Europe	11	RestofWorld	Rest of World
90	xer	Rest of Europe	11	RestofWorld	Rest of World
91	kaz	Kazakhstan	11	RestofWorld	Rest of World
92	kgz	Kyrgyztan	11	RestofWorld	Rest of World
93	xsu	Rest of Former Soviet Union	11	RestofWorld	Rest of World
94	arm	Armenia	11	RestofWorld	Rest of World
95	aze	Azerbaijan	11	RestofWorld	Rest of World
96	geo	Georgia	11	RestofWorld	Rest of World
97	bhr	Bahrain	9	MiddleEast	Middle East
98	irn	Iran Islamic Republic of	9	MiddleEast	Middle East
99	isr	Israel	9	MiddleEast	Middle East
100	jor	Jordhan	9	MiddleEast	Middle East
101	kwt	Kuwait	9	MiddleEast	Middle East
102	omn	Oman	9	MiddleEast	Middle East
103	qat	Qatar	9	MiddleEast	Middle East
104	sau	Saudi Arabia	9	MiddleEast	Middle East

105	tur	Turkey	9	MiddleEast	Middle East
106	are	United Arab Emirates	9	MiddleEast	Middle East
107	xws	Rest of Western Asia	9	MiddleEast	Middle East
108	egy	Egypt	1	Tripartite	
109	mar	Morocco	10	RestAfrica	Rest of Africa
110	tun	Tunisia	10	RestAfrica	Rest of Africa
111	xnf	Rest of North Africa	10	RestAfrica	Rest of Africa
112	ben	Benin	10	RestAfrica	Rest of Africa
113	bfa	Burkina Faso	10	RestAfrica	Rest of Africa
114	cmr	Cameroon	10	RestAfrica	Rest of Africa
115	civ	Cote d'Ivoire	10	RestAfrica	Rest of Africa
116	gha	Ghana	10	RestAfrica	Rest of Africa
117	gin	Guinea	10	RestAfrica	Rest of Africa
118	nga	Nigeria	10	RestAfrica	Rest of Africa
119	sen	Senegal	10	RestAfrica	Rest of Africa
120	tgo	Togo	10	RestAfrica	Rest of Africa
121	xwf	Rest of Western Africa	10	RestAfrica	Rest of Africa
122	xcf	Central Africa	10	RestAfrica	Rest of Africa
123	xac	South Central Africa	1	Tripartite	Tripartite
124	eth	Ethiopia	1	Tripartite	Tripartite
125	ken	Kenya	1	Tripartite	Tripartite
126	mdg	Madagascar	1	Tripartite	Tripartite
127	mwi	Malawi	1	Tripartite	Tripartite
128	mus	Mauritius	1	Tripartite	Tripartite
129	moz	Mozambique	1	Tripartite	Tripartite
130	rwa	Rwanda	1	Tripartite	Tripartite
131	tza	Tanzania	1	Tripartite	Tripartite
132	uga	Uganda	1	Tripartite	Tripartite
133	zmb	Zambia	1	Tripartite	Tripartite
134	zwe	Zimbabwe	1	Tripartite	Tripartite
135	xec	Rest of Eastern Africa	1	Tripartite	Tripartite
136	bwa	Botswana	1	Tripartite	Tripartite
137	nam	Namibia	1	Tripartite	Tripartite
138	zaf	South Africa	1	Tripartite	Tripartite
139	xsc	Rest of South African Customs	1	Tripartite	Tripartite
140	xtw	Rest of the World	11	RestofWorld	Rest of World