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Trade Performance of the East African Community: Gravity Model Evidence

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Executive Summary

Member countries of the East African Community (EAC)—Burundi, Kenya, Rwanda, Tanzania, and Uganda—are generally less integrated with the world economy than their peers. In Rwanda, goods trade accounts for only 22% of GDP, compared with 62% and 58% respectively in the low income and Sub-Saharan African country groups. Even in the EAC countries that are most closely integrated with the world economy, Kenya and Uganda, the comparable figure is only around 45%.

Recently, however, there have been encouraging signs of deepening integration in some EAC member countries. Burundi, for example, experienced fast export growth of nearly 8% over the 2006-2009 period, along with solid import growth of 2%. Uganda also experienced solid growth in exports and imports, and Kenya displayed comparable import growth.

An analysis of the trade policy environment in EAC member countries suggests two possible reasons for their relative marginalization in the world economy. On the one hand, ***trade policy in some countries—particularly Burundi, Rwanda, and Uganda—is quite restrictive*** compared with their peer groups. Rwanda's score on the World Bank's Total Trade Restrictiveness Index (TTRI) is 16%, or 50% higher than the low income average and more than 70% higher than the average in Sub-Saharan Africa. By contrast, Tanzania's level of protection on the same metric is just under 8%, which is below both comparator group averages.

The second part of the explanation is that ***EAC member countries are constrained in the area of trade facilitation and logistics.*** As measured by the World Bank's Logistics Performance Index (LPI), all five countries have performance that is inferior to the Sub-Saharan African average, although Uganda is quite close to the average. Only Tanzania and Uganda have LPI scores that are comparable to the low income group average. Rwanda, in particular, appears to be severely constrained in the area of logistics

and trade facilitation: its LPI score is more than 25% lower than the average in Sub-Saharan Africa, and more than 20% lower than the low income average.

Data like those referred to above have given rise to concern that EAC member countries might be "under-trading", i.e. exporting and importing less than expected based on what is observed elsewhere in the world. However, gravity model results presented here suggest that ***EAC's trade performance is approximately in line with the average, once economic fundamentals are accounted for***. In fact, the region's import performance is relatively strong in both industrial and agricultural products. There is also some evidence that EAC members tend to trade more than expected among themselves in agricultural products. At the level of individual countries, there is evidence of strong performance in industrial products by Burundi and perhaps Rwanda, and in agricultural products by Kenya, Uganda, Rwanda, and to a lesser extent Burundi.

The model suggests, however, that ***tariffs and trade facilitation remain significant barriers*** to further integration with world industrial products markets. A one percent reduction in applied tariffs would be associated with a trade gain of 3.75% in industrial products. Similarly, an improvement of 1% in the exporting country's LPI score would be associated with a trade increase of 0.25% in that sector. These factors are less obvious impediments to performance in agriculture, however, presumably because of the relatively more important role played by non-tariff barriers.

Findings from this report support three core policy messages:

- EAC member countries can boost their trade performance by focusing anew on trade policy reforms.
- The relatively high level of tariffs in the region should be reduced over time.
- Improving the trade facilitation and logistics environment should be a priority, because of its potential to boost trade in industrial products.

1 Introduction

East Africa has a long history of trade-related cooperation, going back to colonial days. The latest incarnation of that movement is the East African Community (EAC), consisting of Kenya, Tanzania, Uganda, Burundi, and Rwanda. Initially made up of just the first three states, the EAC came into being in the year 2000. The last two members joined in 2007, bringing the EAC's total population to over 125 million people, and its combined GDP to $73bn (2009).

The EAC has been active in pursuing regional trade integration among its members. A customs union was established in 2005, with implementation over a five year period (see McIntyre, 2005 for an overview). In 2009, the member states signed a new agreement establishing an EAC Common Market. The common market, which will be implemented progressively, aims to ensure the free movement of goods, people, labor, services, and capital within the EAC, as well as protecting the rights of establishment and residence. Plans are afoot for a monetary union (2012), as well as further political integration among EAC members.

Despite the important part that trade plays in the EAC's overall regional integration strategy, Figure 4 (discussed in detail below) shows that these countries are generally less integrated with international goods markets than one might expect. Indeed, trade plays a less important role in EAC economies than it does on average in comparator groups of Sub-Saharan African and low income countries. This paper examines the reasons behind this apparently disappointing performance, focusing in particular on whether it is possible to identify genuine "under-trading" once other factors are controlled for. By "under-trading" is meant a weaker performance than expected based on the average relation between trade and economic fundamentals observed elsewhere in the world.

I use a standard gravity model of trade to investigate the question of whether or not the EAC countries are under-trading. In industrial products, the model discloses little evidence that the EAC countries are

under-trading once their economic fundamentals are controlled for. Indeed, performance on the import side appears quite strong. However, there is some evidence that trade facilitation and logistics performance constitutes a significant barrier to further integration with international markets. In agricultural products, model results are again indicative of strong performance on the import side, as well as relatively strong intra-regional trade performance. Interestingly, the role of tariffs and trade facilitation as barriers to further international integration appears to be less important in agricultural sectors than in industrial products. One reason might be the proliferation of non-tariff measures in respect of agricultural products.

The core policy message that emerges from these results is that there is clear scope for the EAC countries to boost their trade performance by focusing anew on trade reforms. The regional economy remains protected by relatively high tariffs, which could be reduced over time. Improving the trade facilitation and logistics environment could do a lot to help boost trade in industrial products. For agriculture, it is likely that greater attention to non-tariff measures is needed.

The paper proceeds as follows. The next section provides some basic background material on the trading environment of the EAC countries. It covers two areas: trade policies, and trade outcomes. Section 3 introduces the gravity model methodology, and discusses data sources. Estimation results are presented and discussed in Section 4. Section 5 concludes.

2 The EAC's Trading Environment

By way of setting the scene, I first briefly analyze the EAC's trading environment from two angles: trade policies at home and abroad, and trade outcomes.

2.1 Trade Policies

The World Bank's Total Trade Restrictiveness Index (TTRI) provides an overall measure of a country's trade policy stance (Kee et al., 2009). It is defined as the ad valorem tariff which, if applied uniformly by a country, would result in the same level of imports as is observed under current policy settings.

Figure 1 shows that EAC countries have mixed performance on this metric, compared with the averages for Sub-Saharan Africa and the World Bank's low income group. Kenya and Tanzania have levels of tariff protection a few percentage points lower than those of both comparator groups. The other EAC countries, however, exhibit higher levels of protection. Burundi, Rwanda, and Uganda all have rates of protection higher than the low income group and Sub-Saharan African averages. Rwanda in particular stands out: its TTRI score of 16% is the highest in EAC, and is more than double the rate of protection in the least protected market, Tanzania.[1]

[Figure 1 here]

The second pillar of EAC trade policy relates to market access abroad. To measure it, I use the World Bank's Market Access TTRI (Kee et al., 2009). It is defined as the ad valorem tariff which, if applied uniformly by the rest of the world, would result in the same level of exports from a given country as is observed under current policy settings. Interestingly, all EAC countries face levels of foreign protection noticeably in excess of the Sub-Saharan African average (Figure 2). The market access conditions faced by exporters in Kenya and Burundi are slightly better than the low income group average, and those for Tanzanian exporters are broadly comparable. Exporters in Rwanda and Uganda face relatively higher tariffs abroad, up to 8.3%. For all EAC countries, however, rates of protection at home are considerably

[1] McIntyre (2005) shows that the three-band structure of the EAC's common external tariff (CET) results in relatively high rates of protection. Since the TTRI depends on the structure of protection as well as the pattern of imports, it is different for each country even though they have a CET in place.

higher than those faced by their own firms when dealing with overseas markets—nearly three times as high in the case of Burundi.

[Figure 2 here]

In addition to traditional trade policies, trade facilitation is also an important determinant of overall trade performance. To measure trade facilitation performance, I use the World Bank's Logistics Performance Index (LPI). The LPI is a comprehensive metric covering six core areas of trade facilitation and logistics: efficiency of the clearance process; quality of trade- and transport-related infrastructure; ease of arranging competitively priced shipments; competence and quality of logistics services; ability to track and trace consignments; and timeliness of shipments. It is based on a detailed survey of around 1,000 logistics professionals (Arvis et al., 2010).

Figure 3 shows that logistics and trade facilitation represent a major constraint in EAC countries. All five countries have performance that is inferior to the Sub-Saharan African average, although Uganda is quite close to the average. Only Tanzania and Uganda have LPI scores that are comparable to the low income group average. Rwanda, in particular, appears to be severely constrained in the area of logistics and trade facilitation.

[Figure 3 here]

2.2 Trade Outcomes

EAC member countries are noticeably less integrated with the international economy than their peer groups (Figure 4): with the exception of Rwanda, goods trade accounts for around 40% of GDP in EAC members. Even Kenya and Uganda, where the figure is closer to 45%, are not as open in this sense as the low income (62%) and Sub-Saharan African (58%) groups. The situation is much worse in Rwanda,

where goods trade accounts for only 22% of GDP. This observation automatically leads to the core question addressed by this paper: are the EAC countries under-trading relative to expectations?

[Figure 4 here]

In addition to aggregate openness, it is also important to look at the extent to which the EAC countries' import and export bundles are diversified. Figure 5 presents product and market concentration indices, i.e. a higher score indicates a less diversified bundle. Focusing on the export side, the data show that Kenya, Uganda, and Tanzania are all more diversified in terms of products than the low income group average. Rwanda has a less diversified product bundle than the low income group average, but is still more diversified than the Sub-Saharan African average. Only Burundi stands out, with a product diversification level that is much lower than in the comparator groups. In terms of market diversification, all EAC countries are more diversified than the comparator group averages.

On the import side, a different picture emerges. Kenya, Tanzania, and Uganda have, in this case, less diversified import product bundles than the Sub-Saharan Africa and low income group averages. Burundi and Rwanda have more diversified bundles than average. In terms of import market diversification, only Uganda stands out as having a level of diversification that is lower than the comparator group averages.

[Figure 5 here]

In terms of export growth over recent years (Figure 6), it is Burundi that stands out with a growth rate of 7.6%. Uganda and Rwanda have slower growth rates—noticeably lower than the low income group average—but they buck the trend towards export contraction witnessed elsewhere in Sub-Saharan Africa. Kenya and Tanzania both exhibit declining real export values, but at a slower rate than the Sub-Saharan African average.

On the import side, Burundi, Kenya, and Uganda all show growth at a faster rate than the low income group average. These countries stand out from the trend towards import contraction, on average, in Sub-Saharan Africa. Rwanda and Tanzania have seen shrinking import values. In Tanzania's case, the rate of contraction is faster than the Sub-Saharan African average.

[Figure 6 here]

2.3 Consolidation and Motivation for the Paper

The overall picture that emerges from this brief review of the EAC trading environment is one of significant constraints on international trade integration. It is striking that although some EAC countries apply less restrictive trade policies than their regional and income group averages, trade as a share of GDP is uniformly lower than average. A likely reason is that the trade facilitation and logistics environment appears to be particularly constrained in all EAC countries. This finding sits well with the general literature on trade facilitation, in which it is found to be a significant potential source of trade cost reductions and welfare improvements compared with other alternatives such as tariff cuts (Hertel and Keeney, 2006; Hoekman and Nicita, 2010).

However, this first look at the evidence only provides general indications of the types of areas that should be trade policy priorities for the EAC countries. In assessing their trade performance more rigorously, it is important to keep two additional factors in mind. The first is that there are many other influences that mediate the link between policies and outcomes, and it is important to control for them. The second is that the performance of EAC countries needs to be kept in context, and assessed relative to the performance of other regional groupings. The remainder of this paper uses a gravity model framework to assess EAC's trade performance while taking account of these two factors.

3 The Gravity Model: Data and Methodology

The gravity model is the workhorse of empirical international trade. In addition to strong explanatory power, the gravity model now also has sound microeconomic credentials in the form of a number of underlying theories that give rise to gravity-like equations. The standard benchmark in the literature is now the "gravity with gravitas" model of Anderson and Van Wincoop (2003). Their gravity equation takes the following form:

$$(1)\ \log(X_{ij}) = \log(E_j) + \log(Y_i) - \log(Y) + (1-s)\log(t_{ij}) - (1-\sigma)\log(P_j) - (1-s)\log(\Pi_i) + e_{ij}$$

where: X_{ij} is exports from country *i* to country *j*; E_j is expenditure in country *j*; Y_i is production in country *i*; t_{ij} is bilateral trade costs; *s* is the intra-sectoral elasticity of substitution (between varieties within a sector); and e_{ij} is a random error term satisfying standard assumptions. The P_j and Π_i terms represent multilateral resistance, i.e. the fact that trade patterns are determined by the level of bilateral trade costs relative to trade costs elsewhere in the world. Inward multilateral resistance $(P_j)^{(1-s)} = \sum_{i=1}^{N}(\Pi_i)^{(s-1)} w_i (t_{ij})^{(1-s)}$ captures the dependence of country *j*'s imports on trade costs across all suppliers. Outward multilateral resistance $(\Pi_i)^{(1-s)} = \sum_{i=1}^{N}(P_j)^{(s-1)} w_j (t_{ij})^{(1-s)}$ captures the dependence of country *i*'s exports on trade costs across all destination markets. The *w* terms are weights equivalent to each country's share in global output or expenditure.

To operationalize the model, a specification is needed for the trade costs function t_{ij}. It is common in the gravity literature to include a range of data on geographical and historical factors that are believed to influence trade costs, and I follow that approach here. I include international distance as a proxy for transport costs, and dummy variables for landlocked countries, countries that are geographically

contiguous, those that share a common language, those once in a colonial relationship, and those that were colonized by the same power.

Since the aim of this paper is to analyze the trade performance of EAC relative to other international trading areas, I follow the regional integration literature in supplementing those data with three sets of dummy variables for each regional integration structure (Soloaga and Winters, 2001; Dee and Gali, 2003; and Coulibaly, 2007).[2] Using the EAC as an example, the first dummy variable ("EAC both") is equal to unity only if the exporting and importing countries are both EAC members. The second dummy variable ("EAC exporter") is equal to unity if the exporting country is an EAC member. The third dummy variable ("EAC importer") is equal to unity if the importing country is an EAC member. The last two dummies reflect the overall openness of a given regional arrangement to exports and imports respectively. The first dummy reflects the additional effect on trade when both countries belong to the same arrangement. Negative signs on any of these coefficients would be consistent with an interpretation in which EAC countries under-trade relative to what is observed on average.

To provide a solid basis for comparison, I include the following regional integration arrangements in addition to the EAC, adopting the three dummy variable approach in each case: NAFTA, EU, Mercosur, ASEAN, SADC, COMESA, and SAFTA. Although this is obviously not an exhaustive list of regional integration arrangements, inclusion of these variables means that the regression results account for EAC's performance relative to major trading blocs with common market objectives.

Consolidating, the trade costs function takes the following form:

[2] Egger (2002) points out the disadvantages of a common alternative approach based on the analysis of gravity model forecast errors as a measure of "trade potential". The problem is two-fold. First, systematic (i.e. non-random) variation in forecast errors tends to indicate model misspecification. Second, the search for systematic variation in forecast errors is necessarily confounded by the assumed presence of random noise. The dummy variable approach taken here ensures that only systematic variation is extracted from the data.

$$(2) t_{ij} = b_1 EAC_{ij}^{Both} + b_2 EAC_i^{Exp} + b_3 EAC_j^{Imp} + b_4 LPI_i + b_5 LPI_j + b_6 \log(1 + tariff_{ij})$$
$$+ b_7 Contig_{ij} + b_8 Comlang_{ij} + b_9 Colony_{ij} + b_{10} ComCol_{ij} + b_{11} Landlocked_i$$
$$+ b_{12} Landlocked_j + \sum_{r=1}^{R} a_r RTA_{ij}^{Both} + \sum_{r=1}^{R} c_r RTA_i^{Exp} + \sum_{r=1}^{R} d_r RTA_j^{Imp}$$

Estimation of the Anderson and Van Wincoop (2003) model most commonly proceeds using fixed effects: dummy variables for each importer and exporter account for market size as well as multilateral resistance. The benefit of this approach is that it avoids having to estimate the nonlinear multilateral resistance terms directly, while still accounting for their effects. However, it makes it impossible to include data that vary in the same dimension as the fixed effects. This difficulty is crucial in the present context: fixed effects estimation would lead two of the three sets of dummy variables discussed above to drop out of the equation.

Baier and Bergstrand (2009) provide a neat solution that takes account of multilateral resistance simply and transparently, but without relying on fixed effects estimation. They use a first-order Taylor series to approximate the multilateral resistance terms of the original Anderson and Van Wincoop (2003) model. Under comparable specifications, the Baier and Bergstrand (2009) approximate multilateral resistance terms provide results that are very close to those obtained using fixed effects. Their gravity model specification, which I apply here, takes the following form:[3]

$$(3) \log(X_{ij}) = \log(E_j) + \log(Y_i) - \log(Y)$$
$$+ (1 - s)\left[\log(t_{ij}) - \frac{1}{N}\sum_{i=1}^{N}\log(t_{ij}) - \frac{1}{N}\sum_{j=1}^{N}\log(t_{ij}) + \frac{1}{N^2}\sum_{j=1}^{N}\sum_{i=1}^{N}\log(t_{ij})\right] + e_{ij}$$

[3] In fact, Baier and Bergstrand (2009) take the assumption of unit income elasticities seriously, and move the two GDP terms to the left hand side of equation (3) to avoid the potential for endogeneity bias (since exports enter GDP). Results in the present case, however, suggest that the unit elasticity assumption is too strong. I therefore leave the GDP terms on the right hand side of the estimating equation. In their meta-analysis of over 1,000 sets of gravity model estimates, Disdier and Head (2008) find that correcting for endogeneity bias in the GDP terms does not make any statistically significant difference to estimates of the distance coefficient.

where N is the total number of countries.

Baier and Bergstrand (2009) estimate their model using OLS. However, Santos Silva and Tenreyro (2006) point out that it is usually more appropriate to use the Poisson estimator as the benchmark in log-linearized models such as gravity. In addition to allowing the inclusion of zero trade observations in the estimating sample, the Poisson estimator deals with a particular type of heteroskedasticity that can result in biased coefficient estimates in addition to the more usual problem of biased standard errors. For these two reasons, I prefer Poisson estimates in the present case, and present OLS for comparative purposes only.

Data for the gravity model are drawn from standard sources (Table 1). Trade data come from UN-COMTRADE, and are disaggregated into two macro-sectors, industry and agriculture, using the relevant WTO definitions based on the Harmonized System. Import data are generally believed to be more reliable than exports, and so are used whenever possible. When import data are missing, mirror export data are used instead. Simple average applied tariffs are sourced from UNCTAD's TRAINS database. These rates take account of bilateral and regional preference arrangements. As in Section 2 above, the World Bank LPI is used as an indicator of overall trade facilitation performance. Finally, geographical and historical variables are sourced from CEPII's distance database (Mayer and Zignago, 2006).

[Table 1 here]

4 Results and Discussion

Results from estimating the gravity model appear in Tables 2-5. The first two tables use data on trade flows in industrial products only. The second two tables use data on trade in agricultural products only. This section presents and discusses each set of results in turn.

4.1 Industrial Products

Table 2 presents regression results for industrial products, using alternately OLS and Poisson as estimators. Commonly used gravity variables such as GDP, distance, and geographical and historical factors generally have coefficients with the expected signs and magnitudes, and which are statistically significant under OLS; a number of the geographical variables are correctly signed but statistically insignificant under Poisson.[4] The only real exception is the dummy for landlocked exporting countries, which is unexpectedly positive and statistically significant. However, the dummy for landlocked importers remains negative and statistically significant under OLS; it is statistically insignificant under Poisson. In terms of policy variables, tariffs have a negative and statistically significant coefficient, while the LPI coefficients for the importing and exporting countries both have positive and statistically significant coefficients under OLS, but only the exporter coefficient is statistically significant under Poisson.

Columns 5-6 contain results for the baseline model, which includes tariffs and trade facilitation data. Both sets of estimates have a positive and statistically significant coefficient on the EAC importer dummy, which suggests that EAC's trade performance is relatively strong on the import side. There is evidence from the OLS regression that EAC member countries tend to trade more than expected among themselves, but the Poisson results do not support this conclusion. In none of the regressions is there any evidence that the EAC countries' export performance is statistically different from what would be expected based on their economic fundamentals.

[4] Due to different data and specifications, it is difficult to directly compare results with previous work looking at the impacts of particular regional integration agreements. The finding that only a few regional agreements appear to have strong trade effects is, however, reflected in the pattern of results in some previous work, such as Dee and Gali (2003). There is also overlap in some cases between the configuration of dummy variable coefficient signs reported here and those in Soloaga and Winters (2001) and Dee and Gali (2003).

Table 2 highlights the quantitative importance of tariffs and trade facilitation in terms of EAC's trade performance. Evaluated at the sample average, results suggest that a one percentage point decrease in tariffs would be associated with a 3.75% increase in trade in industrial products. Similarly, a one percent increase in the exporting country's LPI score would be associated with a 0.25% increase in trade in industrial products.

[Table 2 here]

To test whether the OLS estimator is appropriate, I use the Park regression suggested by Santos Silva and Tenreyro (2006, equation 11). Using fitted values from the benchmark model, the null hypothesis is strongly rejected (prob. = 0.000). This result tends to indicate that the log-linearized OLS estimates might be unreliable. There is thus good reason to prefer the Poisson estimates.

By removing variables from the baseline model, it is possible to get a first idea of the importance of selected determinants of the EAC countries' trade performance. Columns 1-2 exclude all policy variables, and columns 3-4 include tariffs only. Although a number of the variables of primary interest—the EAC dummies—are statistically insignificant in one or more specifications, it is possible to use observed changes in their magnitudes to give a first indication of some interesting features of the data. Of course, these results should be interpreted cautiously, because the changes involved are small relative to the imprecision with which the relevant coefficients are estimated.

The first result to note is that intra-regional trade performance as captured by the EAC both dummy falls noticeably once tariffs are accounted for. Preferences would therefore seem to be an important part of the regional trading environment. In addition, the EAC importer dummy increases in value when tariffs are added to the regression, which reflects the fact that import performance is strong despite relatively restrictive trade policy settings, as discussed above.

The second interesting result to emerge from these regressions relates to the role of logistics and trade facilitation. The EAC exporter dummy decreases noticeably between columns 3-4 and 5-6, and even turns negative but statistically insignificant in the Poisson regression. The EAC importer dummy also decreases in the Poisson specification, but it increases in the OLS model. This evidence reinforces the analysis presented above, to the effect that trade facilitation and logistics performance is a significant impediment to greater international integration of goods markets in the region. Poor trade logistics would appear to be hampering local firms as they attempt to source goods from overseas, or export to foreign markets.

Table 3 goes deeper into these results by using country dummies instead of dummies for the EAC region. This approach makes it possible to examine whether particular countries in the region exhibit stronger or weaker trade performance than expected. The configuration of dummies makes it possible to identify unexpected trade performance vis-à-vis the world as a whole (simple country dummies), or with other partners in the EAC region (country dummies interacted with the EAC both dummy).

Columns 5-6 present the baseline results. As in the previous discussion, Poisson results are preferred on the basis of a Park test (prob. = 0.000). Under Poisson, it is only Burundi that appears to trade more than average with the rest of the world: its country dummy coefficient is positive and statistically significant. There is also evidence from OLS of strong trade performance in Kenya, Uganda, and Tanzania, but it is not backed up by the Poisson model. In terms of intra-regional trade performance, Burundi and Rwanda stand out as having positive and statistically significant coefficients, i.e. they trade more than expected with their regional partners. In light of the evidence on very strong recent trade growth in Burundi presented in Section 2, it is to be expected that that country's performance should stand out in the gravity models too.

Again, the inclusion of policy variables covering tariffs and trade facilitation accounts to some extent for these findings. Moving from left to right across Table 3 shows that the EAC countries generally tend to exhibit closer to average trade performance as policy variables are added in. This finding is particularly strong for the LPI, which again highlights the importance of logistics and trade facilitation for international integration in the region.

[Table 3 here]

Taking all of these regression results together, it appears that the EAC region has relatively strong import performance, but that export and intra-regional trade performance are more or less in line with expectations. In terms of individual country performance, only Burundi and perhaps Rwanda stand out as doing better than expected. Tariffs at home and abroad (see Section 2) go part of the way towards explaining these findings. But there is also some evidence to suggest that trade facilitation and logistics might constitute a significant barrier to increased trade in industrial products for the EAC countries.

4.2 Agricultural Products

Table 4 presents results using data on agricultural products only, and incorporating dummies for EAC membership. Columns 5-6 contain the baseline model. Results on standard gravity model variables are again largely in line with expectations in terms of sign, magnitude, and statistical significance. As was the case for industrial products, the landlocked exporter dummy has an unexpected positive and significant coefficient under OLS, but it is negative and statistically insignificant using Poisson. However, the landlocked importer dummy has a negative and statistically significant coefficient in both specifications. In line with the results of Santos Silva and Tenreyro (2006), a Park test (prob. = 0.000) suggests that the OLS estimates may be unreliable, and there are therefore good reasons for preferring Poisson as a workhorse estimator in this case.

In terms of intra-regional trade, there is consistent evidence across all models that EAC countries perform better than expected in relation to agricultural products: the coefficient on the EAC both dummy is positive, statistically significant, and stable in magnitude across all specifications. The picture is less clear in relation to the importer and exporter dummies, however, due to qualitatively different results from OLS and Poisson. Preferring Poisson on the basis of the Park test suggests that the EAC countries' export performance is perhaps a little below expectations—although the result is not statistically significant—but that import performance is generally strong. These results are quite in line with those for the industrial products sector.

Interestingly, tariffs and trade facilitation play a less important role as determinants of agricultural trade patterns than they do for industrial products. Removing these variables from the model (columns 1-4) results in estimates of core coefficients that are very little different. Indeed, in the baseline Poisson model, none of the three policy variables—tariffs, importer LPI, and exporter LPI—have statistically significant coefficients. (The tariff coefficient is 12% significant, and the exporter LPI coefficient is borderline significant at the 15% level.)

[Table 4 here]

Table 5 presents results using individual country dummies, rather than regional dummies. The configuration of dummy variables vis-à-vis the rest of the world and the region is as in Table 3. Again, a Park test suggests that the OLS estimates may be unreliable (prob. = 0.000). Focusing on the Poisson results for the baseline model (column 6), there is evidence that agricultural trade performance with the rest of the world is strong in Kenya, Uganda, and Rwanda. Performance is approximately in line with expectations for Burundi. Tanzania, however, has much weaker than expected performance. In terms of intra-regional trade, the model suggests that Uganda, Rwanda, and Burundi perform strongly, but that the other countries are approximately in line with what would be expected based on their

fundamentals. Both sets of results are reasonably consistent across all Poisson specifications in Table 5, which again suggests that tariffs and trade facilitation play a less significant role in relation to agricultural trade than they do in industrial sectors.

[Table 5 here]

5 Conclusion

This paper has used a gravity model to investigate the recent trade performance of the EAC countries. It started from the observation that they are less integrated with the world economy than the average among their regional and income level peers. However, once economic fundamentals are accounted for through the gravity model, the EAC countries' performance appears much closer to average. There is even some evidence of strong performance on the import side.

In terms of intra-regional trade performance, there is little evidence that EAC's efforts have led to greater trade in industrial products, although there is some evidence of such an effect for agriculture. These mixed findings are in line with the ex ante simulations conducted by Busse and Shams (2003) for Kenya, Tanzania, and Uganda. Those authors also find highly divergent trade impacts across product groups, which is perhaps reflected here in the different results for agriculture versus manufactures.

An important result to emerge from the gravity model for industrial products relates to the continued importance of tariffs and trade facilitation. As noted in Section 2, the trade policy environment in the EAC remains relatively restricted by international standards. There is clear scope for tariff reductions to further boost trade. In addition, the region's relatively weak trade facilitation and logistics performance also appears to be holding back further integration with international markets. This finding lines up well with the observations of Kafeero (2008). That author shows that although some progress has been made on customs reform in EAC, greater attention needs to be paid to trade facilitation, and particularly

regional transit arrangements. Moving forward, tariff reductions and improved trade facilitation should be policy priorities for the EAC countries.

The gravity model results also have policy implications for landlocked countries in the region. It is sometimes argued that increased openness to the world economy would disproportionately benefit the coastal EAC countries, because they are better placed to act as production bases for industrial goods to be exported to developed countries. The data paint a more nuanced picture, however. In industrial goods sectors, there is little evidence that landlocked countries trade less than expected based on economic fundamentals, which tends to undermine the idea that they are poorly placed to take advantage of greater openness. It is important to be clear, however, that the term "economic fundamentals" includes trade facilitation performance as measured by the LPI. Landlocked countries generally have substantially weaker trade facilitation outcomes compared with coastal countries, due to a range of problems involving both "hard" infrastructure and regional integration "software" such as transit arrangements and border procedures. The model results can therefore be interpreted as highlighting the fact that trade facilitation represents a particular constraint for landlocked countries, and is an issue that needs to be tackled head on if they are to reap the expected benefits from greater international integration.

In agricultural goods sectors, by contrast, the model discloses significant evidence of worse than expected trade performance in landlocked countries, particularly on the import side. One likely explanation is that it is difficult to trade perishable agricultural products when shipments are subject to long and uncertain delays. Trade facilitation is therefore again likely to be crucial to this result. Although the data suggest that the landlocked EAC countries are not well placed to take advantage of additional openness in the agricultural sector, it is important not to over-interpret this finding. In reality, it indicates that additional attention needs to be given to the particular impediments facing agricultural

trade in the region. It is by no means an argument against additional market opening, but rather an indication that such measures need to be accompanied by the right set of complementary policies to aid development of the agricultural sector and facilitate trade.

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Tables

Table 1: Data and sources.

Variable	Definition	Year	Source
"Bloc" Both	Dummy variable equal to unity if the importer and exporter both belong to "bloc" (EAC, NAFTA, EU, Mercosur, ASEAN, SADC, COMESA, SAFTA)	n/a	Author
"Bloc" Exporter	Dummy variable equal to unity if the exporter belongs to "bloc" (EAC, NAFTA, EU, Mercosur, ASEAN, SADC, COMESA, SAFTA)	n/a	Author
"Bloc" Importer	Dummy variable equal to unity if the importer belongs to "bloc" (EAC, NAFTA, EU, Mercosur, ASEAN, SADC, COMESA, SAFTA)	n/a	Author
Border	Dummy variable equal to unity for exporting and importing countries with a common land border	n/a	CEPII
Colony	Dummy variable equal to unity when the exporter and importer were once in a colonial relationship	n/a	CEPII
Common Colonizer	Dummy variable equal to unity when the exporter and importer were once colonized by the same power	n/a	CEPII
Common Language	Dummy variable equal to unity for exporting and importing countries with a common language (ethnographic basis)	n/a	CEPII
Exporter GDP	Nominal GDP in the exporting country, in USD.	2007	WDI
Exporter Landlocked	Dummy variable equal to unity if the exporter is landlocked	n/a	CEPII
Exporter LPI	Exporting country's LPI score (1-5).	2007	LPI
Importer GDP	Nominal GDP in the importing country, in USD.	2007	WDI
Importer Landlocked	Dummy variable equal to unity if the importer is landlocked	n/a	CEPII
Importer LPI	Importing country's LPI score (1-5).	2007	LPI
Tariffs	Importing country's simple average applied tariff rate, including preferences (% ad valorem)	2007	WITS-TRAINS
Trade	Value of imports into the importer from the exporter, using mirror data if direct data are unavailable	2007	WITS-COMTRADE

Table 2: Regression results for EAC countries jointly, industrial products only.

	OLS	Poisson	OLS	Poisson	OLS	Poisson
EAC (Both)	**2.212*** **	**0.642**	**2.003*** **	**0.538**	**2.016*** **	**0.585**
	(0.000)	**(0.268)**	**(0.001)**	**(0.332)**	**(0.000)**	**(0.310)**
EAC (Exporter)	**2.383**	**6.804**	**2.528**	**5.296**	**1.170**	**-3.299**
	(0.526)	**(0.481)**	**(0.501)**	**(0.590)**	**(0.759)**	**(0.720)**
EAC (Importer)	**38.749*** **	**28.555*** **	**38.791*** **	**30.334*** **	**39.388*** **	**29.220*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Log(Importer GDP)	1.041***	0.743***	1.041***	0.757***	1.037***	0.751***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Exporter GDP)	1.016***	0.833***	1.016***	0.832***	0.999***	0.832***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Distance)	-1.487***	-0.489***	-1.470***	-0.476***	-1.470***	-0.468***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(1+Tariff)			-3.592***	-4.062***	-3.464***	-4.011***
			(0.000)	(0.004)	(0.000)	(0.004)
LPI Exporter					1.720*	8.387***
					(0.071)	(0.006)
LPI Importer					11.173***	4.364
					(0.000)	(0.263)
Common Border	0.535***	0.683***	0.500***	0.680***	0.497***	0.676***
	(0.001)	(0.000)	(0.003)	(0.000)	(0.003)	(0.000)
Common Language	0.830***	0.533***	0.780***	0.510***	0.786***	0.503***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Colony	0.878***	0.043	0.894***	0.072	0.887***	0.081
	(0.000)	(0.772)	(0.000)	(0.619)	(0.000)	(0.568)
Common Colonizer	1.116***	0.137	1.111***	0.174	1.113***	0.163
	(0.000)	(0.743)	(0.000)	(0.669)	(0.000)	(0.687)
Landlocked Exporter	10.362***	13.090***	10.358***	14.223***	10.795***	18.169***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Landlocked Importer	-18.947***	2.270	-18.921***	1.655	-11.329***	4.343

	OLS	Poisson	OLS	Poisson	OLS	Poisson
	(0.000)	(0.502)	(0.000)	(0.646)	(0.000)	(0.357)
NAFTA (Both)	-2.074	-0.272	-2.151	-0.391	-2.143	-0.346
	(0.151)	(0.374)	(0.130)	(0.201)	(0.132)	(0.261)
NAFTA (Exporter)	13.127**	37.234	13.348**	29.723	6.525	26.658
	(0.017)	(0.130)	(0.016)	(0.222)	(0.344)	(0.283)
NAFTA (Importer)	-104.203***	-82.405***	-103.939***	-81.895***	-129.764***	-87.119***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EU (Both)	-0.163	0.240	-0.134	0.219	-0.147	0.276
	(0.101)	(0.158)	(0.176)	(0.193)	(0.137)	(0.109)
EU (Exporter)	1.112	5.752*	1.079	7.151**	-1.695	-8.893
	(0.219)	(0.068)	(0.234)	(0.024)	(0.350)	(0.165)
EU (Importer)	22.391***	8.536***	22.089***	8.216***	8.004***	0.793
	(0.000)	(0.001)	(0.000)	(0.001)	(0.008)	(0.902)
MERCOSUR (Both)	-0.477	-0.160	-0.787	-0.578	-0.776	-0.532
	(0.739)	(0.770)	(0.584)	(0.310)	(0.592)	(0.359)
MERCOSUR (Exporter)	13.996***	-3.594	14.046***	-1.357	15.626***	-7.442
	(0.000)	(0.567)	(0.000)	(0.830)	(0.000)	(0.296)
MERCOSUR (Importer)	3.934	-14.385	4.023	-12.533	-5.903	-16.717
	(0.341)	(0.147)	(0.329)	(0.205)	(0.178)	(0.118)
ASEAN (Both)	-0.883*	0.986***	-1.082**	0.833***	-1.067**	0.810***
	(0.071)	(0.001)	(0.027)	(0.007)	(0.028)	(0.009)
ASEAN (Exporter)	9.901***	32.654***	9.950***	35.287***	7.483**	29.347***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)	(0.000)
ASEAN (Importer)	-9.813***	13.552*	-9.967***	12.269*	-19.705***	9.204
	(0.000)	(0.065)	(0.000)	(0.094)	(0.000)	(0.246)
SADC (Both)	1.644***	0.923	1.518***	0.689	1.531***	0.682
	(0.000)	(0.141)	(0.001)	(0.279)	(0.001)	(0.296)
SADC (Exporter)	-7.209***	-5.697	-7.226***	-5.266	-7.636***	-4.843
	(0.001)	(0.119)	(0.000)	(0.149)	(0.000)	(0.185)
SADC (Importer)	4.540	-21.362***	4.836*	-21.202***	8.420***	-21.241***
	(0.121)	(0.004)	(0.098)	(0.006)	(0.005)	(0.005)

	OLS	**Poisson**	**OLS**	**Poisson**	**OLS**	**Poisson**
COMESA (Both)	1.427***	1.558***	1.258***	1.222***	1.246***	1.211***
	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.002)
COMESA (Exporter)	-4.482**	3.393	-4.552**	3.246	-4.078*	5.324
	(0.035)	(0.522)	(0.032)	(0.541)	(0.055)	(0.312)
COMESA (Importer)	-5.812***	-10.956***	-5.670***	-11.084***	-7.553***	-10.964***
	(0.000)	(0.003)	(0.000)	(0.003)	(0.000)	(0.002)
SAFTA (Both)	-0.943	-0.754	-1.007	-0.852	-1.005	-0.836
	(0.177)	(0.329)	(0.136)	(0.271)	(0.129)	(0.281)
SAFTA (Exporter)	-9.657**	0.566	-9.731**	-0.245	-8.835**	-1.630
	(0.014)	(0.963)	(0.013)	(0.984)	(0.024)	(0.893)
SAFTA (Importer)	-11.303***	-3.552	-11.172***	-3.891	-9.212**	-5.063
	(0.002)	(0.643)	(0.003)	(0.613)	(0.013)	(0.504)
Constant	-45.979***	-21.322***	-46.016***	-21.648***	-37.104***	-13.621***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
R2	0.695	0.640	0.696	0.642	0.698	0.645
Obs.	14273	15263	14273	15263	14273	15263

*Standard errors are corrected for clustering by country-pair. P-values appear in parentheses below the parameter estimates. Statistical significance is indicated by: * (10%), ** (5%), and *** (1%). R2 for the Poisson models is calculated as the squared coefficient of correlation between actual and fitted values, as in Santos Silva and Tenreyro (2006).*

Table 3: Regression results for EAC countries individually, industrial products only.

	OLS	Poisson	OLS	Poisson	OLS	Poisson
Kenya	**46.108*** **	**1.811**	**46.125*** **	**3.483**	**43.729*** **	**0.768**
	(0.000)	**(0.895)**	**(0.000)**	**(0.801)**	**(0.000)**	**(0.957)**
Uganda	**21.478*** **	**6.606**	**21.762*** **	**6.303**	**21.995*** **	**3.117**
	(0.000)	**(0.476)**	**(0.000)**	**(0.501)**	**(0.000)**	**(0.743)**
Tanzania	**20.910*** **	**-6.137**	**20.933*** **	**-4.586**	**25.366*** **	**-1.192**
	(0.007)	**(0.708)**	**(0.006)**	**(0.785)**	**(0.001)**	**(0.944)**
Rwanda	**7.643**	**9.347**	**7.590**	**11.599**	**6.965**	**10.374**
	(0.115)	**(0.371)**	**(0.117)**	**(0.281)**	**(0.149)**	**(0.339)**
Burundi	**32.047*** **	**48.484*** **	**32.176*** **	**47.024*** **	**33.011*** **	**44.291*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Kenya-EAC	**0.005**	**0.106**	**-0.063**	**0.082**	**-0.055**	**0.097**
	(0.995)	**(0.783)**	**(0.944)**	**(0.832)**	**(0.950)**	**(0.803)**
Uganda-EAC	**1.491**	**0.151**	**1.412**	**0.129**	**1.424**	**0.139**
	(0.154)	**(0.704)**	**(0.174)**	**(0.749)**	**(0.153)**	**(0.729)**
Tanzania-EAC	**1.307**	**1.042** **	**1.061**	**0.750**	**1.071**	**0.780**
	(0.188)	**(0.049)**	**(0.283)**	**(0.166)**	**(0.240)**	**(0.146)**
Rwanda-EAC	**1.305***	**1.134*** **	**1.248***	**1.135*** **	**1.303***	**1.240*** **
	(0.081)	**(0.006)**	**(0.093)**	**(0.006)**	**(0.060)**	**(0.004)**
Burundi-EAC	**1.598***	**1.667** **	**1.498***	**1.680** **	**1.420**	**1.470** **
	(0.079)	**(0.017)**	**(0.094)**	**(0.017)**	**(0.109)**	**(0.034)**
Log(Importer GDP)	1.029***	0.731***	1.029***	0.742***	1.026***	0.739***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Exporter GDP)	1.040***	0.847***	1.040***	0.847***	1.022***	0.848***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Distance)	-1.485***	-0.488***	-1.468***	-0.477***	-1.469***	-0.471***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(1+Tariff)			-3.617***	-3.483**	-3.493***	-3.441**
			(0.000)	(0.013)	(0.000)	(0.014)
LPI Exporter					0.649	2.721

					(0.491)	(0.373)
LPI Importer					10.964***	5.489
					(0.000)	(0.176)
Common Border	0.533***	0.694***	0.499***	0.694***	0.497***	0.692***
	(0.002)	(0.000)	(0.003)	(0.000)	(0.003)	(0.000)
Common Language	0.834***	0.549***	0.784***	0.529***	0.790***	0.525***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Colony	0.878***	0.025	0.894***	0.048	0.888***	0.055
	(0.000)	(0.865)	(0.000)	(0.742)	(0.000)	(0.702)
Common Colonizer	1.115***	0.178	1.110***	0.205	1.112***	0.201
	(0.000)	(0.649)	(0.000)	(0.595)	(0.000)	(0.600)
Landlocked Exporter	12.337***	11.706***	12.326***	12.498***	12.405***	13.816***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Landlocked Importer	-17.061***	0.307	-17.031***	0.020	-9.560***	3.594
	(0.000)	(0.926)	(0.000)	(0.995)	(0.000)	(0.438)
NAFTA (Both)	-2.072	-0.273	-2.151	-0.377	-2.142	-0.350
	(0.152)	(0.359)	(0.131)	(0.208)	(0.133)	(0.246)
NAFTA (Exporter)	10.966*	46.021*	11.169*	39.238	9.961	38.317
	(0.053)	(0.065)	(0.050)	(0.113)	(0.159)	(0.125)
NAFTA (Importer)	-95.166***	-84.907***	-94.877***	-84.903***	-119.633***	-92.069***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EU (Both)	-0.164	0.283*	-0.135	0.260	-0.146	0.296*
	(0.100)	(0.090)	(0.175)	(0.116)	(0.141)	(0.083)
EU (Exporter)	1.602*	6.760**	1.567*	7.880**	0.558	2.750
	(0.083)	(0.032)	(0.091)	(0.013)	(0.756)	(0.662)
EU (Importer)	20.976***	8.118***	20.674***	7.838***	6.948**	-1.181
	(0.000)	(0.002)	(0.000)	(0.003)	(0.022)	(0.855)
MERCOSUR (Both)	-0.478	-0.208	-0.790	-0.568	-0.779	-0.549
	(0.737)	(0.687)	(0.580)	(0.288)	(0.588)	(0.308)
MERCOSUR (Exporter)	13.651***	3.326	13.690***	5.153	14.904***	3.469
	(0.000)	(0.622)	(0.000)	(0.441)	(0.000)	(0.625)
MERCOSUR (Importer)	3.329	-17.918*	3.426	-16.536*	-6.165	-21.115**

	(0.419)	(0.063)	(0.406)	(0.085)	(0.160)	(0.042)
ASEAN (Both)	-0.888*	0.883***	-1.088**	0.761**	-1.073**	0.753**
	(0.058)	(0.004)	(0.020)	(0.012)	(0.021)	(0.013)
ASEAN (Exporter)	10.385***	42.117***	10.427***	44.014***	9.157***	41.375***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
ASEAN (Importer)	-9.733***	16.923**	-9.915***	15.684**	-19.240***	12.004
	(0.000)	(0.022)	(0.000)	(0.032)	(0.000)	(0.126)
SADC (Both)	1.643***	0.954	1.516***	0.752	1.527***	0.741
	(0.000)	(0.145)	(0.001)	(0.253)	(0.001)	(0.265)
SADC (Exporter)	-5.165**	4.034	-5.183**	4.192	-5.738***	4.020
	(0.016)	(0.315)	(0.015)	(0.298)	(0.007)	(0.320)
SADC (Importer)	6.762**	-17.153**	7.070**	-16.895**	9.932***	-17.470**
	(0.033)	(0.024)	(0.025)	(0.030)	(0.002)	(0.024)
COMESA (Both)	1.425***	1.579***	1.248***	1.299***	1.238***	1.290***
	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.002)
COMESA (Exporter)	-14.465***	-0.448	-14.516***	-1.029	-14.201***	-0.445
	(0.000)	(0.929)	(0.000)	(0.841)	(0.000)	(0.929)
COMESA (Importer)	-3.064*	-7.944*	-2.935	-7.962*	-4.008**	-7.134*
	(0.094)	(0.069)	(0.108)	(0.072)	(0.029)	(0.096)
SAFTA (Both)	-0.946	-0.845	-1.010	-0.926	-1.008	-0.915
	(0.170)	(0.255)	(0.129)	(0.213)	(0.122)	(0.218)
SAFTA (Exporter)	-15.179***	-11.069	-15.242***	-11.589	-15.005***	-12.553
	(0.000)	(0.346)	(0.000)	(0.326)	(0.000)	(0.297)
SAFTA (Importer)	-9.789***	-5.981	-9.663***	-5.968	-8.065**	-7.175
	(0.009)	(0.425)	(0.010)	(0.425)	(0.031)	(0.327)
Constant	-46.136***	-21.325***	-46.170***	-21.624***	-38.052***	-16.409***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R2	0.695	0.643	0.695	0.644	0.697	0.647
Obs.	14273	15263	14273	15263	14273	15263

*Standard errors are corrected for clustering by country-pair. P-values appear in parentheses below the parameter estimates. Statistical significance is indicated by: * (10%), ** (5%), and *** (1%). R2 for the Poisson models is calculated as the squared coefficient of correlation between actual and fitted values, as in Santos Silva and Tenreyro (2006).*

Table 4: Regression results for EAC countries jointly, agricultural products only.

	OLS	Poisson	OLS	Poisson	OLS	Poisson
EAC (Both)	**1.524****	**1.330*****	**1.315****	**1.241*****	**1.368****	**1.310*****
	(0.011)	**(0.002)**	**(0.032)**	**(0.006)**	**(0.021)**	**(0.005)**
EAC (Exporter)	**7.523****	**-5.527**	**7.671*****	**-5.392**	**5.864***	**-5.401**
	(0.011)	**(0.299)**	**(0.010)**	**(0.316)**	**(0.051)**	**(0.311)**
EAC (Importer)	**0.083**	**19.285*****	**0.097**	**19.584*****	**-1.155**	**19.615*****
	(0.979)	**(0.002)**	**(0.976)**	**(0.001)**	**(0.713)**	**(0.001)**
Log(Importer GDP)	0.648***	0.649***	0.648***	0.648***	0.640***	0.648***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Exporter GDP)	0.251***	0.382***	0.249***	0.384***	0.220***	0.382***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Distance)	-1.324***	-0.320***	-1.321***	-0.319***	-1.324***	-0.318***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(1+Tariff)			-2.422***	-1.392	-2.320***	-1.393
			(0.000)	(0.108)	(0.000)	(0.114)
LPI Exporter					2.389***	2.360
					(0.002)	(0.152)
LPI Importer					8.029***	-0.795
					(0.000)	(0.715)
Common Border	0.735***	0.817***	0.707***	0.813***	0.709***	0.814***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Common Language	0.733***	0.550***	0.680***	0.540***	0.685***	0.542***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Colony	1.122***	0.218*	1.139***	0.228*	1.119***	0.231*
	(0.000)	(0.083)	(0.000)	(0.069)	(0.000)	(0.068)
Common Colonizer	0.932***	0.503**	0.921***	0.511**	0.930***	0.505**
	(0.000)	(0.013)	(0.000)	(0.010)	(0.000)	(0.012)
Landlocked Exporter	0.405	-2.969	0.302	-3.313*	2.145*	-1.560
	(0.680)	(0.127)	(0.759)	(0.090)	(0.069)	(0.388)
Landlocked Importer	-24.740***	-5.683***	-24.770***	-5.927***	-18.233***	-6.483***

	OLS	Poisson	OLS	Poisson	OLS	Poisson
	(0.000)	(0.004)	(0.000)	(0.002)	(0.000)	(0.003)
NAFTA (Both)	-2.472	0.313	-2.600	0.237	-2.586	0.255
	(0.407)	(0.312)	(0.380)	(0.427)	(0.387)	(0.386)
NAFTA (Exporter)	8.010**	-3.123	8.002**	-4.365	-0.716	-12.671
	(0.022)	(0.668)	(0.024)	(0.521)	(0.872)	(0.231)
NAFTA (Importer)	12.810**	58.106***	12.718**	57.868***	-6.305	59.831***
	(0.013)	(0.000)	(0.014)	(0.000)	(0.272)	(0.000)
EU (Both)	0.400***	1.097***	0.294**	1.029***	0.276**	1.036***
	(0.001)	(0.000)	(0.012)	(0.000)	(0.017)	(0.000)
EU (Exporter)	2.398***	1.033	2.503***	1.376	-0.945	-2.042
	(0.001)	(0.441)	(0.000)	(0.270)	(0.461)	(0.442)
EU (Importer)	9.461***	6.167***	9.303***	6.014***	0.926	7.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.425)	(0.005)
MERCOSUR (Both)	-0.141	0.150	-0.313	0.037	-0.295	0.015
	(0.825)	(0.760)	(0.622)	(0.940)	(0.644)	(0.976)
MERCOSUR (Exporter)	9.643***	-11.425**	9.833***	-11.244**	8.774***	-14.843**
	(0.001)	(0.026)	(0.001)	(0.029)	(0.004)	(0.018)
MERCOSUR (Importer)	-19.128***	-7.625	-19.568***	-7.705	-22.487***	-6.987
	(0.000)	(0.109)	(0.000)	(0.106)	(0.000)	(0.146)
ASEAN (Both)	0.307	0.927***	0.180	0.865***	0.168	0.862***
	(0.402)	(0.000)	(0.621)	(0.001)	(0.637)	(0.001)
ASEAN (Exporter)	13.413***	-0.618	13.456***	-0.103	9.896***	-3.269
	(0.000)	(0.876)	(0.000)	(0.979)	(0.000)	(0.526)
ASEAN (Importer)	1.853	18.802***	1.843	18.851***	-3.355	19.133***
	(0.392)	(0.000)	(0.393)	(0.000)	(0.128)	(0.000)
SADC (Both)	1.421***	1.321***	1.362***	1.241***	1.402***	1.320***
	(0.001)	(0.002)	(0.002)	(0.006)	(0.001)	(0.009)
SADC (Exporter)	8.323***	-2.604	8.267***	-1.862	7.669***	-1.884
	(0.000)	(0.525)	(0.000)	(0.635)	(0.000)	(0.639)
SADC (Importer)	0.471	-0.316	0.611	-0.247	2.930	-0.658
	(0.828)	(0.926)	(0.778)	(0.942)	(0.177)	(0.838)

	OLS	**Poisson**	**OLS**	**Poisson**	**OLS**	**Poisson**
COMESA (Both)	-0.270	0.682	-0.469	0.457	-0.486	0.463
	(0.590)	(0.199)	(0.349)	(0.389)	(0.326)	(0.407)
COMESA (Exporter)	-6.870***	2.841	-6.921***	2.741	-6.612***	1.819
	(0.000)	(0.332)	(0.000)	(0.346)	(0.000)	(0.513)
COMESA (Importer)	3.015**	-8.366***	3.152**	-8.410***	2.627*	-8.437***
	(0.044)	(0.001)	(0.035)	(0.000)	(0.077)	(0.000)
SAFTA (Both)	-0.196	-0.016	-0.252	-0.061	-0.269	-0.024
	(0.823)	(0.979)	(0.766)	(0.917)	(0.733)	(0.968)
SAFTA (Exporter)	-2.096	-14.047**	-2.256	-15.358***	-1.517	-15.572***
	(0.535)	(0.021)	(0.504)	(0.010)	(0.654)	(0.007)
SAFTA (Importer)	5.897**	23.357***	6.033**	23.231***	7.444***	23.203***
	(0.030)	(0.000)	(0.026)	(0.000)	(0.006)	(0.000)
Constant	-19.489***	-10.229***	-19.537***	-10.323***	-8.114***	-8.901***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
R2	0.501	0.671	0.503	0.674	0.507	0.676
Obs.	11301	12660	11301	12660	11301	12660

*Standard errors are corrected for clustering by country-pair. P-values appear in parentheses below the parameter estimates. Statistical significance is indicated by: * (10%), ** (5%), and *** (1%). R2 for the Poisson models is calculated as the squared coefficient of correlation between actual and fitted values, as in Santos Silva and Tenreyro (2006).*

Table 5: Regression results for EAC countries individually, agricultural products only.

	OLS	Poisson	OLS	Poisson	OLS	Poisson
Kenya	**12.174*** **	**26.446*** **	**12.048*** **	**26.593*** **	**6.959**	**27.849*** **
	(0.007)	**(0.001)**	**(0.008)**	**(0.001)**	**(0.126)**	**(0.001)**
Uganda	**20.344*** **	**15.780** **	**20.431*** **	**16.278** **	**17.477*** **	**16.247** **
	(0.000)	**(0.024)**	**(0.000)**	**(0.019)**	**(0.000)**	**(0.020)**
Tanzania	**4.726**	**-19.281** **	**4.884**	**-19.626** **	**9.291***	**-19.596** **
	(0.399)	**(0.043)**	**(0.385)**	**(0.037)**	**(0.098)**	**(0.036)**
Rwanda	**-4.151**	**24.016*** **	**-4.012**	**23.997*** **	**-4.186**	**23.964*** **
	(0.417)	**(0.007)**	**(0.432)**	**(0.007)**	**(0.406)**	**(0.006)**
Burundi	**-28.062*** **	**-0.175**	**-27.848*** **	**0.528**	**-32.098*** **	**0.506**
	(0.000)	**(0.987)**	**(0.000)**	**(0.961)**	**(0.000)**	**(0.963)**
Kenya-EAC	**1.145**	**-0.014**	**1.077**	**-0.002**	**1.087**	**0.001**
	(0.149)	**(0.973)**	**(0.168)**	**(0.996)**	**(0.154)**	**(0.997)**
Uganda-EAC	**1.557***	**1.183*** **	**1.488***	**1.196*** **	**1.498***	**1.187*** **
	(0.069)	**(0.003)**	**(0.079)**	**(0.004)**	**(0.052)**	**(0.005)**
Tanzania-EAC	**-0.303**	**0.645***	**-0.576**	**0.435**	**-0.555**	**0.488**
	(0.700)	**(0.079)**	**(0.458)**	**(0.254)**	**(0.441)**	**(0.218)**
Rwanda-EAC	**0.243**	**1.180** **	**0.216**	**1.215** **	**0.330**	**1.281*** **
	(0.732)	**(0.013)**	**(0.756)**	**(0.011)**	**(0.626)**	**(0.009)**
Burundi-EAC	**1.061**	**2.490** **	**0.955**	**2.513** **	**0.917**	**2.681** **
	(0.179)	**(0.017)**	**(0.220)**	**(0.017)**	**(0.224)**	**(0.013)**
Log(Importer GDP)	0.656***	0.661***	0.657***	0.660***	0.647***	0.660***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Exporter GDP)	0.256***	0.389***	0.254***	0.390***	0.224***	0.387***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Distance)	-1.320***	-0.316***	-1.317***	-0.315***	-1.320***	-0.315***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(1+Tariff)			-2.408***	-1.384	-2.310***	-1.392
			(0.000)	(0.124)	(0.000)	(0.126)
LPI Exporter					2.696***	1.972

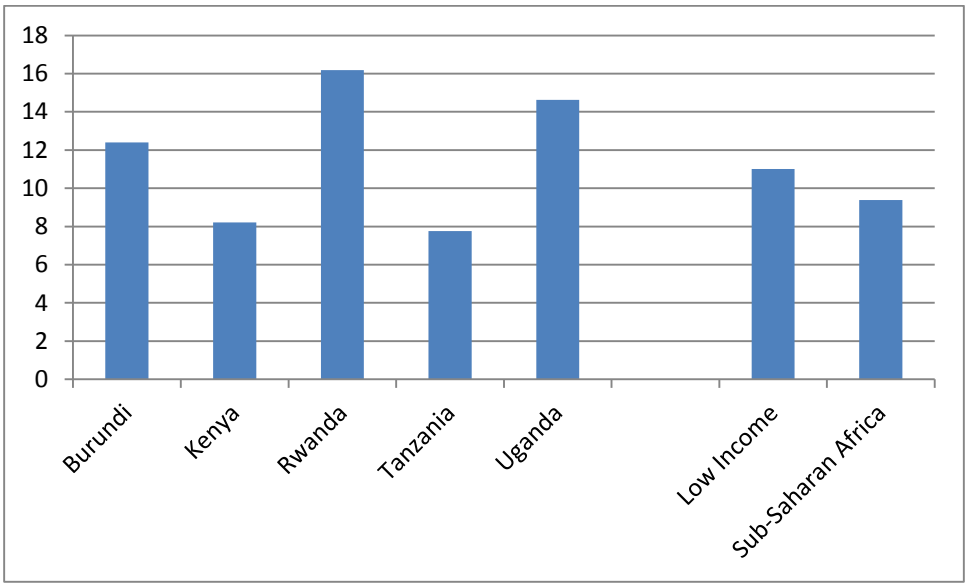
	OLS	Poisson	OLS	Poisson	OLS	Poisson
					(0.000)	(0.257)
LPI Importer					8.028***	-1.907
					(0.000)	(0.395)
Common Border	0.751***	0.815***	0.724***	0.811***	0.725***	0.811***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Common Language	0.729***	0.567***	0.676***	0.557***	0.681***	0.559***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Colony	1.127***	0.225*	1.143***	0.234*	1.124***	0.232*
	(0.000)	(0.073)	(0.000)	(0.061)	(0.000)	(0.064)
Common Colonizer	0.928***	0.503**	0.918***	0.511**	0.927***	0.505**
	(0.000)	(0.013)	(0.000)	(0.010)	(0.000)	(0.012)
Landlocked Exporter	1.571	-3.972*	1.454	-4.284**	3.587***	-2.805
	(0.124)	(0.058)	(0.156)	(0.041)	(0.003)	(0.158)
Landlocked Importer	-23.240***	-4.512**	-23.289***	-4.765**	-16.832***	-6.066***
	(0.000)	(0.036)	(0.000)	(0.026)	(0.000)	(0.008)
NAFTA (Both)	-2.471	0.383	-2.599	0.306	-2.585	0.309
	(0.406)	(0.258)	(0.378)	(0.346)	(0.385)	(0.337)
NAFTA (Exporter)	8.633**	-6.436	8.632**	-7.662	-0.093	-14.136
	(0.017)	(0.429)	(0.019)	(0.304)	(0.983)	(0.180)
NAFTA (Importer)	13.837***	55.195***	13.732***	55.005***	-5.202	60.247***
	(0.007)	(0.000)	(0.007)	(0.000)	(0.363)	(0.000)
EU (Both)	0.400***	1.085***	0.295**	1.020***	0.276**	1.018***
	(0.001)	(0.000)	(0.011)	(0.000)	(0.016)	(0.000)
EU (Exporter)	1.243*	-0.465	1.356*	-0.147	-2.557**	-2.967
	(0.080)	(0.725)	(0.058)	(0.904)	(0.048)	(0.301)
EU (Importer)	9.487***	4.647***	9.331***	4.476***	1.028	6.840***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.375)	(0.008)
MERCOSUR (Both)	-0.186	0.154	-0.357	0.040	-0.338	0.026
	(0.771)	(0.761)	(0.574)	(0.938)	(0.591)	(0.959)
MERCOSUR (Exporter)	9.560***	-10.602**	9.738***	-10.266**	8.740***	-14.005**
	(0.001)	(0.024)	(0.001)	(0.030)	(0.004)	(0.024)

	OLS	Poisson	OLS	Poisson	OLS	Poisson
MERCOSUR (Importer)	-18.342***	-15.485***	-18.773***	-15.576***	-21.426***	-14.184***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.004)
ASEAN (Both)	0.313	0.928***	0.187	0.863***	0.176	0.862***
	(0.403)	(0.001)	(0.616)	(0.001)	(0.630)	(0.001)
ASEAN (Exporter)	12.937***	-0.734	12.982***	-0.196	8.532***	-2.767
	(0.000)	(0.866)	(0.000)	(0.963)	(0.000)	(0.623)
ASEAN (Importer)	2.116	16.312***	2.111	16.348***	-2.890	17.302***
	(0.323)	(0.000)	(0.323)	(0.000)	(0.186)	(0.001)
SADC (Both)	1.438***	1.393***	1.377***	1.312***	1.414***	1.385***
	(0.001)	(0.002)	(0.002)	(0.005)	(0.001)	(0.007)
SADC (Exporter)	8.365***	-0.106	8.290***	0.721	6.632***	0.769
	(0.000)	(0.984)	(0.000)	(0.884)	(0.003)	(0.877)
SADC (Importer)	1.902	3.880	2.009	4.025	3.617	3.293
	(0.390)	(0.236)	(0.363)	(0.219)	(0.103)	(0.290)
COMESA (Both)	-0.354	0.721	-0.566	0.473	-0.579	0.519
	(0.512)	(0.196)	(0.297)	(0.403)	(0.279)	(0.366)
COMESA (Exporter)	-6.100***	-4.835	-6.101***	-5.069	-5.219***	-6.007*
	(0.001)	(0.152)	(0.001)	(0.122)	(0.003)	(0.064)
COMESA (Importer)	0.487	-10.653***	0.626	-10.724***	0.869	-10.907***
	(0.760)	(0.000)	(0.695)	(0.000)	(0.585)	(0.000)
SAFTA (Both)	-0.180	0.024	-0.236	-0.017	-0.252	0.015
	(0.837)	(0.967)	(0.780)	(0.976)	(0.750)	(0.979)
SAFTA (Exporter)	-0.311	-16.146**	-0.452	-17.501***	0.776	-17.569***
	(0.927)	(0.015)	(0.894)	(0.006)	(0.820)	(0.004)
SAFTA (Importer)	5.415**	21.197***	5.539**	21.095***	6.842**	21.211***
	(0.046)	(0.000)	(0.041)	(0.000)	(0.011)	(0.000)
Constant	-19.688***	-11.240***	-19.733***	-11.339***	-7.939***	-11.355***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R2	0.504	0.661	0.506	0.642	0.511	0.667
Obs.	11301	12660	11301	12660	11301	12660

*Standard errors are corrected for clustering by country-pair. P-values appear in parentheses below the parameter estimates. Statistical significance is indicated by: * (10%), ** (5%), and *** (1%). R2 for the Poisson models is calculated as the squared coefficient of correlation between actual and fitted values, as in Santos Silva and Tenreyro (2006).*

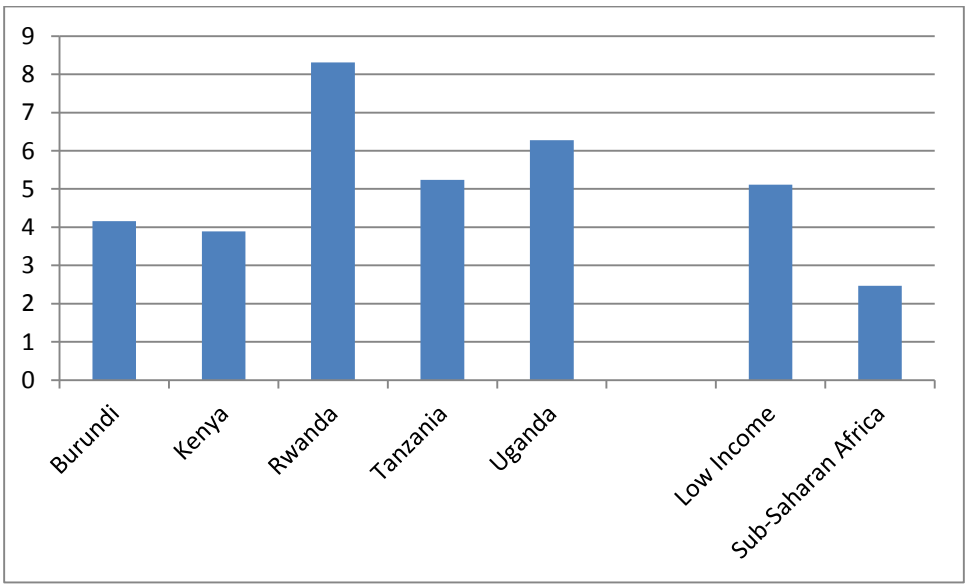
Figures

Figure 1: TTRI (all goods, most recent year) for EAC countries and comparator groups. Source: World Trade Indicators.



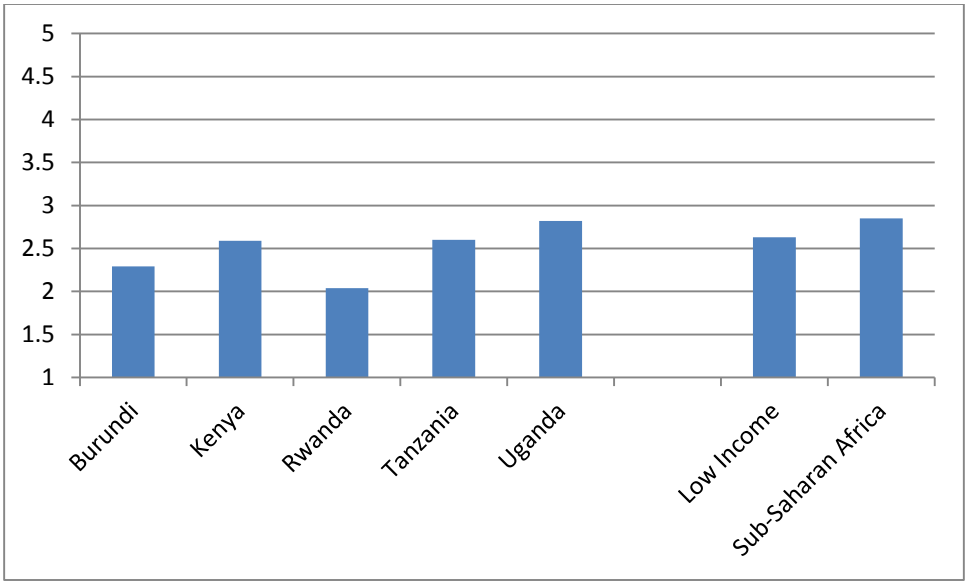
Averages are calculated using GDP weights.

Figure 2: MA-TTRI (all goods, most recent year) for EAC countries and comparator groups. Source: World Trade Indicators.



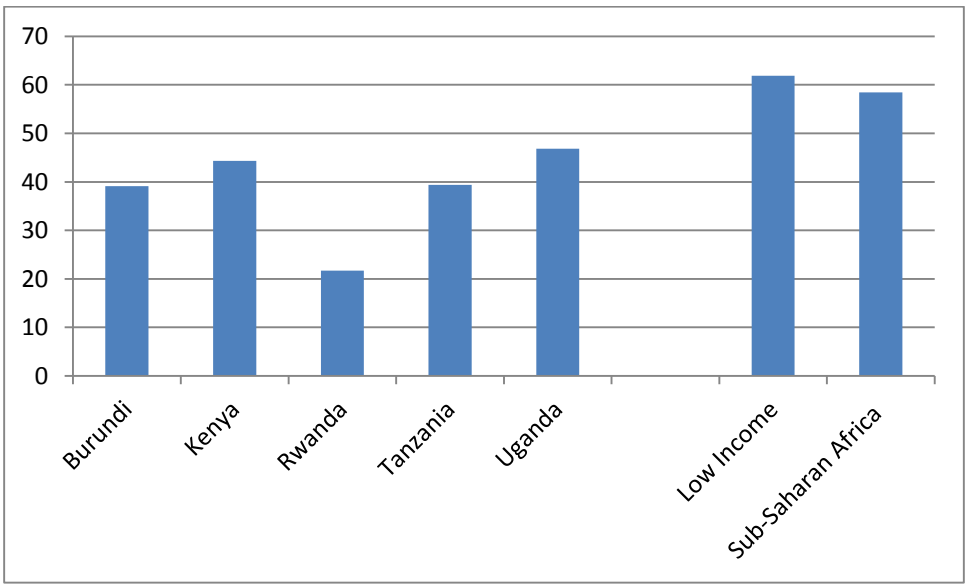
Averages are calculated using GDP weights.

Figure 3: LPI (most recent year) for EAC countries and comparator groups. Source: World Trade Indicators.



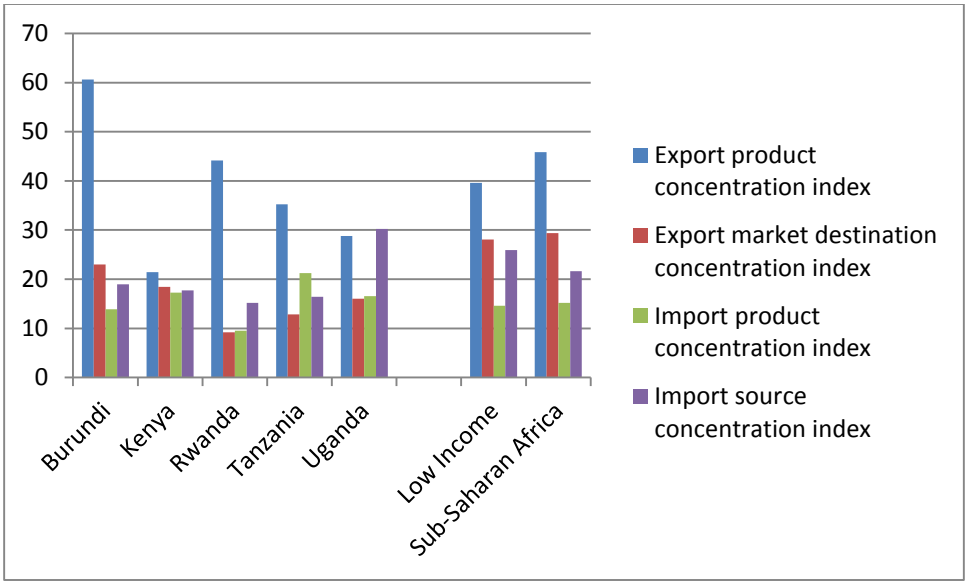
Averages are calculated using GDP weights.

Figure 4: Goods trade integration (% GDP) for EAC countries and comparator groups. Source: World Trade Indicators.



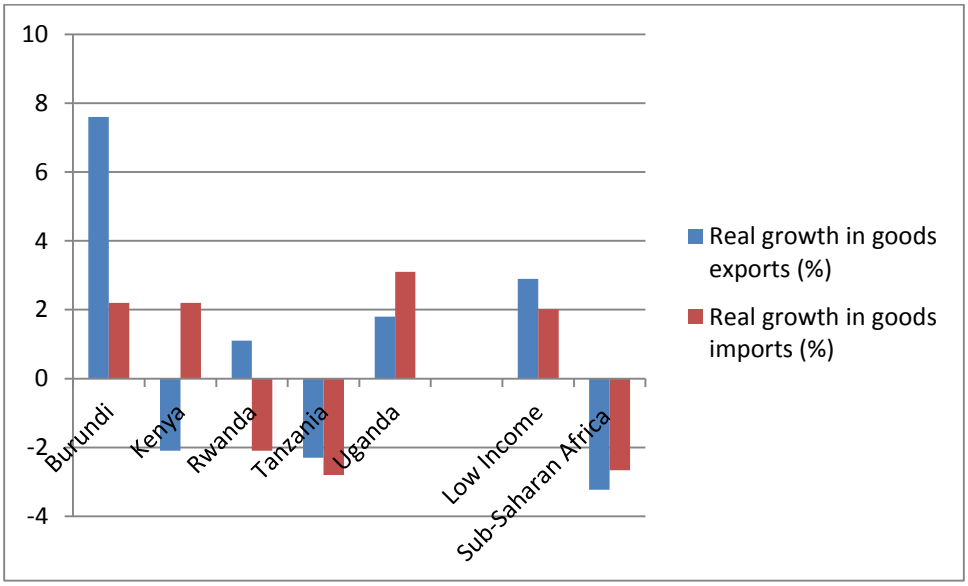
Averages are calculated using GDP weights.

Figure 5: Export and import concentration indices for EAC countries and comparator groups. Source: World Trade Indicators.



Averages are calculated using GDP weights.

Figure 6: Real growth of goods exports and imports in EAC countries and comparator groups. Source: World Trade Indicators.



Averages are calculated using GDP weights.