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Regional Trade Agreements and the pacification of Eastern Africa

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Abstract

Our paper uses the recent quantitative trade setup built around the structural micro-foundations for the gravity equation to evaluate the consequences of existing and prospective trade agreements between Eastern African Countries. We consider the economic gains that those agreements involve and, most important, their consequences on military conflict risks in the region, which the theory predicts to be ambiguous. Our gravity results point to large effects of those regional agreements in terms of trade creation. Using the structure of the model reveals diversion effects and welfare gains from the agreement that are modest, but in line with existing estimates of the literature. The political stability effects are more substantial, revealing that the main gains from African trade integration might be found in a pacifying effect in inter-state relations. We also point to non-negligible post-agreement increase in the risk of internal conflicts, suggesting accompanying measures to prevent those detrimental effects to regional integration.

Key Findings

- In this paper, we quantify the economic and security gains to be expected from the deepening/extension of the East African Community (EAC) agreement. The accurate ranking of various trade strategies in terms of expected gains should contribute to prioritize the sequence of trade policies in the negotiation agenda of the EAC member countries.

- Our quantification exercise hinges on the best practices in the academic literature interested in the quantification of the peace-promoting impact of trade. We use the so-called GETI procedure to quantify trade-creation, trade diversion and welfare effects of trade policies. The GETI procedure combines gravity regressions with general equilibrium simulation; it also

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complements the standard CGE methods by offering a much less model-dependent procedure but in a more aggregated perspective.

- In a first stage of the analysis we embrace a retrospective approach and quantify the historical impact of the EAC formation on regional trade and security risk:

  a) Our gravity results point to large effects of EAC agreement in terms of trade creation: Historically, two member countries experience an increase in bilateral trade of 213 percent with respect to the situation without EAC. With respect to other agreements in the region, the trade promoting impact of EAC on its members was much larger than the impact of COMESA (+80 percent) or SADC (+110 percent) on their respective members.

  b) The EAC trade agreement has been a major contributor to peace in the great lakes region. On average the agreement led to a 12% decrease in bilateral conflict risk between country members. This pacifying effect is substantial and even larger than what has been observed in the case of the construction of European Union.

- In a second stage of the analysis, we adopt a prospective approach and quantify the economic gains attached to a set of trade strategies selected on the basis of the current and future negotiation agenda of the EAC.

  a) The trade and security gains following the *effective* implementation of a common market would be substantial: on average it would increase intra-regional trade by 67% percent and decrease conflict risk by 4%. We also point to an non-negligible increase in the potential risk of internal conflicts (+2% on average), suggesting accompanying measures to prevent those detrimental effects to regional integration.

  b) The gains following the implementation of a common currency would be modest for all EAC countries. Given the costs attached to the creation of a common currency area, we conclude that this policy is less crucial for the future of the region.

- In the final stage of the analysis, we quantify the expected impact of a civil war in Burundi on intra-EAC trade flows. On average, Burundi would experience a 11% reduction in its

exports and a 5% decrease in its imports. For other pairs of EAC countries that do not involve Burundi, trade flows would be barely disrupted.

- Beyond providing a theory-based counterfactual quantification of different regional integration scenarios with consequences on trade patterns, welfare, and political violence, two additional contributions of our paper are: (i) Providing the community with an extended and reliable trade/production dataset for economies of Eastern Africa; (ii) Performing a gravity analysis on African trade agreements according to the leading-edge methodologies.

1 Introduction

From the early days of their independence, East African countries have pursued regional integration with the idea that it could lift some of the constraints imposed on their economic development. These constraints include the lack of domestic competition (due to limited economies of scale); the limited capacity to adjust to changes in the global marketplace, as well as limited negotiation power vis-à-vis their main trading partners. Even though the process has been slow, important steps have been achieved in defining regional integration policies and institutions, which began with the creation in 1999 of the EAC between the three original member states, continued with the integration of two new members in 2007 and the entry into force of the customs union in 2010. The integration process should reach a culminating point in the forthcoming years, with the consolidation and completion of a common market and a monetary union.

Building on both international trade theory and best practices of regional integration around the world, this paper assesses policy options that could be used to optimize the outcome of the EAC FTA in terms of shared prosperity and peace. More specifically, the paper addresses the following question: what should be the optimal depth of integration, mostly between current EAC members, from a growth and security perspective. In particular, we aim to quantify the gains attached to an effective implementation of a single market/currency union at the regional-level and the gains resulting from a deeper trade integration with SADC/COMESA with the aim of potentially building a Pan-African trade area. We believe that the accurate ranking of those various regional strategies in terms of expected trade gains and security risks should contribute to prioritize the sequence of trade policies in the negotiation agenda of the EAC member states. Moreover, we also quantify the impact on conflict risks with countries outside the EAC region when they are not involved in a trade agreement with the EAC countries. This makes it possible to assess the political factors that could be a source of resistance to the implementation of the trade reforms by EAC member countries.

As explained in detail in the first section of the paper, our quantification exercise hinges on the best practices in the academic literature interested in the quantification of Welfare Gains from Trade. Following the influential paper by Dekle et al. (2007), this field has been very active in the recent years and it has reached a clear consensus on what are the adequate modeling procedures

to be used, the so-called GETI procedure (Costinot and Rodriguez-Clare (2014), Head and Mayer (2014)), to assess trade-creation, trade diversion and welfare effects of trade policies. The GETI procedure combines gravity regressions with general equilibrium simulation; it also complements the standard CGE methods by offering a much less model-dependent procedure but in a more aggregated perspective (i.e. sector-level analysis is still in its infancy). To our knowledge we are the first to apply the GETI procedure to quantify the efficiency of real-world trade policies. We also make use of methodologies developed in the leading-edge academic literature interested in the complex relationship between trade and war. In particular, we highlight the risk of a deleterious impact of trade diversion on conflict: following the implementation and deepening of trade agreements, some countries may experience a reshuffling of their trade structure and this in turn can increase the risk of an intra-state or inter-state war at the regional level. Hence the optimal architecture of trade agreements must take into account this risk.

In our view, historical trade data can be used very fruitfully to inform the relevance and potential impacts of prospective agreements that could be signed by EAC countries. In the second section of the paper, we consequently adopt a retrospective approach to understand what have been the historical factors determining the outcome of the current EAC intra- regional economic relations. We assess what would have been the counterfactual trade and conflict risk patterns in EAC in absence of those trade policy changes. We consequently implement the GETI procedure in order to investigate whether past dynamics of Regional Trade Agreements and current architecture of RTAs do a good job at explaining, through trade diversion/creation effects, the observed trade patterns in East Africa.

In the third section of the paper we consider a prospective approach to explore the regional strategies for preferential trade agreements. We use the GETI procedure to quantify various counterfactual scenarios of RTA formation/reinforcement. This step involves testing the relative importance of various existing impediments to intra-regional integration (in the spirit of the cost of Non-Europe project that accompanied the transformation of the European Community from a simple custom union to a single market). We exploit the data-informed model to quantify which specific new agreement seems the more interesting in terms of trade creation and conflict risk, and how it compares with the new envisioned agreements. Finally we quantify the expected impact of a civil war in Burundi on intra-EAC trade flows.

Beyond providing a theory-based counterfactual quantification of different regional integration scenarios with consequences on trade patterns, welfare, and political violence, two additional contributions of our paper are: (i) Providing the community with an extended and reliable trade/production dataset for economies of Eastern Africa; (ii) Performing a gravity analysis on African trade agreements according to the leading-edge methodologies.

2 Methodology

2.1 Trade and welfare impacts of RTAs

The modern approach to welfare evaluation of changes in trade policies relies on the gravity model, which describes how bilateral imports of country n from country i react to changes in the level of bilateral "freeness" of trade, noted ϕ_{ni}. A surprisingly large set of models (covered in Head and Mayer (2014), and referred to as *structural gravity*) explain trade flows as

$$X_{ni} = \underbrace{\frac{Y_i}{\Omega_i}}_{S_i} \underbrace{\frac{X_n}{\Phi_n}}_{M_n} \phi_{ni}, \tag{1}$$

where $Y_i = \sum_n X_{ni}$ is the value of production, $X_n = \sum_i X_{ni}$ is the value of the importer's expenditure on all source countries, and Ω_i and Φ_n are "multilateral resistance" terms defined as

$$\Phi_n = \sum_\ell \frac{\phi_{n\ell} Y_\ell}{\Omega_\ell} \quad \text{and} \quad \Omega_i = \sum_\ell \frac{\phi_{\ell i} X_\ell}{\Phi_\ell}. \tag{2}$$

An immediately apparent feature of structural gravity is its multiplicative form. After taking logs, this means that the effect of multilateral resistance terms can be captured by exporter and importer fixed effects, while ϕ_{ni} is measure through a vector of bilateral trade costs variables, including RTAs:

$$\ln X_{ni} = \ln G + \ln S_i + \ln M_n + \ln \phi_{ni}. \tag{3}$$

A second key feature is that the level of trade flows between n and i is affected by third countries, only through the Φ and Ω terms, that are specific to n and i respectively. Once armed with measures of income and expenditure for each country and bilateral trade costs for all country pairs,

those terms can be solved easily. This allows for a calculation of the impacts of trade costs changes that take into account *direct effects* through ϕ_{ni} and *indirect effects*, through multilateral resistance terms.

It is useful to consider three different approaches to quantify the trade impacts of a change in a bilateral trade cost such as a regional agreement. Suppose that $\ln \phi_{ni}$ is linear in B_{ni}, one element of bilateral trade costs, with coefficient β. We contemplate the impact on trade of changing B_{ni} to B'_{ni}. The simplest approach is to hold the multilateral terms constant (in practical terms through the above mentioned importer and exporter fixed effects in gravity estimation). This *partial trade impact* is given by

$$\text{PTI}_{ni} = \hat{\phi}_{ni} = \phi'_{ni}/\phi_{ni} = \exp[\beta(B'_{ni} - B_{ni})]. \tag{4}$$

Note that $\text{PTI}_{ni} = 0$ for any country pair that does not change bilateral linkages, i.e. $B'_{ni} = B_{ni}$. Thus, the PTI omits third-country effects, which are to be expected because the multilateral resistance terms change whenever other countries change their trade costs.

For any trade equation fitting into structural gravity, the ratio of new bilateral trade, X'_{ni}, to original trade *taking MR changes into account* (but leaving incomes unchanged) is obtained from equation (1) as

$$\text{MTI}_{ni} = \frac{X'_{ni}}{X_{ni}} = \underbrace{\exp[\beta(B'_{ni} - B_{ni})]}_{\text{PTI}} \times \underbrace{\frac{\Omega_i}{\Omega'_i}\frac{\Phi_n}{\Phi'_n}}_{\text{MR adjustment}} \tag{5}$$

The procedure to implement is therefore to retrieve $\ln \phi_{ni}$, including coefficient β for B_{ni} either using estimates from the literature or estimating ϕ_{ni} through an implementation of equation (3). Then, using ϕ_{ni}, Y_i and X_n in equation (2), a contraction mapping gives us Φ_n and Ω_i. The third step is to do a counterfactual change to B_{ni} (for instance, turn on or off one RTA), which results in a new freeness of trade index ϕ'_{ni}. Re-running the contraction mapping provides us with Φ'_n and Ω'_i. We have all the needed elements to calculate X'_{ni}/X_{ni}. Contrary to the PTI approach, a change in a variable specific to a pair of country using this approach will provide counterfactual changes in trade flows for *all country pairs*.

A key issue is that MTI may omit potentially important effects. For instance, if the thought experiment is the removal of trade costs with a major partner, it is very unlikely that such a drastic change in the trade cost matrix, and therefore in predicted trade flows, would leave incomes

unchanged. The MTI remains an interesting entity but we think it also worth calculating the GETI allowing for wage/income changes.

To calculate changes in Y, recall that the value of production in the origin country is given by $Y_i = w_i L_i$. Considering the labor endowment as fixed, the change in Y_i will therefore be completely determined by the change in w_i: we have $\hat{w}_i = \hat{Y}_i$. Bilateral trade is a function of the output of the origin country Y_i, but the expenditure at destination X_n also enters. In general, $X_n \neq Y_n$, because of trade deficits, denoted as D_n. There are different ways to handle the presence of trade deficits, which are all *ad hoc* in the absence of a fully specified inter-temporal model. The most straightforward way to incorporate those deficits is to assume that deficit is exogenously given on a per capita basis, that is $D_n = L_n d_n$. With this assumption (which implies that trade deficits are specified in units of labor of country n), $X_n = w_n L_n (1 + d_n)$, so that $\hat{X}_n = \hat{w}_n = \hat{Y}_n$.

At this stage we therefore need to derive the equilibrium change in income, $\hat{Y}$. Note first that market clearing implies that $\hat{Y}_i = Y_i'/Y_i = \frac{1}{Y_i}\sum_n \pi_{ni}' X_n'$. We will use $\pi_{ni} = X_{ni}/X_n$ as notation for the share of n's expenditure spent on goods from i. In all the models we call structural gravity, changes in π resulting from trade cost shocks take the following form (first demonstrated in Dekle et al. (2007)):

$$\hat{\pi}_{ni} = \frac{(\hat{Y}_i \hat{\tau}_{ni})^{\epsilon}}{\sum_{\ell} \pi_{n\ell} (\hat{Y}_{\ell} \hat{\tau}_{n\ell})^{\epsilon}}. \tag{6}$$

Plugging this back into the market clearing condition, one can solve for the changes in production of each origin country.

$$\hat{Y}_i = \frac{1}{Y_i} \sum_n \hat{\pi}_{ni} \pi_{ni} \hat{Y}_n X_n = \frac{1}{Y_i} \sum_n \frac{\pi_{ni} \hat{Y}_i^{\epsilon} \hat{\phi}_{ni}}{\sum_{\ell} \pi_{n\ell} \hat{Y}_{\ell}^{\epsilon} \hat{\phi}_{n\ell}} \hat{Y}_n X_n. \tag{7}$$

The method for calculating the GETI involves four steps.

1. Retrieve β as the coefficient on B_{ni} from a gravity equation in which B_{ni} is a dummy for a trade cost changing event such as a free trade agreement or a currency union formation (or dissolution).

2. The exponential of the coefficient is our estimator of the impact of the trade cost change. That is let $\hat{\phi}_{ni} = \exp(\beta)$ for the ni for whom $B_{ni} = 1$ and $\hat{\phi}_{ni} = 1$ for all other ni pairs.

3. Along with the value of production of each country (Y_i), the original trade share matrix (π_{ni}),

plug the estimated $\hat{\phi}_{ni}$ into equation (7), which defines a system of equations determining $\hat{Y}_i$ for each country. Using the estimated value of ϵ[1], substitute the $\hat{\phi}_{ni}$ and $\hat{Y}_i^{\epsilon}$ into equation (6) to derive the matrix of trade changes, $\hat{\pi}_{ni}$. Iterate using a dampening factor until $\hat{\pi}_{ni}$ stops changing.

4. The GETI for each country pair is $\hat{\pi}_{ni}\hat{Y}_n$.

Once the bilateral trade change for all pairs of countries is obtained, it is straightforward to calculate welfare changes in this setup. Indeed, Arkolakis et al. (2012) have shown that for the whole class of models that are compatible with structural gravity (which include–among others– foundations as diverse as CES with Armington differentiating and perfect competition, CES monopolistic competition with or without firm heterogeneity, and the modern version of the Ricardian model of trade by Eaton and Kortum (2002)) welfare changes that can be written as

$$\widehat{W}_n = \hat{\pi}_{nn}^{1/\epsilon}. \tag{8}$$

The GETI approach shares the same primary goal as standard Computational General Equilibrium (CGE) models. However, as explained by Costinot and Rodriguez-Clare (2014), a first important difference is that the quantification under GETI does not need to impose the somewhat ad-hoc "Armington" assumption, namely that each country is exogenously endowed with a distinct good. GETI is a flexible approach that is fundamentally based on the gravity equation and is consequently compatible with a very large set of quantitative trade models with appealing micro-founded structure (e.g heterogeneous firm models, etc). Second, CGE models usually rely on trade elasticities calibrated/estimated on out of sample data while the GETI offers a tighter connection between theory and data as the key structural parameters necessary for counterfactual analysis are estimated in a gravity regression on the same sample of countries used for the simulation. Nevertheless both approaches are complement: CGE models have a rich structure with multiple sectors, while the GETI approach put more emphasis on transparency and less emphasis on realism. The idea is to construct middle-sized models that are rich enough to speak to first-order features of the data, like the role of country size and geography, yet parsimonious enough so that one can credibly

[1] We use $\epsilon = -5.03$, the median value from the meta-analysis of Head and Mayer (2014).

identify its key parameters and understand how their magnitude affects counterfactual analysis. Furthermore, simulations using GETI only require easily acccessible macroeconomic data.

The last step of our analysis consists in quantifying the impact of the considered trade arrangements on conflict risk. This exercise is based on our series of empirical papers dealing with the impact of trade on civil conflicts and interstate wars (Martin, Mayer, Thoenig, 2008 REStud; Martin, Mayer, Thoenig, 2008 JEEA; Martin, Mayer, Thoenig, 2012, AEJ:macro). In these papers we estimate the country-level elasticities of violence to (bilateral/multilateral) trade based on various empirical strategies (cross-section, panel, OLS, 2SLS). The GETI approach enables us to compute the full matrix of counterfactual trade flows following a trade arrangement. Combined with the set of estimated elasticities, we can quantify the contribution of future preferential trade arrangements in Eastern Africa to the pacification of the great lakes area.

2.2 Data Construction

The impact evaluation of RTAs for the EAC zone using the gravity / GETI approach requires the use of mainly two separate datasets for bilateral trade in goods:

1. The impact evaluation of RTAs for the Great lakes region using the gravity/GETI approach requires the use of mainly two separate datasets for bilateral trade in goods: The first one is used to evaluate the bilateral trade creation to be expected from the potential signature of regional trade agreements (RTAs) or monetary unions. To get the largest possible set of countries over the longest possible period, we extend the dataset by Head et al. (2010) to cover the most recent decades. The source of bilateral trade data is DOTS (produced by the IMF), complemented with COMTRADE data, when DOTS is unavailable and COMTRADE is available. The set of covariates (distance, common language, RTAs, currency unions, etc.) comes from the CEPII gravity database, and original sources are described in Head et al. (2010).

2. A second source of data is needed for the GETI approach. The general equilibrium approach described above needs to re-compute counterfactual multilateral resistance terms and GDPs following a change in any of the bilateral trade costs. Since trade with self the amount of expenditure spent on goods produced domestically is such a large share of overall trade, it

is crucial to have data on this internal trade ow. Trade with self is traditionally measured as total output minus total exports. It is a challenge to define this at the national level since GDP measures value added, and also since it contains a large share of output that is not tradable in most countries. Therefore, the literature has mostly used industry-level analysis for manufacturing for this type of exercise. However, we want to keep the aggregate level here, because restricting the focus on manufacturing is likely to present a distorted view of those countries. We use UNIDO data to calculate ratios of value added to production value at the country-year level, for aggregate manufacturing. We then combine this ratio with the yearly share of manufacturing value added in GDP, and GDP figures (both obtained from the World Bank WDI) in order to infer the value of production for all combinations of country-years. The last step is to use the total exports of the country-year, subtract it from total production value, which gives estimated internal trade. An important note about this dataset is the following: because GETI uses the market clearing assumption that $Y_i = \sum_n X_{ni}$, and that $\sum_n \pi_{ni}$ has to sum to one, the dataset has to be squared, with the value of output defined as sum of exports, and the value of expenditure defined as the sum of imports (both including trade with self). With 2009 data, we have squared data for more than 100 countries, including most countries from Eastern Africa.

3 Gravity

In this section, we estimate gravity regressions with the purpose of quantifying the direct impact of existing trade arrangements on the bilateral trade flows between member countries. Equipped with a set of point-estimates, we are able to gauge, for example, the efficiency of the EAC agreement on regional trade, or the success of ACP agreements on EAC exports to the EU. To our knowledge, our gravity analysis is the most comprehensive one on African RTAs, both in term of sample size and estimation methods. Our data, mainly based on IMF DOTS runs from 1949 to 2011 and has about 1389475 observations, one of the most complete we know of.

Table 1 displays our gravity results, each column corresponding to a different estimation method applied to equation (3). For the sake of exposition we do not discuss in details the technicalities of the different methods (the interested reader should refer to the Handbook chapter by Head

and Mayer (2014)). The idea is rather to illustrate how misspecified, but commonly used, naive gravity regressions may lead to wrong policy conclusions. We will see below that this issue is particularly salient with the estimate of the trade impact of the EAC agreement. Column (1) corresponds to a naive gravity setup, where the effect of origin and destination countries include only the traditional size variables, GDP and population. Column (2) includes dyadic fixed effects, Column (3) implements the tetrad approach of Head et al. (2010). Tetrads take ratios of ratios with respect to two reference countries in order to purge out the need to estimate a large set of fixed effects capturing multilateral resistance terms from theory. Column (3) is taking France and the United Kingdom as reference countries. Column (4) also reports tetrad results but averaged across 30 dyads of references. In Column (5) multilateral trade resistance is filtered out thanks to the inclusion of country $\times$ year fixed effects using a procedure for high dimensional demeaning introduced by Guimaraes and Portugal (2010). Although specification in column (4) is considered to be reliable, the state-of-the-art practice commands to take column (5) as the most rigorous estimate. We therefore take column (5) as our benchmark estimates, both in our discussion below and in our GETI simulations. The rest of estimates are mostly reported for the interest of comparing with the existing literature. All of them suffer from some sort of misspecification. Naive gravity is quite remote from what any trade theory recommends (it does what is referred to as the gold medal mistake in the literature by omitting multilateral resistance terms). The dyadic fixed effects do not account for the change in multilateral resistance terms, which is a first order concern in a sample as long as ours, and also when considering such drastic changes as signatures of RTAs. Tetrading accounts for all needed effects but needs reference countries, which can make estimates quite sensitive to missing values in non-balanced samples. Column (5) is using three-way fixed effects: importer-year, exporter-year and dyad. The only default we see with it for estimating structural gravity is computing time.[2]

We report only the coefficients that vary in the dyadic and time dimension (GDPs for instance, but also distance are not reported, even when estimated in columns 1 and 2 for GDP, column 1 for distance). The first conclusion to be drawn form Table 1 relates to the apparent large success of the EAC agreement in promoting bilateral trade between its members. Two member countries experience an increase in bilateral trade of 213 percent with respect to the situation without EAC.

[2]We recommend the use of the `reghdfe` procedure in Stata that vastly improved computing time.

Table 1: Gravity regression results: Dyadic Time-Varying Variables

Specification	(1) Naive	(2) DyadFE	(3) Tetrad FRA, GBR	(4) Tetrad 30 Avg.	(5) PG reg 3W FE
RTA	0.824^a	0.322^a	0.220^a	0.226^a	0.345^a
	(0.037)	(0.024)	(0.027)	(0.035)	(0.025)
European Union	-0.350^a	0.410^a	0.241^a	0.236^a	0.155^a
	(0.067)	(0.040)	(0.039)	(0.071)	(0.045)
European Union post 1992	0.447^a	-0.003	0.557^a	0.435^a	0.518^a
	(0.056)	(0.035)	(0.038)	(0.131)	(0.045)
NAFTA	0.332^c	0.683^a	0.439	0.205	-0.161
	(0.185)	(0.163)	(0.324)	(0.280)	(0.135)
MERCOSUR	0.878^a	0.706^a	1.694^a	1.303^a	0.473^b
	(0.219)	(0.140)	(0.216)	(0.329)	(0.232)
EAC	1.368^a	0.661^b	1.013^a	1.175^a	0.797^a
	(0.362)	(0.260)	(0.346)	(0.267)	(0.283)
EAC post 2009	0.317	0.225	0.359	0.229	0.347^b
	(0.259)	(0.141)	(0.346)	(0.308)	(0.166)
COMESA	-0.203	-0.183	0.349^b	0.393	0.245^b
	(0.143)	(0.114)	(0.161)	(0.255)	(0.117)
SADC	0.294	0.071	0.748^a	0.426	0.397^a
	(0.188)	(0.133)	(0.220)	(0.285)	(0.137)
ACP to EU	-0.129^b	-0.561^a	0.287^a	0.117	0.111^b
	(0.056)	(0.048)	(0.070)	(0.074)	(0.049)
GSP: donator exports	0.450^a	0.093^a	0.080^b	-0.026	0.004
	(0.028)	(0.023)	(0.034)	(0.088)	(0.031)
GSP: donator imports	0.549^a	0.216^a	-0.089^c	0.064	0.042
	(0.037)	(0.032)	(0.046)	(0.141)	(0.040)
Both GATT	0.147^a	0.225^a	0.089^b	0.107	0.111^a
	(0.018)	(0.015)	(0.040)	(0.091)	(0.028)
Shared Currency	0.536^a	0.348^a	-0.052	0.123	0.141^a
	(0.078)	(0.060)	(0.037)	(0.163)	(0.054)
Years since indep.	-0.046^a	-0.054^a	-0.023^a	-0.040	-0.030^a
	(0.008)	(0.008)	(0.003)	(0.025)	(0.006)
Years since indep. sq.	0.000^c	0.000^a	0.000^a	0.000	0.000^b
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Currently Sibling	1.602^a	0.989^a	1.159^a	1.107^a	0.374^a
	(0.194)	(0.110)	(0.235)	(0.286)	(0.134)
Observations	739215	739215	698450		739215
R^2	0.635	0.434	0.112		0.867
rmse	1.961	1.302			1.197

Note: Standard errors in parentheses with ^{a}, ^{b} and ^{c} respectively denoting significance at the 1%, 5% and 10% levels. Column (5) is using the reghdfe procedure written by Sergio Correia, inspired by previous code by Guimaraes and Portugal among others. Standard errors are robust to correlation of errors within dyads in columns (1), (2), and (5). Column (3) clusters by ij, it, and jt. Column (4) shows mean and standard deviation across 30 tetrad regressions. ^{a} means no negative coefficients, ^{b} less than 5% negative, ^{c} less than 10% negative.

Out of the 213 percent, an amount of 41 percent corresponds to the generic impact of Regional Trade Agreements (gravity coefficient of 0.345) and a complementary amount of 121 percent is specific to the EAC agreement (gravity coefficient of 0.797). This trade promoting impact is even larger after 2010 when the Customs Union protocol (launched in 2005) became fully operational and the Common Market (signed in 2009) started to be implemented. Quantitatively, this post-2010 deepening of the EAC zone resulted into an additional increase of 42 percent (gravity coefficient of 0.347) in bilateral trade flows among the country members. This evidence clearly indicates that EAC has been a particularly successful agreement among the large (but admittedly very heterogeneous) set of existing RTAs. With respect to other agreements in the region, the trade promoting impact of EAC on its members was much larger than the impact of COMESA (+80 percent) or SADC (+110 percent) on their respective members. More surprisingly, the gravity coefficients of GSP agreements are not significantly different from zero. While African countries were granted preferential access to the EU market very quickly after their independence, those trade arrangements , at least in their past design, contributed only marginally to African exports. These results temper the view that EAC has not fully delivered its economic promises. It is true that the political process of trade integration in the EAC has stalled over the last five years but the economic benefits attached to EAC, though partial and incomplete, are already very large.

Our gravity analysis also offers some guidance to select the most promising trade strategies for the East African countries. For instance, mimicking the entry into force of the EU single market in 1992 or the implementation of the Euro should have a major effect on intra-regional trade (respectively +67 percent and +16 percent). Consequently, in our GETI simulations, we investigate the expected economic benefits if the East African countries managed to follow the same regional strategy by implementing a common market and a common currency.

4 Historical Impact of EAC

Our first simulation assesses the historical impact of the EAC agreement on Eastern Africa trade and conflict risk. Our procedure is simple. We take the observed trade patterns in 2009 as a baseline. As a counterfactual, we compute the world matrix of trade that should prevail, everything else equal, in the absence of EAC. The comparison between the baseline and the counterfactual trade patterns informs us not only on the contribution of the EAC agreement to regional trade between members but also (thanks to the underlying general equilibrium analysis) on its contribution to mutilateral trade between members and non-members or between non-members. With respect to the gravity evidence discussed in the previous section, the GETI quantifications incorporate changes in multilateral resistance and in GDP that are mediated by geographical structure. This is why we will be able to quantify trade diversion effects and we will get heterogeneous results across countries, two features that are absent from a simple gravity analysis. Finally only the GETI quantifications allow to compute changes in trade shares, the relevant metric for conflict risk.

Before turning to the quantification, let us describe in a verbal way the expected economic consequences of the entry into force of EAC. Firstly, following country adhesion to EAC, bilateral accessibility within the member countries improves (thanks to a reduction in tariff and non-tariff barriers), EAC-based firms have a lower delivered price on East African markets and intra-regional trade openness increases (by 126 percent, as measured by gravity). Secondly, due to the rise in competitive pressures on East African markets, quality, quantity and number of varieties tend to increase: as a result, nominal GDP inflates and the consumer price index decreases. Thirdly, the East African market becoming more competitive, non-EAC based firms lose market shares on East African markets. Finally, the evolution of EAC trade openness (export component) with the rest of the world is ambiguous as it is subject to two opposing forces: on the one hand, EAC-based firms are more competitive on world markets thanks to improvements in quality and diversity; on the other hand they have to compete for labor and inputs with other EAC-based firms and so their costs of productions deteriorate.

From a security perspective, we quantify the impact of EAC on conflicts following results in Martin et al. (2008b). In this paper, it is found that more trade tends to have ambiguous effects on military conflicts. More bilateral trade increases the opportunity cost of a military conflict (which

reduces trade flows and therefore welfare severely). A greater integration with the rest of the world on the contrary reduces the cost of a bilateral conflict, since it serves as an insurance in terms of imports when a bilateral crisis hampers bilateral exchanges. Here, we find that EAC agreement increases bilateral trade openness between members which decreases their risk of bilateral conflict. However we should expect an increase of the risk of civil conflict for each member country because their share of internal trade decreases: Indeed, following EAC entry into force, member countries are less dependent of their home production as alternatives sources of expenditures become cheaper. As a result, the opportunity cost of a civil conflict decreases. Also neighboring non-member countries face a trade diversion effect, hence, the conflict risk between each EAC member and proximate third countries rises.

Table 2 displays the main results for each EAC member country. The first two columns display the level of trade openness (exports over GDP) with other EAC members and with the rest of the world in the counterfactual scenario where EAC would not be in force. Columns 3 and 4 report the same statistics as they are observed in the data. Columns 6 and 7 report the percentage change in these statistics between the benchmark and the counterfactual situations (Column 5 displays the percentage change in total trade openness). While openness with the rest of the world is barely affected by the entry into force of EAC, we see that intra-regional openness is massively impacted: the observed regional trade openness of the EAC members as a whole is 3.26 percent; in absence of any trade arrangement it would fall to 1.14 percent. The last column of Table 2 reports the change in real GDP due to EAC membership that can be interpreted as the welfare gains of the trade agreement in "normal times", that is in the absence of a military conflict. When a conflict occurs, trade falls, which causes a reduction of those welfare gains of column (5). Those welfare gains might appear modest, but several remarks are in order here. The first is that in this class of models, welfare gains arise directly from the amount of trade created with the RTA partner. This creation is, in a structural gravity model, proportional to the share of trade done with the partner *before* the RTA. Since those countries trade in vast majority within their national borders initially, the amount of trade created is modest, even with neighboring countries. The second reason is more technical. Welfare gains are also a function of the trade elasticity. The larger the number assumed, the smaller the gains. We take a central estimate of the literature here, -5, but reducing it would mechanically increase those gains, if we think that goods within this region are less subsitutable

than in usual samples. A value of -5 will compress estimates of gains in any sample. Even when evaluating the gains of ambitious agreements such as NAFTA, the literature using comparable numbers for the trade elasticity finds quite modest effects rarely exceeding 1%.

Table 2: Impact of EAC Membership

	No Membership		Membership		Changes (pct.)			Welfare (pct.)
Country	Trade Open.(pct)		Trade Open.(pct)		Trade Open.			Real GDP
	Regional	World	Regional	World	Total	Regional	World	
BDI	.18	4.68	.58	5.52	25.6	222.95	17.97	.26
KEN	1.94	13.32	5.31	12.43	16.24	173.54	-6.69	.59
RWA	.96	3.35	3.65	3.97	76.52	280.1	18.31	.7
TZA	.31	7.62	.93	7.84	10.52	196.6	2.87	.18
UGA	1.12	8.71	3.24	8.79	22.31	188.32	.91	.49
TOTAL EAC	1.14	9.59	3.26	9.44	18.38	186.52	-1.56	.45

Note: The benchmark year is 2009. Col.2-5 report ratios of export over Output. Col.6- Col.9 report changes

We supplement our trade evidence with Table 3 that reports changes in conflict risk for each pair of EAC countries –the diagonal corresponding to the change in internal conflict probability. The procedure here is to calculate the difference for bilateral and multilateral openness between a situation with and without EAC for each member country. Once those changes in openness are obtained, they are combined with the causal estimates of trade on war from our previous work in Martin et al. (2008b). We see that the effects are substantial in terms of reduction of inter-state wars - the reason being that trade dependence between EAC members substantially increases with the entry into force of the agreement. By contrast, each member country is also less dependent of its own production and so the internal conflict risk is raised, but to a much lesser extent. In Table 4 we document the historical change in conflict risks with 4 neighboring countries of the EAC zone (DRC, Ethiopia, Mozambique, Malawi and Zambia) following the implementation of the agreement. Because of trade diversion, the trade dependence between EAC members and their neighboring countries decreased after implementation and this resulted in a small increase in conflict risks.

Is the pacifying impact of EAC agreement large with respect to other existing trade agreements? By way of benchmarking we replicate the same type of analysis for the case of European construction. More precisely we quantify the pacifying impact of the implementation of the Eu-

Table 3: Change in war probabilities within EAC

Country	BDI	KEN	RWA	TZA	UGA
BDI	1.7	-10.87	-11.63	-12.16	-11.7
KEN	-10.87	1.79	-10.86	-13	-12.99
RWA	-11.63	-10.86	4.69	-10.8	-10.41
TZA	-12.16	-13	-10.8	.83	-12.98
UGA	-11.7	-12.99	-10.41	-12.98	2.92

Note: Figures represent percentage changes in conflict risk.

Table 4: Change in war probabilities with EAC neighboring countries

Country	DRC	ETH	MOZ	MWI	ZMB
BDI		2.75	-1.3	2.44	2.55
KEN	1.39	1.55	.9	1.44	1.41
RWA	1.76	4.51		3.77	3.84
TZA	.48	.29	-.04	.01	.52
UGA	.79	1.83	1.12	1.33	1.45

Note: Figures represent percentage changes in conflict risk.

ropean common market after 1992 on the five largest economies of EU: France, Germany, Italy, Spain, and the United Kingdom. The results are reported in Table 5. We see that the reduction in inter-state conflict risk between EU members has been substantial but smaller than in the case of EAC agreement (the change in intra-state conflict risks being comparable). Given that the construction of European Union has been considered by many policy makers and academic scholars as a force of geopolitical stabilization, this comparison makes clear that the EAC trade agreement is a major contributor to peace in the great lakes region.

Table 5: Change in war probabilities - The case of European Common Market

Country	DEU	ESP	FRA	GBR	ITA
DEU	5.69	-1.52	-1.68	-2.37	-1.92
ESP	-1.52	6.45	-1.12	-1.9	-.81
FRA	-1.68	-1.12	6.3	-1.87	-1.15
GBR	-2.37	-1.9	-1.87	4.11	-1.88
ITA	-1.92	-.81	-1.15	-1.88	6.03

Note: Figures represent percentage changes in conflict risk.

5 Exploring Prospective Trade Strategies

In this part of the paper we quantify the economic consequences of several trade strategies taking the year 2009 as a benchmark. The set of policies that we consider is selected on the basis of the current and prospective negotiation agenda.

5.1 Implementation of Common Market and Common Currency

The Protocol for the Establishment of the EAC Common Market was signed in 2009 and became operational in 2010. However only partial implementation has been realized so far. As for Monetary Union, negotiations were initiated in 2010. Yet, objectives are far from being implemented: There is still no common market; there is still no common currency. This stalling process of integration partly reflects the wide disparities of economic and social situations between the member states and partly reflects the legal and institutional complexity for making common market/currency operational. However, the implementation process has also lost top priority in the political agenda of several countries of the region mainy because the economic gains expected from common market/currency implementation are perceived by many stakeholders to be small.

In this section, we quantify the two main changes in integration policies – common market and common currency – at the core of the current agenda of negotiations within EAC. Based on historical gains attached to the creation of the EU singe market and of the Euro, those two strategies seem promising. Indeed, as shown in our gravity analysis, both policies had a large impact on bilateral trade between EU/Euro area members : The impact of the EU single market was to increase intra-EU trade by +67 percent; the impact of the Euro was to increase intra-EU

trade by 16 percent.

Our first prospective scenario consists in simulating the World trade matrix that should be observed if the EAC states managed to fully implement a common market. The post-implementation sequence of economic adjustments follows the same logic than the one that has been historically observed when EAC entered into force (and described in Section 4). The expected drop in tariff and non-tariff barriers should lead to a rise in competitive pressures on EAC markets and to an improvement in quality and quantity: As a result, intra-regional exports would be boosted and real GDP would inflate. Simultaneously, non-EAC based firms lose market shares on EAC markets. Hence implementation of the common market is expected to harm non-member countries, in particular for those countries that are more open to trade with the EAC countries. If quantitatively large, those vested interests could harm the political feasability of common market implementation as neighboring countries would tend to be opposed to it.

Table 6 reports the quantitative estimates of the economic consequences of a common market for EAC countries. We see that the increase in trade openness would be substantial for all members and even larger for members that already dependent on regional trade, the reason being that their production structure benefits more from the reduction in trade barriers following implementation. As for non-members, the (unreported) economic impact of a common market is usually negative due to trade diversion. However the quantitative effects are small, even for countries close to the EAC. The vested interests for non-members being marginal, the implementation process is unlikely to be endangered by political veto/action of some countries. Comparing with the retrospective results of Table 2 we see that the economics gains following the implementation of the Single Market are expected to reach the same magnitude that the historical gains generated by the implementation of EAC. In other words, the Single Market would double the trade gains generated by EAC. Table 7 reports the changes in conflict risk within the EAC area following the implementation of a common market. We see that the magnitude of changes is again quite substantial: on average a common market would decrease conflict risk by 4%. We also point to an non-negligible increase in the potential risk of internal conflicts (+2% on average), suggesting accompanying measures to prevent those detrimental effects to regional integration.

Let us now consider the prospective scenario of a common currency area that includes EAC countries. We compare the counterfactual trade and conflict risk to their counterparts in 2009.

Table 6: Impact of a common market

	No Membership		Membership		Changes (pct.)			Welfare (pct.)
Country	Trade Open.(pct)		Trade Open.(pct)		Trade Open.			Real GDP
	Regional	World	Regional	World	Total	Regional	World	
BDI	.58	5.52	1.04	6.27	19.61	77.12	13.53	.26
KEN	5.31	12.43	8.08	11.78	11.99	52.21	-5.2	.52
RWA	3.65	3.97	6.74	4.29	44.85	84.8	8.16	.75
TZA	.93	7.84	1.52	8.02	8.84	63.84	2.32	.17
UGA	3.24	8.79	5.19	8.83	16.56	60.4	.41	.46
TOTAL EAC	3.26	9.44	5.15	9.32	13.96	58.12	-1.28	.42

Note: The benchmark year is 2009. Col.2-5 report ratios of export over Output. Col.6- Col.9 report changes

Table 7: Within EAC change in war probabilities from a common market

Country	BDI	KEN	RWA	TZA	UGA
BDI	1.56	-3.57	-3.62	-4.6	-4.08
KEN	-3.57	1.49	-3.79	-5.36	-5.35
RWA	-3.62	-3.79	4.28	-3.76	-3.29
TZA	-4.6	-5.36	-3.76	.75	-5.26
UGA	-4.08	-5.35	-3.29	-5.26	2.46

Note: Figures represent percentage changes in conflict risk.

Table 8: Change in war probabilities with EAC neighboring countries from a common market

Country	DRC	ETH	MOZ	MWI	ZMB
BDI		2.29	-.92	2	2.1
KEN	1.12	1.25	.74	1.16	1.14
RWA	1.52	3.48		2.82	2.9
TZA	.43	.28	0	.05	.47
UGA	.73	1.57	.97	1.16	1.25

Note: Figures represent percentage changes in conflict risk.

Results are displayed in Tables 9, 10 and 11. We see that the implementation of a common currency, by alleviating exchange rate risk, would boost intra-regional trade. However the quantitative impact is small, around four times smaller than the impact of a common market. Our interpretation is that those expected economic gains are too low for justifying to pay the political, institutional and legal costs attached to the implementation of a common currency. This is naturally reinforced by the the fact that our evaluation of economic gains does *not* account for the costs of abandoning discretionary monetary policy as a tool for achieving macro-stabilization. By contrast, establishing a common market is relatively easier; and it brings much higher trade gains. Hence our recommendation is to prioritize the negotiation agenda towards the common market objective. This feeling is reinforced by the results in Table 10 regarding the impact of a common currency on potential conflicts. The gains are here again smaller than the ones from a common market, reported in Table 7.

Table 9: Impact of a common currency

	No Membership		Membership		Changes (pct.)			Welfare (pct.)
Country	Trade Open.(pct)		Trade Open.(pct)		Trade Open.			Real GDP
	Regional	World	Regional	World	Total	Regional	World	
BDI	.58	5.52	.68	5.7	4.43	16.45	3.16	.06
KEN	5.31	12.43	5.97	12.27	2.81	12.39	-1.29	.12
RWA	3.65	3.97	4.31	4.06	9.97	18.31	2.3	.16
TZA	.93	7.84	1.06	7.88	2.01	14.33	.55	.04
UGA	3.24	8.79	3.68	8.8	3.8	13.76	.14	.1
TOTAL EAC	3.26	9.44	3.7	9.41	3.22	13.42	-.3	.1

Note: The benchmark year is 2009. Col.2-5 report ratios of export over Output. Col.6- Col.9 report changes

Table 10: Within EAC change in war probabilities from a common currency

Country	BDI	KEN	RWA	TZA	UGA
BDI	.36	-1.07	-1.12	-1.32	-1.21
KEN	-1.07	.35	-1.11	-1.5	-1.5
RWA	-1.12	-1.11	1	-1.11	-1
TZA	-1.32	-1.5	-1.11	.17	-1.48
UGA	-1.21	-1.5	-1	-1.48	.58

Note: Figures represent percentage changes in conflict risk.

Table 11: Change in war probabilities with EAC neighboring countries from a common currency

Country	DRC	ETH	MOZ	MWI	ZMB
BDI		.54	-.23	.48	.5
KEN	.27	.3	.18	.28	.27
RWA	.35	.84		.69	.71
TZA	.1	.06	0	.01	.11
UGA	.17	.37	.23	.27	.29

Note: Figures represent percentage changes in conflict risk.

5.2 Full integration with COMESA and SADC

We quantify hereafter the economic gains that would be attached to the formation of a large, continent-wide, free trade area in East Africa. More precisely, we consider two scenarios: Fusion of EAC and COMESA and fusion of EAC and SADC. Currently there is some overlap between the existing RTAs, with Tanzania being both a member of EAC and SADC, and Uganda, Kenya, Rwanda, Burundi being members of both EAC and COMESA. Hence, our thought experiments consist in quantifying the counterfactual changes in trade and conflict risk attached to an integration of *all* EAC members to COMESA or SADC. By suppressing tariff and non tariff barriers, this entry would promote EAC exports. The quantifications are displayed in Tables 12, 13, 14, 15, 16, and 17. We see that the effects are small for the EAC countries: This is due to the fact that those zones are already largely overlapping. With those results in mind, we expect a much larger effect of the entry into force of a Pan-African RTA that would go from East to West Africa and that would group EAC, SADC, COMESA and ECOWA.

Table 12: Impact of COMESA Membership

	No Membership		Membership		Changes (pct.)			Welfare (pct.)
Country	Trade Open.(pct)		Trade Open.(pct)		Trade Open.			Real GDP
	Regional	World	Regional	World	Total	Regional	World	
BDI	.58	5.52	.58	5.52	0	.02	0	0
KEN	5.31	12.43	5.29	12.43	-.1	-.42	.04	0
RWA	3.65	3.97	3.64	3.98	.17	-.07	.4	0
TZA	.93	7.84	.93	8.32	5.61	.61	6.2	.11
UGA	3.24	8.79	3.24	8.79	-.01	-.08	.01	0
TOTAL EAC	3.26	9.44	3.25	9.6	1.16	-.21	1.64	.03

Note: The benchmark year is 2009. Col.2-5 report ratios of export over Output. Col.6- Col.9 report changes

Table 13: Within EAC change in war probabilities from COMESA membership

Country	BDI	KEN	RWA	TZA	UGA
BDI	0	-.01	.01	.17	0
KEN	-.01	-.01	-.01	.29	-.01
RWA	.01	-.01	.02	.18	0
TZA	.17	.29	.18	.48	.22
UGA	0	-.01	0	.22	0

Note: Figures represent percentage changes in conflict risk.

Table 14: Change in war probabilities with EAC neighboring countries from COMESA membership

Country	DRC	ETH	MOZ	MWI	ZMB
BDI		0	0	.06	.37
KEN	-.01	-.01	-.01	.45	.1
RWA	.01	.01		.05	.37
TZA	.24	-7.26	.09	-7.43	-7.25
UGA	0	0	-.01	.13	.34

Note: Figures represent percentage changes in conflict risk.

Table 15: Impact of SADC Membership

	No Membership		Membership		Changes (pct.)			Welfare (pct.)
Country	Trade Open.(pct)		Trade Open.(pct)		Trade Open.			Real GDP
	Regional	World	Regional	World	Total	Regional	World	
BDI	.58	5.52	.59	5.84	5.23	.87	5.69	.07
KEN	5.31	12.43	5.47	14.28	11.35	2.94	14.95	.49
RWA	3.65	3.97	3.46	4.74	7.76	-5.05	19.53	.13
TZA	.93	7.84	.88	7.87	-.18	-4.97	.39	0
UGA	3.24	8.79	3.19	9.68	7.01	-1.37	10.1	.19
TOTAL EAC	3.26	9.44	3.27	10.39	7.63	.48	10.11	.22

Note: The benchmark year is 2009. Col.2-5 report ratios of export over Output. Col.6- Col.9 report changes

Table 16: Within EAC change in war probabilities from SADC membership

Country	BDI	KEN	RWA	TZA	UGA
BDI	.42	.88	.74	.75	.93
KEN	.88	1.41	.86	.16	1.14
RWA	.74	.86	.78	.64	.83
TZA	.75	.16	.64	-.01	.69
UGA	.93	1.14	.83	.69	1.06

Note: Figures represent percentage changes in conflict risk.

Table 17: Change in war probabilities with EAC neighboring countries from SADC membership

Country	DRC	ETH	MOZ	MWI	ZMB
BDI		.82	-9.91	-8.42	-8.59
KEN	-9.39	.39	-8.92	-9.42	-9.32
RWA	-9.03	.76		-8.54	-8.54
TZA	.11	-.03	-.08	.31	.29
UGA	-9.5	1	-8.71	-8.39	-8.29

Note: Figures represent percentage changes in conflict risk.

5.3 Civil War in Burundi

The current situation in Burundi has lead to an increasing risk of a civil conflict affecting this country in the forthcoming years. Hereafter, we quantify the trade impact on EAC members of such a scenario. To this purpose we retrieve the estimates of the (PTI) trade impact of civil conflicts from the existing literature. Martin et al. (2008a) show in a gravity setup that on average, civil conflicts reduce external trade flows by 25%. As for internal trade flows, no comparable analysis exists in the literature. We consequently uses the gravity estimates of 35 % for the trade impact of inter-state wars from Martin et al. (2008b) that we extrapolate to the case of intra-state wars. Equipped with those PTI for internal and external trade flows we quantify the counterfactual trade matrix should a civil conflict erupt in Burundi. The results are reported in Table 18. We see that the trade disruption of bilateral trade flows between Burundi and its EAC partners would be substantial. On average, Burundi would experience a 11% reduction in its exports and a 5% decrease in its imports. For other pairs of EAC countries that do not involve Burundi, trade flows would be barely disrupted.

Table 18: Change in trade flows following a civil war in Burundi

Destination / Origin	BDI	KEN	RWA	TZA	UGA
BDI	-2.82	-11.11	-11.09	-11.12	-11.15
KEN	-5.38	0	.03	0	-.04
RWA	-5.4	-.02	.01	-.02	-.06
TZA	-5.38	0	.03	0	-.04
UGA	-5.34	.05	.07	.04	0

Note: Figures represent percentage changes in trade flows.

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