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Article

Deep Integration in Eastern and Southern Africa: What are the Stakes?

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Abstract

Evidence indicates that trade costs are a much more substantial barrier to trade than tariffs, especially in sub-Saharan Africa. We decompose trade costs into (a) trade facilitation; (b) non-tariff barriers and (c) the costs of business services. We develop a conceptually innovative model and new dataset to assess deep integration to reduce these three types of trade costs in the East African Community, the Common Market of East and Southern Africa and South African Development Community (EAC-COMESA-SADC) 'Tripartite' Free Trade Area (FTA), within the EAC alone and unilaterally by the EAC. We find that there are substantial gains for all six of our African regions from deep integration in the Tripartite FTA or comparable unilateral reforms by the EAC; but the estimated gains vary considerably across countries and depend on the reform. Thus, countries would have an interest in negotiating for different reforms in different agreements. Tariff removal in the Tripartite FTA would produce only small losses or gains, depending on the country. Interestingly, we estimate that Kenya gains less from comparable unilateral liberalisation by the EAC than from the Tripartite FTA, due in part to an umbrella of protection in services markets in the Tripartite region.

Key words: trade facilitation, services liberalisation, regional integration, Tripartite Free Trade, East African Community, foreign direct investment

JEL classification: F14, F15, F17, O55, F55

1. Introduction

Evidence is now substantial that with the progressive global decline in tariffs over several decades, trade costs are often a much more substantial barrier to trade than tariffs.[1] Moreover, trade costs are especially high in sub-Saharan Africa compared with other regions in the world. For example, the World Economic Forum (2012) found that it is still considerably more expensive to trade with Africa than with other regions, and, in many

1 See, for example, Hummels *et al.* (2007) or Hummels and Schaur (2013).

cases, the cost of trading is a more important obstacle to trade development than trade policies.[2]

Countries in Eastern and Southern Africa, however, are attempting to address the high trade costs through regional initiatives. Notably, the proposed 26 member country Tripartite Free Trade Area (Tripartite FTA) (among the East African Community (EAC), the Common Market of East and Southern Africa (COMESA) and South African Development Community (SADC)) has programmes in place for trade and transport facilitation and the reduction of non-tariff barriers and has the objective in 'Phase II' to liberalise trade in services.[3] The members of the EAC also have initiatives within the EAC to similarly reduce trade costs.[4] In this article, we assess the impacts of deep integration to reduce trade costs in the Tripartite FTA. In order to assess the relative gains of narrowing or widening the reforms, we also assess comparable reforms by the members of the EAC applied only within the EAC and more widely if the EAC unilaterally extends the reforms to all countries, where feasible.

We decompose trade costs into three categories: costs that can be lowered by trade facilitation; non-tariff barriers and the costs of business services. Trade facilitation addresses costs such as delays at border crossing, roadblocks for trucks and the necessity to pay bribes. Regarding non-tariff barriers, recent work by Cadot and Gourdon (2014) has shown that the old command and control non-tariff barrier measures have significantly declined, but standards as barriers to trade have supplanted them in importance. Further, poor business services for trade are also a problem. Improvements in a wide range of business services such as banking, insurance, communication and professional services such as legal, auditing, engineering and computer services would also lower trade costs. This also includes poor transportation services, such as very poor or non-existent freight train services in many countries of sub-Saharan Africa, delays at ports and poor air freight services in many countries.

In this article, we build a 10 region, 19-sector global trade model. The model contains Kenya, Tanzania, Uganda, Rwanda,[5] COMESA, SADC, the USA, EU, China and Rest of the World. This article is innovative both conceptually and empirically.

Conceptual innovation is that this article is the first global trade model to numerically assess regional liberalisation of barriers against foreign direct investors in services; and it is also the first such model to assess non-discriminatory barriers that apply to both domestic and foreign service providers.[6] The literature now contains a substantial number of good studies that examine regional agreements in goods. However, given that commitments to

2 Brenton and Isik (2012) have also documented the high costs of trading in sub-Saharan Africa. See also the estimates of Hummels *et al.* (2007) and Minor (2013).

3 See http://www.comesa-eac-sadc-tripartite.org/intervention/focal_areas/trade_facilitation, Pearson (2012) and the East African Business Council progress report at http://www.eabc.info/uploads/progress_report.pdf.

4 See East African Community (2012), East African Community Secretariat (2011), World Bank (2012), and Dihel *et al.* (2010).

5 Due to lack of data, Burundi, the fifth member of the EAC, is not represented as a separate region of our model.

6 Brown and Stern (2001) and Dee *et al.* (2003) employ multi-country numerical models with foreign direct investment in services. Because their models contain only three sectors, agriculture, manufacturing and services, they are rather stylized and do not assess regional commitments.

both foreign direct investors in services and cross-border trade in services are crucial elements of modern FTA agreements negotiated with the EU and the USA, are included in the EAC, and are proposed in the Tripartite FTA, it is important to have a tool to investigate these services commitments.

The essential data problem to assess services commitments has been the lack of estimates of the ad valorem equivalents (AVEs) of the barriers to foreign suppliers of services based on assessments of the regulatory regimes in place. We developed a new database of the AVEs of barriers in 11 business services sectors in 103 countries (see Jafari and Tarr, 2015), which was aggregated to the sectors and regions of this model (Jafari, 2013c). The estimates of the AVEs were possible due to the newly released World Bank survey information on the discriminatory regulatory barriers against foreign suppliers of services on these 11 sectors in 103 countries (see Borchert *et al.*, 2014). Many results in the article depend crucially on this database of AVEs.

In addition, this article builds on or adapts the following three databases: (a) trade facilitation—the article employs the database on the time in trade costs of Hummels *et al.* (2007) and Minor (2013). We aggregate the database to the sectors and regions of our model. Although a central finding of the studies by Hummels, Minor and their co-authors is that the AVE of time in trade varies across products, most computable general equilibrium modelling of trade facilitation issues have used a single AVE across all products. We show that this more accurate database impacts the results; (b) foreign affiliate sales—we use the 'Global Database of Foreign Affiliate Sales' developed by Fukui and Lakatos (2012). In the Tripartite region, we augmented the database with independent work and (c) estimates of the AVEs of non-tariff measures (NTMs) developed by Kee *et al.* (2009).

We find that there are substantial gains for all six of our African regions from deep integration in the Tripartite FTA or comparable unilateral reforms to all countries by the EAC to reduce trade costs; but our decomposition analysis reveals that the estimated gains and the magnitudes vary considerably across countries and depend on the reform. Thus, the regions and countries have very different stakes in the various reforms and would have an interest in negotiating for different reforms in different agreements. One striking finding is that we estimate that Kenya gains less from comparable unilateral liberalisation by the EAC than from the Tripartite FTA, due in part to an umbrella of protection in services markets in the Tripartite region. For goods markets, Wonnacott and Wonnacott (1981) and Harrison *et al.* (2002) have shown that due to market access, there is the possibility of larger gains in preferential agreements than from unilateral liberalisation. This extends their result to services markets.

Karingi and Fekadu (2009), Jensen and Sandry (2011) and Willenbockel (2013) have executed general equilibrium assessments of the impacts of the Tripartite FTA. They focus either exclusively or primarily on preferential tariff reductions.[7] They find small welfare

7 Jensen and Sandry add a 2% uniform reduction in non-tariff barriers on goods and cross-border services to preferential tariff reduction. Willenbockel also executes a scenario with a 5% reduction in border crossing costs for all goods based on unpublished TradeMark South Africa estimates of border crossing costs; then the estimated gains increase to 0.4% of GDP for the Tripartite region in aggregate.

Although they do not focus or Eastern or Southern Africa, two other interesting general equilibrium assessments of trade policy changes in Africa are the following. Anderson *et al.* (2006) find that global

changes from preferential tariff reduction in the Tripartite FTA, with many countries losing and net gains of only about 0.1–0.2% of GDP. Our estimates of the impact of tariff changes are consistent with these earlier studies; but, depending on the country or region, our estimates of the gains from reductions of trade costs within the Tripartite area are about 10–30 times larger than their estimated gains of preferential tariff reduction—suggesting very different stakes.

The article is organised as follows. In Section 2, we provide an overview of the model. In Section 3, we explain the data that we have developed or used in constructing this model. The results are presented in Section 4. Sensitivity analysis is presented in Section 5. In Section 6, we conclude with a summary of the key results and the stakes of the regions of our model based on the reform.

2. Overview of the model

This article builds on the algebraic structure of the small open economy models of Rutherford and Tarr (2008), Jensen and Tarr (2010, 2012) and of Balistreri and Tarr (2011). Here we provide a general description of the structure described there and provide more details where we depart from that structure.

The key extension of the earlier models we developed of Armenia, Kenya and Tanzania is that we adopt a multi-region model, since we want to endogenously account for the 'market access' effects on exports of a reduction of import tariffs by the partner countries. Agreements to facilitate trade, lower non-tariff barriers or allow access to service providers have market access effects. Our framework allows us to explicitly evaluate the importance to the regions in our model of improved market access or reduced trade costs, as well as losses members may suffer as partner countries may raise export prices to each other.

There are 18 sectors in the model shown in Table 1. The mapping from the 57 sectors in the GTAP 8.1 dataset to sectors of our model is explained in Appendix A of Balistreri *et al.* (2014), hereafter BTY. There are three categories of sectors: (a) four perfectly competitive goods and services sectors; (b) seven imperfectly competitive goods sectors and (c) seven services sectors in which there is imperfect competition and foreign direct investment. The cost, production and pricing structures in the three categories differ widely, but regardless of sector, all firms minimise the cost of production.

Primary factors are skilled labour, unskilled labour, capital (including land)[8] and natural resources. Regarding capital, there is mobile capital and sector-specific capital in imperfectly competitive goods sectors and services sectors with FDI; and primary inputs imported by multinational service providers, reflecting specialised management expertise or technology of the firm. There is some sector-specific capital for each imperfectly competitive firm

free merchandise trade would boost real incomes in sub-Saharan Africa more than proportionately than in other developing countries; but partial liberalization proposals would capture only a small share of the gains. Mevel and Karingi (2012) analyse the removal of all tariffs on goods within the African continent as a whole. They find this would increase intra-African trade by 52%, but if trade facilitation measures are also implemented that reduce the time costs of trade by 50%, intra-African trade would more than double.

8 Given the nature of the shocks we consider (which are economy-wide), we do not believe the aggregation of capital and land has a significant impact on the results.

Table 1: List of Sectors, Regions and Factors of Production in the Eastern and Southern Africa Model

Business Services with FDI	Dixit-Stiglitz goods
Air transport	Chemicals mineral and metal products
Communication	Energy and minerals
Insurance	Food products
Business Services nec	Petroleum and coal products
Financial Services nec	Other manufacturing
Transport nec	Textile, apparel and leather products
Water transport	Wood and paper products
CRTS goods and services	Regions
Agriculture and forestry	Kenya
Other Services	Tanzania
Trade	Uganda
Utilities	Rwanda
	COMESA
Factors of production	SADC
Skilled labour	USA
Unskilled labour	European Union (EUR)
Capital	China
Natural resources	Rest of the World (ROW)

(and for firms in services sectors with FDI) for each region of the model. In the sectors where there is sector-specific capital, there are decreasing returns to scale in the use of the mobile factors and supply curves in these sectors slope up. We calibrate the elasticity of substitution between sector-specific capital and other inputs in each sector so that the elasticity of supply of the firms is consistent with econometric evidence that indicates that the supply response depends on the level of development and the technological complexity of the product.[9]

2.1 Perfectly competitive goods and services sectors

In these sectors, we employ the 'Armington' structure, with goods and services differentiated by the country of origin. Exports are also differentiated by the country of destination.

2.2 Imperfectly competitive goods sectors

For goods produced under imperfect competition, the cost, production and competition structure for firms in this group of industries follows Helpman and Krugman (1985). Goods are differentiated at the firm level. We assume that manufactured goods may be produced domestically or imported from firms in any region in the model. Firms set prices using the Chamberlinian large group monopolistic competition assumption within a Dixit-Stiglitz framework, which results in constant mark-ups over marginal cost for both foreign firms and domestic firms. Demand in all countries for these goods is characterised by the constant elasticity of substitution demand function. As the marginal utility of a good goes to infinity as the quantity goes to zero, if a variety of the good is produced anywhere, some of it will be consumed in all regions of the model. As in Harrison *et al.* (1996), we assume that there

9 See Schiff *et al.* (2002) and Schiff and Wang (2006).

is a nested demand structure, with firm level product differentiation under a national nest. Pure firm level product differentiation is a special case of this structure where the elasticities of substitution at both levels are identical. For the impact of varying these elasticities, see Balistreri and Markusen (2009) and Willenbockel (2004).

Following Krugman (1980), we assume that imperfectly competitive firms have a fixed cost of production and that marginal costs are constant with respect to output. Then, suppressing subscripts for firms, sectors and regions, total costs are

$$\mathrm{TC}(q;\, p) = q * \mathrm{MC}(p) + \mathrm{FC}(p), \tag{1}$$

where TC is the total costs, MC is the marginal costs, FC is the fixed costs, q is the output of the firm and p is a vector of factor prices. Following the literature (e.g., Helpman and Krugman, 1985), we assume that the input proportions of fixed and marginal costs are identical, from which it follows that the ratio of fixed to marginal costs is constant. That is, for all firms producing under increasing returns to scale (in both goods and services), we have

$$\mathrm{FC}(p)/\mathrm{MC}(p) = k, \text{where } k \text{ is a constant.} \tag{2}$$

Equations (1) and (2), in the Chamberlinian framework, imply that output per firm remains constant, i.e., the model does not produce rationalisation gains or losses. The number of varieties affects the productivity of the use of imperfectly competitive goods based on the standard Dixit-Stiglitz formulation. The effective cost function for users of goods produced subject to increasing returns to scale declines in the total number of firms in the industry. But, since all countries consume some of any variety that is produced, the number of varieties is determined by global demand and one country can affect the number of varieties only insofar as it affects global demand.

2.3 Imperfectly competitive service sectors in which foreign direct investment occurs

In these services sectors, we observe that some services are provided by foreign service providers on a cross-border basis analogous to goods supply from abroad. But a large share of business services is provided by service providers with a domestic presence, both multinational and local.[10] Our model allows for both types of provision of foreign services in these sectors.

The cost, production, demand and competition structure for firms in this group of industries follows the same structure as the imperfectly competitive goods firms with two differences. The first difference is that we allow multinational service firms to establish a local presence to compete with local firms directly. Multinational service firms produce a home region specific variety, which is differentiated from domestic and other home region varieties. The second difference is that downstream firms do not experience a productivity increase from additional varieties, i.e., no variety externality. Given that there are no rationalisation gains or variety externalities, the model exhibits an equivalence with respect to our policy changes to one in which all multinationals from a specific home region are in perfect competition with each other. That is, it is analogous to the Armington structure, except that production also takes place in the host country.

10 One estimate puts the world-wide cross-border share of trade in services at 41% and the share of trade in services provided by multinational affiliates at 38%. Travel expenditures 20% and compensation to employees working abroad 1% make up the difference. See Brown and Stern (2001, Table 1).

For domestic firms, costs are defined by the costs of local primary factors and intermediate inputs. When multinationals service providers decide to establish a local presence, they will import some of their technology or management expertise. That is, foreign direct investment generally entails importing specialised foreign inputs. Thus, the cost structure of multinationals differs from national-only service providers. Multinationals incur costs related to both imported primary inputs and local primary factors, in addition to intermediate factor inputs. Foreign provision of services differs from foreign provision of goods, because the service providers use local primary inputs.

For multinational firms, the barriers to foreign direct investment raise their costs of production. The reduction of the barriers lowers these costs, freeing the capital and labour that was used to overcome the barriers for use elsewhere in the economy. In our central scenario, the reduction in the constraints on foreign direct investment allows the domestic economy to capture rent rectangles. In addition, reducing barriers induces foreign entry until profits are driven to zero, so there are also triangles of efficiency gains.

3. Data of the model and evidence for key elasticities

3.1 AVEs of the barriers against foreign suppliers of business services

Our estimates in the services sectors necessitated the development of a new global database of the AVEs of discriminatory barriers against foreign providers of services. This was possible only because of the availability of a new World Bank database of survey information on the discriminatory regulatory barriers in 11 services sectors in 103 countries described in Borchert *et al.* (2014).[11] Borchert *et al.* produced 'Services Trade Restrictiveness Indices,' but did not transform their indices of the regulatory regimes into AVEs. Our methodology uses the World Bank database for an assessment of the regulatory regimes, but builds on a series of studies, supported by the Australian Productivity Commission, to convert assessments of services regulatory regimes into AVEs for all 11 sectors in 103 countries. This work is documented in Jafari and Tarr (2015). The aggregation to the sectors and regions of our model is documented in Jafari (2013c). In the cases of Kenya and Tanzania, additional information was available and the estimates are taken from Jafari (2013a) and Jafari (2013b).

3.2 Estimates of the AVEs of the costs of time in exporting and importing

In order to estimate the impact of improved trade facilitation, in this article we apply a new dataset of the time cost of trade based on the path-breaking work of Hummels and Schaur (2013) and Hummels *et al.* (2007). Using the estimates of Hummels and his co-authors, Peter Minor (2013) provided estimates for the regions and products in the GTAP database on a bilateral basis. We use estimates from Peter Minor, which we aggregate to the sectors and regions of our model, yielding the cost of trade by product and country on a bilateral trade basis. Detailed documentation of the steps we have taken and a brief explanation of the methodology may be found in Appendix C of BTY.

11 In the cases of Kenya and Tanzania, we commissioned new surveys by local law firms of the regulatory regimes in services as a basis of estimating both the non-discriminatory barriers that impact both domestic and foreign suppliers of services as well as the discriminatory regulatory barriers against foreign suppliers of services. See Jafari (2013a, b).

3.3 Estimates of the AVEs for NTMs for the regions of our model

Our estimates of the AVEs of NTMs are based on the estimates of Kee *et al.* (2009). Building on Kee *et al.* (2008), Kee *et al.* (2009) estimate the AVEs of NTMs for 105 countries at the 6 digit level. These estimates, as well as aggregated estimates for manufacturing and agriculture for the 105 countries, are available on the World Bank Web site.[12] An alternate choice of NTM estimates is Cadot and Gourdon (2014). Although the Kee *et al.* estimates should be updated, we choose the Kee *et al.* dataset due to its acceptance in the literature and the need to have non-negative estimates of the AVEs.[13]

The measure we use from Kee *et al.* is the uniform tariff equivalent that generates the same level of import value for the country in a given year, based on applied tariffs, which take into account bilateral trade preferences.[14] At the six digit level, the estimates of Kee *et al.* are sometimes subject to a substantial margin of error that may lead to misleading results in a CGE model policy analysis. Consequently, we have chosen to use the aggregated estimates of Kee *et al.* at the sector level, i.e., for each country, we have two AVEs for each country: one AVE of the NTMs in manufacturing and one AVE of the NTMs in agriculture. We then further aggregate these values for 93 countries to the regions of our model. Details are available in Appendix B of BTY. Where the non-tariff measure has a regulatory function, we assume that the estimate of Kee *et al.* is the discriminatory component of the regulation.

Although the benchmark equilibrium incorporates tariff free trade between partners in free trade agreements or customs unions, the report of the East African Community (2012) shows that non-tariff barriers remain a very significant problem. Consequently, we assume the AVEs of the non-tariff barriers apply to all countries.

3.4 Tariff and trade data

Trade data and tariff rates are taken from the GTAP 8.1 database. For tariff rates, GTAP 8.1 uses the third version of the MAcMap-HS6 database, described in Guimbard *et al.* (2012). In our benchmark dataset, we assume that free trade is fully implemented within the separate three regional trade groups EAC, COMESA and SADC. The tariff rates, and other distortion rates, for all African regions in our model are in BTY, Tables 4a–f.

3.5 Social accounting matrices

The core structural data of the model comes from the GTAP 8.1 dataset.[15] Data at the sector level on value added and its components, exports and imports and by trading partner are available in BTY.

12 The dataset is available at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:22574446~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html.

13 Nonetheless, an anonymous referee of this journal has challenged the methodology of Kee *et al.*, and, because the estimates of Kee *et al.* for NTMs are based on data for 2001, they are in need of updating. As shown in the East African Community (2012), however, non-tariff barriers remain a serious problem, and we assume that the estimates of Kee *et al.* remain valid.

14 Specifically, we take the difference between the Overall Trade Restrictiveness Index (OTRI) and for the Tariff-only OTRI (OTRI_T), which gives us the AVE of the NTMs.

15 See https://www.gtap.agecon.purdue.edu/databases/default.asp.

3.6 Share of market captured by foreign direct investors in services and by cross-border sales of services

For each country or region in our model, it was necessary to calculate the market share of foreign direct investors by source region in the business services sectors of our model as well as the share of cross-border services in each of our regions for these seven sectors. For cross-border sales of services, we use the trade data from the GTAP 8.1 dataset.

Our primary data source for foreign affiliate sales is the database developed by Fukui and Lakatos (2012). Fukui and Lakatos combine Eurostat data for 41 countries with an econometric model to estimate the missing values and thus produce estimates for all regions and sectors in the GTAP dataset. For the share of sales in the sector by the host country, we use the GTAP dataset for total sales in the sector and subtract the total of foreign affiliate sales from total sales to obtain the host country share of sales. In the case of insurance services in African regions, we used the Axco database (for a complete list of companies) and publicly available information on ownership shares of companies as our primary data sources. In the case of telecommunications services in our six African regions, we used national communications commission data and other publicly available sources on ownership of companies, taking South Africa as our proxy for SADC. Details are in Appendices D and E of BTY. In Kenya and Tanzania, professional associations of lawyers and engineers in these countries provided data on the number of professionals, both total and non-local. Details and documentation of the calculations for Kenya and Tanzania are available in Jafari (2014d).

3.7 Key elasticities

Supply elasticities are based on the estimates of Schiff *et al*. (2002) and Schiff and Wang (2006); the methodology and additional empirical and theoretical justification for the supply elasticities are provided in Jensen and Tarr (2010). Dixit-Stiglitz elasticities in services are based on estimates from Broda and Weinstein (2006). Dixit-Stiglitz elasticities in goods are the estimates of the elasticity of substitution for imports from different regions in the GTAP dataset.[16]

Armington elasticities of substitution of domestic for foreign, σ(D, M), are from the GTAP dataset. Armington elasticities of substitution of imports from different regions, σ(M, M), in the four CRTS sectors are listed in Table 5. We choose a value of 30 for the elasticities of substitution for imports from different regions based on the estimates of Riedel (1988),[17] but we perform sensitivity analysis on these parameters by substituting GTAP values in Table 5. The key sector among our four CRTS sectors in Africa is agriculture. For agriculture in Africa, the values of Riedel are supported by the estimates of Broda *et al*. (2006) for the countries in their database that are closest to the countries in our model (Malawi and

16 When derived from gravity models, the estimating equation for Dixit-Stiglitz elasticities is the same as the estimating equation for σ(M, M) in the Armington model. Compare Hummels (2001) and Hertel *et al*. (2007).

17 Riedel estimates the elasticity of demand for exports to be 30. Harrison *et al*. (1997b, Appendix C) have shown that in a multi-region Armington trade model, the elasticity of demand for exports = σ(M, M) minus a positive term that is small; so the elasticity of demand for exports is a close proxy for σ(M, M) in models of this type.

Madagascar).[18] Our value for σ(M, M) is considerably larger than those found in the GTAP database, where these elasticities are typically defined by the rule of two: $\sigma(M, M) = 2\sigma(D, M)$. It has been shown, however, that the optimal tariff in a perfectly competitive multi-region model is slightly larger than $\{\sigma(M, M)/[\sigma(M, M) - 1]\}$.[19] Thus, the optimal tariff rises as σ(M, M) decreases, and the optimal tariff in the GTAP model is about 15%. The implication that small countries have this much monopoly power on world markets in which their market share may be minimal has been a long-standing troubling implication of the Armington assumption in multi-region trade models. Our choice of σ(M, M) reduces the optimal tariff considerably.

4. Results: deep integration in Eastern and Southern Africa

As a point of reference to compare with the Tripartite FTA, we first consider what is at stake for the EAC members from narrower deep integration within the EAC alone and wider unilateral liberalisation. As members of a customs union, we assume that the EAC members act collectively on all actions in our scenarios. In our benchmark equilibrium we assume that tariff free trade prevails within each of the three regional groups of the Tripartite area, but the barriers that lead to high trade costs apply to all countries and regions. In Table 2, we show the benchmark ad valorem rates of distortion for all barriers we apply in Tanzania. Comparable tables for the other African regions of our model are available in BTY.

4.1 Deep preferential integration within the East African Community ('EAC Central')

4.1.1 Scenario definition

We execute several scenarios in our multi-region trade model to assess the impacts of the reduction in trade costs by Kenya, Tanzania, Uganda and Rwanda as members of the East African Customs Union. We include a reduction of the AVEs of three types of trade costs: time costs of trade (trade facilitation); non-tariff barriers and barriers against foreign suppliers of services. The specifics and rationale are as follows (see also Table 3).

Trade facilitation: we assume a 20% cut in the AVEs of the time cost of trade within the EAC; and a 5% cut in these costs for trade with countries outside of the EAC. We take modest cuts in these barriers for multiple reasons. One reason is that the most efficient countries in the world have positive time costs of trade. Second, part of the costs is due to infrastructure deficiencies which cannot be addressed through policy alone. There are, however, some collaborative projects and plans among members of the EAC (see East African Community Secretariat, 2011), such as common customs posts, designed to cut the time costs of trade. Since there is likely a spillover benefit of these measures within the EAC that will cut the time costs of trade outside of the EAC, we assume cuts in external trade costs as well.

18 Although Broda, Greenfield and Weinstein estimate many three digit agricultural elasticities at less than 30, there are numerous estimates with elasticities much larger, supporting the higher average central elasticity. For example higher than 30 elasticity values in Malawi are the following: dairy and honey products, 103; fruits and nuts, 103; olive oil, 125; cucumbers and mushrooms, 119. In Madagascar, fruits and nuts, 103; coffee and tea, 77; food containing cocoa, 73.

19 This formula is more complicated when σ(M, M) differs across sectors or regions, but the impact of lowered values will be the same. See Appendix C to

Table 2: Benchmark Distortions in Tanzania; Ad Valorem Values in Percentage

	Barriers against service providers									
	Discriminatory									Non-discriminatory
	Kenya	Uganda	Rwanda	COMESA	SADC	USA	EUR	China	ROW	
Business services										
Air transport	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	0.0
Communication	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	3.1
Insurance	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	17.9
Business services nec	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Financial services nec	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	14.7
Transport nec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water transport	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	0.0
	Tariff rates on goods									Non-tariff
	Kenya	Uganda	Rwanda	COMESA	SADC	USA	EUR	China	ROW	Measures
Goods										
Chemicals mineral and metal products	0.0	0.0	0.0	4.4	0.0	4.4	4.4	4.4	4.4	47.4
Energy and minerals	0.0	0.0	0.0	3.2	0.0	3.2	3.2	3.2	3.2	47.4
Food products	0.0	0.0	0.0	13.4	0.0	13.4	13.4	13.4	13.4	47.4
Petroleum and coal products	0.0	0.0	0.0	3.2	0.0	3.2	3.2	3.2	3.2	47.4
Other Manufacturing	0.0	0.0	0.0	6.3	0.0	6.3	6.3	6.3	6.3	47.4
Textile and apparel	0.0	0.0	0.0	29.7	0.0	29.7	29.7	29.7	29.7	47.4
Wood and paper products	0.0	0.0	0.0	11.6	0.0	11.6	11.6	11.6	11.6	47.4
Agriculture and forestry	0.0	0.0	0.0	11.9	0.0	11.9	11.9	11.9	11.9	22.2

Continued

Table 2: Continued

	Barriers against service providers									
	Discriminatory									Non-discriminatory
	Kenya	Uganda	Rwanda	COMESA	SADC	USA	EUR	China	ROW	
	Barriers to efficient trade facilitation on exports									
Chemicals mineral and metal products	16.2	16.1	14.2	14.0	16.1	12.9	13.7	15.9	16.2	
Energy and minerals	9.0	7.6	9.0	9.0	5.4	5.4	8.6	9.0	8.4	
Food products	12.6	15.3	16.4	12.1	13.8	7.6	14.7	9.8	13.9	
Petroleum and coal products	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	
Other manufacturing	7.8	6.4	13.1	10.2	10.2	9.4	9.3	9.8	9.6	
Textile and apparel	5.9	5.7	5.8	5.6	6.3	6.8	7.2	6.6	7.5	
Wood and paper products	8.3	15.1	11.2	10.8	9.5	5.8	6.3	4.3	15.2	
Agriculture and forestry	14.3	18.2	28.7	12.5	17.6	17.9	15.2	13.1	18.0	
	Barriers to efficient trade facilitation on imports									
Chemicals mineral and metal products	19.9	38.6	58.8	9.2	29.3	4.8	5.9	14.8	13.5	
Energy and minerals	11.7	18.9	19.8	4.5	17.3	2.6	3.9	8.2	9.2	
Food products	20.7	30.7	27.9	41.9	19.7	4.8	4.8	11.3	10.8	
Petroleum and coal products	25.9	41.9	43.9	38.1	36.0	6.0	14.1	18.0	17.8	
Other manufacturing	15.1	26.9	42.6	3.4	16.3	2.0	4.1	8.6	8.2	
Textile and apparel	6.5	12.8	13.8	5.3	15.0	2.1	3.9	5.9	7.2	
Wood and paper products	14.7	17.6	49.9	10.8	33.9	2.6	7.9	9.6	9.7	
Agriculture and forestry	19.8	34.7	54.2	20.4	30.3	8.7	9.0	17.9	15.6	

Non-tariff barriers: we assume a modest 20% cut in the AVE of the non-tariff measures. Under the auspices of the EAC, the member countries are undertaking collaborative efforts to reduce non-tariff barriers (see, for example, East African Community, 2012). Non-tariff measures, however, have become much more subtle in the post-Uruguay Round world. Most measures have a legitimate regulatory function and distinguishing the legitimate regulations from protective or inefficient regulations is complicated. We elaborate in Section 6.3 on an approach to reduce these barriers. Consequently, we take a more modest 20% reduction in the AVE of these barriers.

Barriers on foreign providers of services: we take a 50% cut in these barriers. On 1 July 2010, the EAC adopted a Common Market protocol that called for the free movement of services within the five member states, along with the free movement of goods, capital and labour.[20]

4.1.2 Aggregate welfare effects of deep preferential integration by the East African Customs Union

Our aggregate results for Kenya, Tanzania, Uganda and Rwanda are presented in Table 3. Under the column labelled 'EAC Central,' we report our findings for the impacts of combined cuts in trade facilitation, non-tariff barriers and services barriers. The welfare gains are presented as Hicksian equivalent variation (EV) as a percent of consumption. All results in Table 3 are estimated annual gains that are repeated every year. Thus, if x is the Hicksian EV as a percent of consumption for 1 year, the present value of the gains into the infinite future are the equal to $x^*[(1 + d)/d]$, where d is the discount rate for future gains. For example, with $d = 7\%$, the present value of the gains would equal 15 times the values presented in Table 3.

We find that all four EAC countries gain from this deep integration, with gains ranging from a low of 0.9% of consumption in the case of Tanzania to a high of 1.4% of consumption in the case of Rwanda. The welfare impact on COMESA and SADC of deep integration within EAC is imperceptible. To examine the source of these gains in the EAC, we execute three additional scenarios in which we allow only one of the reforms to be implemented in each case.

4.1.3 Preferential reduction of time in trade costs by EAC

In the case of deep preferential integration within the EAC, the reduction in time in trade costs constitute the largest share of the gains—about two-thirds of the total gains in the cases of Kenya and Tanzania, but over 80% of the gains in the cases of Uganda and Rwanda. In all scenarios shown in Table 3, we assume that all three types of trade barriers consume capital and labour in the home country. For example, reduction of the time in trade costs by 20% within the EAC and by 5% for countries outside the EAC leads to freeing up of 20% of the capital and labour devoted to overcoming the time costs of trade within the EAC on both imports and exports and 5% of the capital and labour devoted to overcoming the time costs of trade outside the EAC on both imports and exports. To help interpret the results, we have calculated the value of the rents recaptured by any of the policies simulated (see Table 9 of BTY). In the case of improved trade facilitation in the EAC, rents recaptured as a percent of domestic consumption are 0.37% in Kenya and 0.41% in Tanzania. These are 'rectangles' of gains. The reduction of the costs of trade results in an increase in the returns to

20 For the text of the protocol, see http://www.eac.int/commonmarket/index.php. See also Dihel *et al.* (2010) for a discussion of liberalization of professional services in East Africa.

Table 3: Summary of Results: Deep Integration in the East Africa Customs Union (EACU) and Tripartite (results are percentage change from initial equilibrium)

Scenario definition	EACU Central: (Trade Facilitation plus services and NTB liberalization)	EACU: only Trade Facilitation[2]	EACU: only services liberalization	EACU: only NTB liberalization	EACU Liberal: (Multilateral services, NTM refrom plus Trade Facilitation within EACU)	EACU Liberal: only services liberalization	EACU Liberal: only NTB liberalization	Tripartite central: Trade Facilitation plus services and NTB liberalization and tariff reform	Tripartite: only Trade Facilitation	Tripartite: only services liberalization	Tripartite: only NTB liberalization	Tripartite regional integration (only tariff reform)
Time in Trade Costs[a]	Yes	Yes	No	No	Yes	No	No	Yes	Yes	No	No	No
Time in Trade Costs[b]	Yes	Yes	No	No	Yes	No	No	Yes	Yes	No	No	No
Services Liberalization[c]	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No
Services Liberalization[d]	No	No	No	No	Yes	Yes	No	No	No	No	No	No
Non-Tariff Barriers[e]	Yes	No	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No
Non-Tariff Barriers[f]	No	No	No	No	Yes	No	Yes	No	No	No	No	No
Tariff[g]	No	No	No	No	No	No	No	Yes	No	No	No	Yes
Aggregate welfare												
Welfare (EV as % of consumption)												
Kenya	0.96	0.66	0.04	0.10	1.81	0.98	0.14	2.88	1.31	1.39	0.24	−0.33
Tanzania	0.95	0.63	0.03	0.17	7.11	1.24	5.06	2.50	1.10	0.13	0.61	0.10
Uganda	1.24	1.13	0.04	0.04	2.79	1.54	0.03	2.62	1.92	0.17	0.13	0.29
Rwanda	1.40	1.21	0.13	0.03	4.95	3.35	0.27	1.81	1.74	0.22	0.06	−0.18
COMESA	0.00	0.00	0.00	0.00	0.01	0.00	0.00	1.40	0.33	0.99	0.04	−0.04
SADC	0.00	0.01	0.00	0.00	0.01	0.00	0.00	1.10	0.56	0.23	0.03	0.17

Aggregate trade												
Aggregate exports												
Kenya	6.08	4.46	0.02	1.04	7.74	2.55	0.46	11.09	6.33	−2.31	1.49	3.80
Tanzania	5.57	2.70	−0.03	1.83	16.65	2.51	10.49	10.76	4.88	0.25	3.36	0.30
Uganda	5.17	4.88	0.02	0.06	7.97	2.96	0.05	25.76	6.86	0.12	0.15	10.97
Rwanda	9.60	8.83	0.17	0.40	20.12	9.92	1.04	12.35	10.92	0.38	0.41	0.76
COMESA	−0.01	0.00	0.00	0.00	0.00	0.00	0.00	4.59	1.82	0.85	0.28	0.54
SADC	0.01	0.02	0.00	0.00	0.03	0.00	0.02	4.05	2.30	0.05	0.12	0.86

Source: Authors' estimates

[a]20% reduction within EACU (Tripartite) countries[1].

[b]5% reduction with non-EACU (Tripartite) countries[1].

[c]50% reduction of discriminatory barriers within EACU (Tripartite)[1].

[d]50% multilateral reduction of discriminatory barriers by EACU.

[e]20% reduction of costs within EACU (Tripartite) countries[1].

[f]20% multiltateral reduction of NTB costs by EACU countries.

[g]100% removal within the Tripartite regions.

[1]Reductions apply to the EACU countries or the Tripartite countries depending on whether the scenario is EACU or Tripartite.

[2]Trade facilitation within EACU is part of the "EACU liberal" scenario also.

exporting relative to domestic sales and a decrease in the cost of imports relative to domestic production. As a result, there are also 'triangles' of efficiency gains from increased trade. Aggregate trade increases in all four EAC countries, ranging from 2.7% in Tanzania to 8.8% in Rwanda. Rents as a share of the total welfare gain range from 50% in the case of Uganda to about 83% in the case of Rwanda.

4.1.4 Reduction of non-tariff barriers within the EAC

For Tanzania and Kenya, the next most important source of gains is the reduction of non-tariff barriers within EAC by 20%. Hicksian EV increases by 0.1% in the case of Kenya and 0.17% in the case of Tanzania. Unlike improved trade facilitation, in this scenario non-tariff barriers only result in captured rents on the import value and only on EAC partner country imports. There are substantially fewer rents affected by the reduction of non-tariff barriers, compared with trade facilitation. Recaptured rents are equal to 0.016% of consumption for Kenya and 0.218% of consumption in the case of Tanzania. Because the non-tariff barriers are lower in Uganda and Rwanda, the welfare gains are only 0.04 and 0.03% of consumption, respectively. Analogous to the reduction in trade costs, the reduction of the non-tariff barriers results in a decrease in the cost of imports relative to domestic production. As a result, there are also 'triangles' of efficiency gains from increased trade. Trade increases in all four countries, with the maximum increase of 1.8% in Tanzania.

4.1.5 Preferential reduction of barriers against EAC service providers

Fifty percent preferential liberalisation of services barriers results in gains of 0.04% of consumption in the case of Kenya and 0.03% of consumption in the case of Tanzania. Only in the case of Rwanda within the EAC are the gains from services liberalisation greater than reduction of non-tariff barriers. As with other trade costs, in our central scenario we assume that it takes domestic capital and labour to overcome the costs of the barriers against foreign providers of services, both those that supply the domestic markets through FDI and also through cross-border services. Thus, there are potentially rectangles of recaptured rents from reducing the barriers on EAC foreign suppliers of services in other EAC markets. We say potential, since if there are no sales of services from partner countries initially, there are no rents to be recaptured. We calculate that the recaptured rents on FDI and the recaptured rents on cross-border sales of in services. The recaptured rents on FDI from partner countries in the EAC are equal to 0.026% of consumption in the case of Kenya and 0.006 of consumption in the case of Tanzania. There are very small flows of cross-border trade in our business services within EAC, however, so only Rwanda has a positive rent rectangle, when measured at three digits. With the reduction in the barriers on EAC suppliers of services within EAC, there are production and consumption efficiency gains, which explain the difference between the total welfare gains and the recaptured rents.

4.2 EAC unilateral liberalisation ('EAC Liberal')

The above estimates indicate that there are gains from deep integration within the EAC. With a combined nominal GDP in 2013 of only about US$121 billion (or US$297 on a purchasing power parity basis),[21] however, the EAC is not a large market, and economic theory indicates

21 In 2013, the International Monetary Fund estimated the nominal GDP of the EAC members as follows (in billions of US dollars): Kenya, 55; Tanzania, 33.3; Uganda, 22.9; Rwanda, 7.4 and Burundi, 2.7. The

that there should be substantially greater gains from integrating into the world trading environment. As a point of reference, in the scenario labelled 'EAC Liberal,' we assess the extent of these larger gains from unilateral extension by the EAC of the reforms to lower trade costs.

4.2.1 Scenario definition

In EAC Liberal, we extend the liberalisations of non-tariff barrier and services barriers implemented in 'EAC Central' to all trading partners in the world. In the case of the time in trade costs, we assume the EAC countries implement equivalent reforms to those in the EAC Deep Integration scenario to reduce the time in trade; but we do not extend these outside of the EAC on the grounds that the improvements that can be made are primarily regional and reciprocal and we already convey a 5% cut in these barriers for countries outside of the EAC. In Table 3, the results and policy changes are listed.

We see that for Kenya and Uganda, the gains are about twice as large; for Rwanda the gains increase substantially from 1.4 to 4.95% of consumption. The biggest increase in welfare is for Tanzania; the welfare gain dramatically increases from 0.95% of consumption to 7.11% of consumption. We decompose the EAC Liberal scenario to explain the differences across the EAC countries.

In the case of Tanzania, the big increase in welfare is clearly due to the broader liberalisation of non-tariff barriers. The wider liberalisation of non-tariff barriers results in a welfare gain of more than 5% of consumption, whereas the welfare gains were only 0.17% of consumption in the EAC Central case. This large increase is explained by two factors: (a) as shown in Table 2, the AVEs of the non-tariff barriers in Tanzania are 47.4% in manufacturing and 22.2% in agriculture. This is substantially higher than the estimates for the other African countries or regions in our model; and (b) on a trade-weighted basis, 84.7% of Tanzania's trade is with countries outside of the EAC. Thus, the reduction of NTB barriers impacts a much larger share of trade, generating more recaptured rents and greater efficiency gains.

The other country in EAC to see much larger gains is Rwanda, but in the case of Rwanda it is due to wider services liberalisation. For Rwanda, that the AVEs of the non-tariff barriers are less than 5%, so the gains from NTB liberalisation are much smaller than in Tanzania. But the AVEs of barriers to foreign service providers are substantial, with four sectors having AVEs of between 25 and 62%. Our dataset on foreign share of services markets (see Table 6d of BTY) shows that the market share of EAC services firms in Rwanda is zero except of Kenyan insurance firms; but there is substantial foreign presence in Rwandan services from the EU, USA and ROW (with SADC having a presence in the Rwandan telecommunications and insurance sectors); so the broader liberalisation has a much larger impact.

4.3 The Tripartite Free Trade Area

4.3.1 Scenario definition

The Second Tripartite Summit in June 2011 envisioned liberalisation of trade in goods and movement of business persons in Phase I and, in Phase II, liberalisation of trade in services and related trade areas. Programmes of trade and transport facilitation and NTB removal have been launched.[22]

purchasing power parity GDP, however, was estimated by the IMF at: Kenya, 125.8; Tanzania, 84.9; Uganda, 61.9; Rwanda, 17.4 and Burundi, 7.9.

22 See Pearson (2012) and Willenbockel (2013) for details.

In our Tripartite preferential liberalisation scenario, we assume all six of our Tripartite-African regions (Kenya, Tanzania, Rwanda, Uganda, COMESA and SADC) execute identical preferential liberalisation of the time costs of trade, non-tariff barriers and services liberalisation as we implemented in the EAC Central scenario, except that the preferences apply throughout the Tripartite region. In addition, where positive tariffs exist in our benchmark dataset among the Tripartite-African regions in our model, we execute a removal of tariffs. We assume free trade within the EAC, COMESA and SADC regions separately in our benchmark. So the tariff changes only apply to the countries that previously did not apply free trade. Take Kenya, Uganda and Rwanda as examples. These three countries are members of the EAC and COMESA. So this implies there will be no change in tariffs among these three countries and no change between these three countries and COMESA. But there will be a reciprocal removal of tariffs between Kenya, Uganda and Rwanda and SADC countries that were not members of COMESA. In order to assess the relative importance of each of the four components of the Tripartite scenario, we execute four additional scenarios, where each of the three trade costs components is liberalised separately, and we also simulate preferential tariff reduction alone. The specific policy changes and results are summarised in Table 3.

4.3.2 Aggregate welfare results

For all four EAC countries, the aggregate welfare gains from deep integration in the Tripartite area are larger than deep integration within the EAC alone—ranging from 1.81% of consumption for Rwanda to 2.88% of consumption for Kenya. Gains for COMESA and SADC while substantial are significantly smaller than for the EAC countries, at 1.4 and 1.1% of consumption, respectively. While the gains for Rwanda and Tanzania fall considerably relative to EAC Liberal (or unilateral), interestingly, in the case of Kenya, the gains are larger in the Tripartite FTA than in 'EAC Liberal.' These results provide a partial rationale for why the Kenyan authorities are among the strongest supporters of Tripartite deep integration. We conduct decomposition analysis to determine the reasons for these differences.

4.3.3 Trade facilitation only results

The 'only trade facilitation' scenario shows that a significant part of the explanation for the larger gains for the EAC countries in the Tripartite FTA is the greater reduction in the time costs of trade. Because the larger reductions in the AVE of the time costs of trade extend to COMESA and SADC, there are additional captured rents and efficiency gains from the widening of the trade facilitation reforms. The simulation results reveal two aspects of the gains from trade facilitation that are not obvious.

First, for the COMESA and SADC regions, we can see that despite the fact that the reduction in the time costs of trade is an important contributor to the gains, the gains for COMESA and SADC (of 0.3 and 0.6% of consumption, respectively) are considerably less than for the four EAC countries. The reason is that the COMESA and SADC regions trade much more intensively with countries outside of the Tripartite region, where we assume there are fewer opportunities for reductions in time in trade costs. The trade-weighted import intensities of goods trade with regions outside of the Tripartite region are as follows: Kenya, 86.7%; Tanzania, 84.7%; Uganda, 70.7%; Rwanda, 63.1%; COMESA, 97.6%; and SADC, 99.3%.

Second, despite wider liberalisation in the EAC Liberal scenario, the trade facilitation gains for the EAC countries are larger in the Tripartite scenario than they are in the EAC Liberal scenario. This is because of our assumption that the trade facilitation reforms, such as road and border crossing improvements, disproportionately reduce the costs of the local countries implementing the reforms. Our Tripartite scenario widens the regions to which the larger 20% cuts apply, but the EAC Liberal scenario applies a 5% cut in these costs on trade outside of the EAC. This is part of the explanation for Kenya gaining more in the Tripartite scenario than in EAC Liberal.

4.3.4 Services liberalisation within the tripartite FTA

In the case of preferential liberalisation of services alone, the gains for the EAC countries are slightly larger than EAC alone, but very significantly reduced compared with widening the service market opening embodied in the EAC Liberal scenario (Kenya is an important exception as discussed below). This is due to the relatively low market shares of partner countries in the services sectors of the Tripartite countries. The Rwanda case is the most extreme. For Rwanda, the gains from services liberalisation increase from 0.22% of consumption under the Tripartite scenario to 3.35% of consumption under EAC Liberal. As explained above, the AVEs of discriminatory barriers to foreign service providers are substantial in Rwanda. But the main foreign service suppliers in Rwanda's are European Union suppliers followed by the USA and Rest of the World. COMESA's share in Rwanda's service markets is zero and SADC is represented in Rwanda only in telecommunications (36%) and insurance (4%). So liberalisation of services markets by Rwanda in the Tripartite FTA yields additional services suppliers and gains from COMESA and SADC only in telecommunications and insurance.

Two regions gain substantially from services liberalisation within the Tripartite FTA. One is Kenya, which, possibly surprisingly, gains more in the Tripartite 'only services liberalisation' scenario than in the EAC Liberal 'only services liberalisation' scenario (1.39 versus 0.98% of consumption). The reason is that Kenya has a significant share of the insurance markets in COMESA, where we estimate a very high AVE of the barriers to services providers (prices about double estimated unconstrained prices). The improved market access for Kenyan insurance suppliers under the protected umbrella of very high barriers creates substantial gains for insurance services suppliers from Kenya in COMESA markets. We verified this explanation by executing a scenario in which we preferentially liberalise services barriers within the Tripartite area, but exclude preferential reduction in insurance services barriers. In this scenario, the estimated gains to Kenya from 'only services liberalisation' within Tripartite fall dramatically from 1.39 to 0.2% of consumption. The theory paper of Wonnacott and Wonnacott (1981) emphasised that improved market access in export markets of goods could lead to preferential trade agreements dominating unilateral trade liberalisation; and this was demonstrated by Harrison *et al.* (2002) for goods. Our result for Kenya extends those earlier results in goods to market access in services and shows that preferential agreements can yield larger gains than unilateral liberalisation due to market access gains.

The other region that reaps substantial gains from services reform in the Tripartite area is COMESA. This is explained by the high services barriers in COMESA, especially in insurance, yielding large rent capture from liberalisation, and efficiency gains from better access to relatively efficient services suppliers.

4.3.5 NTB liberalisation

The key result is that the EAC countries have a lot more to gain from NTB liberalisation in the Tripartite FTA than does COMESA or SADC. For Uganda and Kenya, possibly surprisingly, they gain more from preferential NTB liberalisation in the Tripartite FTA than from equivalent unilateral liberalisation of EAC Liberal scenario. Similar to Kenya in services liberalisation, improved market access in goods is the explanation. Uganda's (Kenya's) AVEs of NTBs are estimated to be a 3.9 (14.6)% in agriculture and zero (0.3%) in goods. So that explains the low gains for Kenya and even lower for Uganda from unilateral liberalisation in EAC Liberal. But the EAC countries obtain preferential market access in COMESA (which has AVEs of agricultural and manufacturing NTBs of 27.5 and 20.1%, respectively) and SADC, with 4.5% AVEs of agricultural NTBs. On the other hand, for Tanzania, since 84.7% of Tanzanian goods trade is with countries outside of Eastern and Southern Africa and they have the highest AVEs of NTBs among our regions (see Table 2 and BTY), the gains under EAC Liberal from NTB liberalisation are about eight times larger than under the Tripartite FTA.

For COMESA and SADC, the gains are negligible from a cut in the AVEs of the NTBs. This is because only 2.4% for COMESA and 0.7% for SADC of their trade is with each other or the EAC countries.

4.3.6 Preferential tariff removal

Results for the preferential tariff changes in the Tripartite FTA show some regions obtain small gains and some obtain small losses, with SADC and Uganda as the main gainers. These results are consistent with economic theory, which indicates that welfare impacts from preferential tariff changes are ambiguous due to the possibility of trade diversion dominating,[23] and with prior CGE analyses of tariff changes in the Tripartite FTA. Jensen and Sandrey (2011), Willenbockel (2013) and Karingi and Fekadu (2009) all find small welfare changes. They find that South Africa is the principal gainer from preferential tariff removal, with losses for a significant share of the remaining countries in the Tripartite region. We also find that Uganda gains from the tariff changes within the Tripartite region. One reason is that agriculture exports account for about 19% of Ugandan exports, but due to its product mix, they face 32% tariffs in SADC; these are the highest tariffs applied by SADC on only sector or any region in our model. So there are significant market access gains for Uganda on agricultural exports in SADC.

4.3.7 Sector impacts: diverse impacts of trade facilitation

Previous efforts at simulating sector output and export changes from trade facilitation used uniform AVEs across sectors, which led to more uniform impacts across sectors. Our dataset has the time costs of trade varying by both product and by country or origin and destination,[24] which yields more diverse estimates of the impacts on output and exports of trade facilitation. The dataset is important in explaining results for Uganda. One of the Ugandan sectors with the highest AVE of the time costs of exporting (importing) is agricultural products, where the Ugandan AVE is about 40 (30)%, depending on the destination (origin)

23 More accurately, the tariff loss from the reduction of trade with excluded countries could dominate the efficiency gains on increased trade with partner countries. But as we have emphasized, market access gains must also be included in the calculation.

24 Due to the product mix differences across countries of the aggregated sectors of our model.

country.[25] Consequently, from trade facilitation, we estimate an expansion of agricultural output and exports in Uganda relative to other sectors in Uganda (see BTY for sector output and export changes in all regions of our model). The reduction of time costs of trade on agricultural exports allows Uganda to more effectively capitalise on the improved market access opportunities presented by the preferential market access in SADC afforded by the Tripartite FTA.

4.4 Adjustment costs and the political economy of regional trade liberalisation

We find that, in general, preferential trade liberalisation (tariff or NTB reduction) results in substantially muted output changes at the sector level compared with unilateral liberalisation. Take Tanzania as an example (which has the highest AVEs of its NTBs in our dataset). The gains from unilateral reduction of NTB barriers alone are about 25 times greater than the gains from liberalisation within EAC alone. But, the maximum output decline at the sector level from NTB liberalisation within EAC alone is 2%, but with unilateral liberalisation, we estimate output declines of 9.5% for textiles and apparel, 11.8% for other manufacturing and 13.8% for wood and paper products. Thus, although the welfare gains of preferential liberalisation are dramatically smaller than unilateral liberalisation, the adjustment costs are also smaller.

To illustrate, we quantify the adjustment costs estimate for Tanzania, by adopting the unemployed resources measure of the social costs of adjustment of a trade policy change.[26] Let w = the annual wage rate; L = the total labour force; ΔL = the number of workers who are displaced by the trade policy change; $\beta = \Delta L/L$ = the share of the labour force that is displaced by the trade policy change; μ = the share of one year that a displaced worker is unemployed and X = the loss of output due to the displacement of ΔL workers. Then, if $\partial Y/\partial L$, the marginal product of labour, is equal to wages, we have that X is given by Equation (3)

$$\frac{\partial Y}{\partial L} * \Delta L * \mu = w * \Delta L * \mu = X. \tag{3}$$

Tanzanian national statistics indicate that labour receives 60.4% of GDP.[27] Then $w = 0.604^*\text{GDP}/L$; substituting for w in Equation(3) and dividing by GDP, we have that the social costs of adjustment as a share of GDP are shown by Equation (4)

$$0.604 * \beta * \mu = X/\text{GDP}. \tag{4}$$

We calculate Equation (4) for Tanzania for our three principal scenarios. Regarding β, in our model simulations, we estimate the number of workers that must change jobs by sector and skill type. Taking a weighted average across all sectors and skill types of labour for Tanzania, we calculate that: $\beta = 0.0049$ for the EAC Central scenario; $\beta = 0.0117$ for the EACU Liberal scenario and $\beta = 0.0146$ for the Tripartite scenario. That is, in the EAC Central scenario, we estimate that about one-half of 1% of labour must change jobs, and between 1 and 1.5 % of labour must change jobs in the other two scenarios.[28]

25 The partner country AVE is also relevant in assessing impacts.

26 For an explanation of the methodology, see Morkre and Tarr (1980, Chapter 3) or Matusz and Tarr (2000).

27 This is the sum of compensation for subsistence labour (that receives 29.8% of value added) and all other categories of labour (which receive 30.6%). See Jensen *et al.* (2010).

28 The Tripartite scenario contains preferential tariff reduction, whereas the EAC Liberal scenario does not any tariff changes; this explains the larger adjustment costs for the Tripartite scenario.

For μ, the Tanzanian National Panel Surveys of 2010 and 2011 found that national unemployment was rather low at 2.5% in 2010 and 3.3% in 2011.[29] Nonetheless, the Integrated Labour Force Survey reported that the national average duration of unemployment is rather high at 1.24 years,[30] i.e., $\mu = 1.24$. Then, from Equation (4), the social costs of adjustment, as a percent of GDP, are presented in row 1 of Table 4.

In Table 3, we have EV as a percent of private consumption. To compare with adjustment costs in Equation (4), we need EV as a percent of GDP. Private consumption in Tanzania in 2012 was 66% of GDP.[31] Converting the estimates in Table 3, we have EV as a percent of GDP for one year as shown in row 3 of Table 4.

Crucially, adjustment costs are a once and for all cost, whereas the gains from the trade policy change continue into the infinite future. Taking the present value of the gains into the infinite future with a 7% discount rate for future gains, the gains from our three principal scenarios, as a percent of GDP, are shown in row 4 of Table 4. Then, the ratios of the gains to the adjustment costs from the trade policy change are shown in row 5 of Table 4 as

$$\text{EAC Central} = 26.0; \quad \text{EAC Liberal} = 81.5; \quad \text{Tripartite} = 23.0.$$

These results are consistent with the evidence from empirical studies, summarised by Matusz and Tarr (2000), which has shown that the adjustment costs of trade liberalisation are dramatically smaller than the welfare gains.[32] However, policy-makers often receive strong lobbying from those who suffer adjustment costs from trade liberalisation, while those who gain are more diverse or may not realise they will gain from trade liberalisation; so the gainers typically do not lobby for liberalisation or lobby much less vigorously. Thus, these results explain some of the appeal of regional liberalisation to policy-makers, despite the usually larger net gains of broader unilateral or multilateral liberalisation.

4.5 Reduction of non-discriminatory barriers in services in Kenya and Tanzania

We also assessed the impacts in Kenya and Tanzania, of reform of domestic regulations that impose costs on both domestic and foreign suppliers of business services in a non-discriminatory manner. We estimate that a 50% reduction of the AVEs of the non-discriminatory barriers to suppliers of services in Kenya (Tanzania) results in gains in Hicksian EV in Kenya equal to 1.4% of domestic consumption and equal to 2.2% of domestic consumption in the case of Tanzania. This exceeds the gains from the 5% reduction in discriminatory barriers in the EAC Liberal scenario, where Kenya is seen to gain 1% of consumption and Tanzania gains 1.2%. Thus, while the discriminatory barriers are important and are the focus of international negotiation, the regulatory barriers that impose costs on domestic suppliers and foreign suppliers of services in a non-discriminatory manner are quantitatively more important in these cases.

The larger gains from the reduction of non-discriminatory barriers are due to the larger base from which the barriers are reduced. The non-discriminatory barriers affect all providers of services, so the base of the recaptured rents and the distortion triangle are larger.

29 See National Bureau of Statistics of Tanzania (2013b, p. 18).

30 Calculated from data in National Bureau of Statistics of Tanzania (2011, Table 6.14).

31 National Bureau of Statistics of Tanzania (2013b, pp. 36, 37).

32 Matusz and Tarr (2000) summarize the evidence on the adjustment costs of trade liberalization.

Table 4: Adjustment Costs Estimates and Benefit–Cost Calculations for Tanzania's Three Principal Trade Policy Options

	EAC central	EAC liberal	Tripartite
1. Adjustment costs as % of GDP	0.37	0.88	1.09
2. EV as % of consumption	0.95	7.11	2.5
3. EV as % of GDP	0.62	4.67	1.64
4. Present value of EV as % of GDP[1]	9.5	71.5	25.1
5. Benefit–cost ratio (row 4 divided by row 1)	26	81.5	23

Source: Authors' calculations.
[1]Seven percent discount factor into the infinite future. Row 4 = (Row 3) * [1.07/.07].

5. Sensitivity analysis

In this section, we assess the impact of parameter values and the key modelling assumption of rent capture on the results. Through our 'piecemeal sensitivity analysis', we will determine the most important parameters for the results, and we will assess how important the rent capture assumption is for the results. We examine the three aggregate policy scenarios: EAC Deep Integration, Tripartite FTA with Deep Integration and EAC Unilateral Liberalisation. Our results are presented in Table 5.

5.1 Impact of rent capture assumption

In our central scenarios, we assume that it takes capital and labour to overcome the barriers; the rents from the barriers are 'dissipated' and the rents are recaptured by the domestic economy in the central scenarios. It is possible, however, that some of the barriers are not dissipated, but instead generate rents that are captured by domestic agents in our initial equilibrium. If so, then the rents that are captured initially by domestic agents would not be available as a net welfare gain since they are a loss to domestic agents; and the welfare analysis for rents is analogous to tariff loss. The 'triangle' of efficiency gains will remain, but the welfare gains should be smaller when there are initial rents captured by domestic agents.

In Table 5, the row labelled θ_r represents the share of rents captured initially by domestic agents. We only display results for Tanzania; tables of results for the other five African regions of our model are available in BTY. We retain all other modelling and parameter assumptions, but allow the initial rent capture share to be either zero (central value) or one (upper value).

For three of our African regions, the welfare gains do not change dramatically. For Kenya and Uganda, in the cases of deep integration within EAC or the Tripartite FTA, the estimated gains fall to about 95% of their level with rent capture. The gains fall by 12% for SADC in the Tripartite FTA scenario. This reflects low levels of Kenyan and Ugandan trade in goods and in services with these regions and hence low available rents. Recall that a substantial share of the Kenyan gains from the Tripartite FTA come from improved market access in COMESA services markets and it is COMESA not Kenya that gains from the capture of these rents. But the welfare gains to Kenya fall by more than 50% in the case of EAC liberal. This reflects large available rents in the case of services and non-tariff barriers in trade with regions outside of Africa.

On the other hand, the estimated gains fall considerably in the cases of Tanzania and COMESA. Table 5 shows that in the case of Tanzania, the welfare gains fall to about 60–70% of their original level in the case of EAC Deep Integration or Tripartite FTA scenarios. In the case of EAC unilateral liberalisation, however, the welfare fall is dramatic—from more than 7% of consumption to about 1% of consumption, deriving mostly from the lack of capture of the large rents that are impacted by unilateral liberalisation of NTBs in Tanzania. For COMESA in the Tripartite FTA, the gains fall from 1.4 to 0.5% of consumption due to no rent capture in services. Results for Rwanda are between Kenya and Tanzania in terms of percentage reduction of the gains due to initial rent capture, but the pattern of a much stronger drop in the percentage of gains in the unilateral liberalisation scenario prevails due to no capture of rents in services liberalisation.

5.2 Piecemeal sensitivity analysis (other than rent capture)

We see that central results are rather robust with respect to most of the parameters. In the cases of the Tripartite FTA and EAC Deep Integration, the parameter that has the strongest impact on the results is the elasticity of substitution between firm varieties in imperfectly competitive goods sectors, $\sigma(q_i, q_j)$, as welfare estimates can vary up to about 114% of their central values, depending on the country and scenario. Following from the Le Chatelier principle, larger elasticities typically lead to larger welfare gains in response to welfare improving reforms, as the economy can adapt more readily. In the case of this parameter, however, there are offsetting impacts. Lower values of this elasticity imply that varieties are less close to each other, so additional varieties are worth more. Thus, theory is ambiguous regarding the impact of this parameter. The elasticity of substitution between imports from different regions in CRTS sectors, σ(M, M), has a modest impact on welfare, but a more substantial impact on imports in some sectors. Larger elasticities allow substitution towards the most efficient supplier at domestic prices, and, with one exception, the welfare gains are larger for Tanzania, Uganda and Rwanda in all three scenarios, as expected. In the case of EAC Deep Integration, however, there is a preference-induced substitution away from non-EAC suppliers and trade diversion slightly dominates in the cases of Kenya and Tanzania. Further, for Kenya, there is a terms of trade loss that dominates the results and slightly lowers the welfare gain in the EAC Liberal scenario. Regarding trade, however, the difference in aggregate exports can be substantial, especially in percentage terms in the Tripartite scenario. For Kenya (Uganda), aggregate exports increase by 9.5 (19.3)% with the GTAP elasticities, but 11.1 (25.8)% with our central values. In the case of agriculture exports, the percentage differences are more substantial: for our six African regions, with GTAP elasticities, agricultural exports increase from between 3 and 26%, depending on the country. But with our central elasticities, estimated agricultural exports increase by five to eleven times more.

For each region, we have a vector of elasticities of firm supply with respect to price for imperfectly competitive goods and services sectors. In the EAC Liberal case, the welfare gains are about 5% larger in Kenya, Uganda and Rwanda with larger elasticities of firm supply.[33]

33 In Tanzania the gains are approximately unchanged. If available varieties in IRTS goods fall, the welfare gain is smaller. In the EAC Deep Integration case, possible trade diversion leads to ambiguous results.

Table 5: Piecemeal Sensitivity Analysis: Impact on Tanzania of EAC Deep Integration, Tripartite FTA Deep Integration and EAC Unilateral Liberalisation

Parameter	EV as a % of consumption											
	Parameter value			EAC deep integration			EAC Liberal			Tripartite integration		
	Lower	Central	Upper	Lower	Central	Upper	Lower	Central	Upper	Lower	Central	Upper
$\sigma(q_i, q_j)$—services sectors	2	3	4	0.95	0.95	0.95	7.13	7.11	7.11	2.51	2.50	2.49
$\sigma(q_i, q_j)$—goods sectors	See below			0.85	0.95	1.06	6.76	7.11	7.64	2.13	2.50	2.96
σ(va, bs)	0.625	1.25	1.875	0.95	0.95	0.95	7.08	7.11	7.14	2.50	2.50	2.50
σ(D, M)	See below			0.94	0.95	0.95	7.10	7.11	7.13	2.48	2.50	2.52
σ(M, M)	GT AP values	30		0.98	0.95	NA	7.04	7.11	NA	2.37	2.50	NA
σ(L, K)	0.5	1	1.5	0.95	0.95	0.95	7.12	7.11	7.11	2.51	2.50	2.50
$\sigma(A_1, \ldots, A_n)$	0	0	0.25	NA	0.95	0.95	NA	7.11	7.14	NA	2.50	2.51
ε_{EACU}, ε_{COMESA}, ε_{SADC}	Lower (upper) values are			0.97	0.95	0.93	7.10	7.11	7.09	2.54	2.50	2.48
ε_{EU}, ε_{ROW}, ε_{USA}, ε_{CHINA}	0.5 (1.5) central values											
θ_r = share of rents captured	0	0	1	NA	0.95	0.68	NA	7.11	1.05	NA	2.50	1.59
θ_m	0.025	0.05	0.075	0.95	0.95	0.95	7.11	7.11	7.11	2.50	2.50	2.50
$\sigma(q_j, q_j)$—IRTS goods	Parameter value			$\sigma(D, M)$—CRTS sectors			Parameter value					
Chemicals and metals	3.4	6.8	10.2				Lower	Central	Upper			
Energy and minerals	5.8	11.6	17.4	Agriculture and forestry			1.3	2.5	3.8			
Food products	2.6	5.1	7.7	Other services			0.8	1.5	2.3			
Petroleum and coal prod.	2.1	4.2	6.3	Trade			0.8	1.5	2.3			
Other manufacturing	3.9	7.7	11.6	Utilities			1.4	2.8	4.2			
Textiles, apparel and leather	3.8	7.6	11.4									
Wood and paper products	3.2	6.3	9.5									

Source: Authors' estimates.

Key: $\sigma(q_i, q_j)$: elasticity of substitution between firm varieties in imperfectly competitive sectors; σ(va, bs): elasticity of substitution between value-added and business services; σ(D, M): elasticity of substitution between domestic goods and imports in CRTS sectors; σ(M, M): elasticity of substitution between imports from different regions in CRTS sectors; σ(L, K): elasticity of substitution between primary factors of production in value added; $\sigma(A_1, \ldots A_n)$: elasticity of substitution in intermediate production between composite Armington aggregate goods; ε_{ROW}, ε_{EU}, ε_{CHINA}, ε_{USA} ε_{EACU}, ε_{COMESA}, and ε_{SADC}: vectors of elasticities of imperfectly competitive firms' supply in the Rest World, EU, China. USA, EACU, COMESA and SADC with respect to the price of their outputs; θ_r: share of rents in services sectors captured by domestic agents; θ_m: shares of value added in multinational firms due to specialised primary factor imports.

6. Policy conclusions

6.1 Overall gains by region

In this article, we have estimated the impact of reducing non-tariff barriers, improving trade facilitation and reducing services costs in the EAC, the Tripartite FTA and unilaterally by the EAC. We estimate that deep integration within the EAC alone will produce significant benefits for its members, but if expanded to include COMESA and SADC in a Tripartite deeply integrated FTA, it would substantially increase the benefits for our EAC countries. We find that SADC and COMESA would gain substantially from the Tripartite FTA, but their gains are about one-half the gains of Kenya, Tanzania and Uganda from deep integration within the Tripartite FTA. Tanzania and Rwanda gain dramatically more from unilateral liberalisation rather than preferential liberalisation, but Kenya gains less from EAC Liberal (Unilateral) than from the Tripartite FTA.

6.2 Sources of gains by region

Our decomposition analysis reveals the reasons for these differences: (a) the augmented gains from reduction in time in trade costs in the Tripartite FTA are an important reason for the increase in gains to the EAC countries relative to deep integration within the EAC alone. These trade facilitation gains for the EAC countries are larger than in the unilateral liberalisation scenario; (b) SADC and COMESA gain both from trade facilitation and from non-tariff barrier reduction in the Tripartite region, but considerably less than the EAC countries since they have very high trade intensities with regions outside of the Tripartite region; (c) for both Tanzania and Rwanda, EAC Liberal (Unilateral) by far yields the largest gains, but for different reasons. For Tanzania, it gains from the reduction of NTBs outside of the Tripartite region. For Rwanda, it is better access to non-Tripartite foreign services providers. But unilateral liberalisation leads to larger adjustment costs for both Tanzania and Rwanda. Within the Tripartite FTA, trade facilitation is the reform that is most important to both countries; (d) Uganda has the most at stake within the Tripartite area in trade facilitation. It would gain substantially from EAC Liberal due to better access to foreign service suppliers; (e) consistent with earlier estimates, our assessment of the gains in the Tripartite FTA shows negligible impacts from tariff changes, with losses for some members. Schiff and Winters (2003) have found that the largest gains from regional integration come from the deep aspects of the agreements, so our results are consistent with the broader empirical and theoretical literature.

The Kenya case is especially interesting because it gains more from the Tripartite FTA than from unilateral liberalisation by the EAC in all three dimensions of our trade costs. We explained these results due to better market access under a protected regional umbrella and the logistics of trade facilitation reform. This extends the Wonnacott and Wonnacott (1981) result to services. Our results provide a rationale for the strong support of the Tripartite FTA by the Kenyan authorities.

6.3 Policies to reduce non-tariff barriers and services costs and to improve trade facilitation

Cadot and Gourdon (2014) have shown that the old command and control non-tariff measures such as quotas, bans and licenses have significantly declined in importance; but sanitary and phyto-sanitary (SPS) regulations and standards as technical barriers to trade (TBTs) have become the new non-tariff measures that restrict trade. SPS regulations and standards on

industrial goods, however, have legitimate regulatory functions. For example, in the case of SPS, countries have the right and obligation to protect human, animal and plant life. The World Trade Organisation SPS and TBT agreements recognise these legitimate regulatory functions, but call for these regulations to be applied in a manner that does not discriminate against imports.[34] Similarly, there are legitimate regulatory functions in many services areas such as banking, insurance and telecommunications; these regulations are a problem when they are applied in a discriminatory manner or impose excessive costs.

Given the importance for developing countries of reducing trade costs, global experts in the field of non-tariff measures, trade facilitation and services (including the World Bank, the International Trade Centre, the Asian Development Bank and the World Economic Forum. (2013))[35] recommend establishing an effective regulatory review and improvement mechanism. Crucially, there should be public–private partnerships that involve the active engagement of the business community, economic policy officials and regulators organised around the supply chain as a whole in a sector or area of trade. The process would be overseen by a focal point within government with a mandate to coordinate and oversee all regulation that directly affects supply chain efficiency. To be effective in reducing trade costs requires coherence and coordination across many government agencies and collaboration with industry. The process should generate information on sources of trade costs through regular assessments of regulatory trade barriers and costs, and concrete action agendas and proposals for reforms.

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34 See https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm.

35 See Cadot *et al.* (2012) for the World Bank and Inklaar (2009) for the International Trade Centre.

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