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Regional Economic Integration and its Implication on Exports in the Common Market for Eastern and Southern Africa (COMESA) Region (1980–2010)

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Abstract

One of the major development challenges facing Africa has been the small and fragmented economies with low incomes and low levels of intra-regional trade. To foster economic growth and promote intra-regional exports, Africa has witnessed renewed momentum for regional integration, in particular trade among COMESA countries. The present study employs fixed effects, random effects, and instrumental variables GMM regressions to estimate an augmented trade gravity model. We find that the formation of the COMESA trading bloc has promoted intra-regional exports. This finding suggests that to enhance export flows in the region, the process of economic integration should be deepened.

Keywords: Regional, Economic integration, Exports, Gravity model

1. Introduction

One of the major development challenges facing Africa has been the small and fragmented economies with low incomes. For example, in 2010 the average real per capita income in Africa was only US\$ 688, and 29 countries out of 53 in Africa were classified as low-income countries with gross national income per capita of US\$ 995 or less (World Bank, 2011). In contrast, gross national income per capita in East Asia and the Pacific was US\$ 4286 during the same period. Low incomes have limited the size of Africa's domestic markets. The small domestic markets and continental fragmentation have, in turn, translated into low economies of scale in production and low productivity for many African economies.

In terms of exports, Africa has been characterized by a high external orientation and a relatively low level of intra-regional trade. The bulk of this trade has been in primary commodities. African economies have been unable to fully take advantage of

economies of scale and other benefits of economic integration because of the limited trade among each other. Trade data shows that on average over the past three decades, intra-African trade has been about 10 percent compared to 60 percent, 40 percent, and 30 percent intra-regional trade that has been achieved by Europe, North America, and ASEAN, respectively (African Union, 2012).

In an attempt to promote intra-regional trade, Africa has witnessed renewed momentum for regional economic integration. There are more Regional Trading Agreements (RTAs) in Africa than in any other continent and most African countries are engaged in more than one regional integration initiative (UNCTAD, 2009). The expectation was that by forming large economic and trading units, Africa would be capable of overcoming some of the development challenges faced by the individual states.

The Common Market for Eastern and Southern Africa (COMESA)¹ is one of the pillars of African economic community. It was formed to promote intra-regional exports among member states with

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¹ COMESA trading bloc is made up of 19 countries, which include Burundi, Comoros, Congo D.R., Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

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the ultimate objective of creating more wealth and more income for the people of the region (COMESA Treaty, 1993). The expectation was that by progressively dismantling trade barriers among the countries that made up COMESA, trade in the region would be enhanced through increased competition and a bigger population. Increased trade would ultimately foster economic growth and development of the member countries (Carrillo-Tudela and Li (2004)).

COMESA traces its genesis to the mid-1960s, when the countries of Eastern and Southern Africa initiated a process towards creating an Eastern and Southern African co-operation arrangement. This was after the post-colonial African leaders had envisaged that the small size and fragmentation of post-colonial African national economies would be a major constraint to economic development. In 1965, during the ministerial meeting of the United Nations Economic Commission for Africa (UNECA) held in Lusaka, Zambia, the creation of an Economic Community of Eastern and Southern African states was recommended. In 1981, a treaty establishing the Preferential Trade Area for Eastern and Southern Africa (PTA) was signed, which entered into force in 1982. It was transformed into a Free Trade Area (FTA)² in 2000. The COMESA Customs Union was launched in 2009 in Harare, Zimbabwe.

COMESA is also actively engaged in the COMESA-EAC-SADC tripartite process to build a Tripartite FTA and promote regional trade covering 26 countries, almost half of Africa. This is motivated by the current overlap of membership among COMESA, Southern African Development Community (SADC), and the East African Community (EAC). Out of the 19 members of COMESA, seven are members of SADC and four are members of EAC.³

Despite the existence of COMESA for the past two decades, its impact on exports of member countries is not clear. Most of these member countries have low incomes and low levels of intra-regional trade. They have been experiencing low rates of growth in exports, leading to an ever-increasing trade deficit. Most previous studies on COMESA Regional Trade Agreement have mainly focused on individual member countries and not the COMESA region as a whole (Kaluwa & Kambewa, 2009; Mayda & Steinberg, 2007; Musila, 2004; Nikki et al., 2008; Roningen & DeRosa, 2003). This study attempts to fill this gap.

Abbreviations

ASEAN	Association of Southeast Asian Nations
CEAO	Communauté économique de l'Afrique de l'Ouest
CEEAC	Economic Community of Central African States
CEMAC	Central African Economic and Monetary Community
EAC	East African Community
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
UDEAC	Union douanière et économique de l'Afrique centrale
UEMOA	Union Economique et Monétaire Ouest Africaine
UNCTAD	United Nations Conference on Trade and Development
RTAs	Regional Trade Agreements

2. Review of the literature

2.1. Theoretical evidence

With regional integration, transfers occur between members of a trade bloc because the removal of tariffs between them means that exports obtain better prices in the partners' markets (a positive transfer), while the costs of imports net of tariffs increase (a negative transfer) (Hoekman and Schiff, 2002). The ideal grouping for economic integration includes countries at comparable levels of development but with disparate and complementary resource bases.

In regional trade agreements, sources of supply shift, leading to trade creation, replacing a high-cost domestic produced commodity with a low-cost foreign-produced commodity, and also trade diversion, displacing low-cost imports from the rest of the world. Therefore, countries would have the maximum gain from integration but little to worry about in terms of the distribution of benefits in favor of rich countries at the expense of poor countries within the grouping (Geloso-Grosso, 2001).

Regional economic integration is expected to lead to a rapid increase of trade, especially among the member countries. According to Yang and Gupta (2005), economic integration especially in developing countries, has been ineffective in promoting trade and attracting Foreign Direct Investment (FDI). That the relatively high external trade barriers and low resource complementarity among the

² Members of the FTA include Burundi, Comoros, Djibouti, Egypt, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Sudan, Swaziland, Zambia, and Zimbabwe.

³ COMESA/SADC members are DRC, Malawi, Mauritius, Seychelles, Swaziland, Zambia, and Zimbabwe. COMESA/EAC members are Burundi, Kenya, Rwanda and Uganda.

member countries of integration, limit internal and external regional trade. Although several regional economic communities have existed in Africa for some time, most of them have not been very effective and with limited benefits. Most integration arrangements are not characterized by strong supranational bodies and virtually all integration institutions are intergovernmental. This is because many developing countries are not willing to relinquish their sovereignty to a supranational community body, as is required for successful economic integration (Salvatore, 2006).

According to Morrison (1976), external trade makes available imported intermediate inputs and foreign exchange that may be critical to the production of exports. Under restrictive trade regimes, potential local exporters may not be able to acquire certain key imported intermediate inputs that they require in order to produce for the export market. Morrison argues that protectionist policies not only discourage exports directly through their effects on costs and availability of imported inputs, but also indirectly through their impact on the exchange rate. Protection reduces the demand for foreign exchange below the level that would exist under free trade, leading to a higher exchange rate than would apply in the absence of protectionist measures. The consequent overvaluation of the currency is, therefore, a disincentive to exporters.

Frank (1978) points out that regional integration is an important economic policy for increasing exports among member countries. This is mainly achieved through reducing or eliminating tariff and non-tariff barriers to trade among member countries, expanding markets, promoting regional specialization, and hence ensuring better resource allocation and improved production efficiency. Another theoretical argument is that trade liberalization tends to reduce anti-export bias. Balassa (1975) argues that there is an incentive effect of protection on production for the domestic market rather than production for export, which is sometimes referred to as relative anti-export bias. The existence of large profits to be made in protected import-substituting industries will make firms to be unwilling to invest in production for export. Protection tends to adversely affect the competitiveness of exports of a country in relation to the production of other countries. Therefore, by removing protectionism, regional integration enhances competition, and production efficiency, and hence increased exports.

According to Foroutan and Lant (1993), the fundamental explanation for the failure of various regional integration schemes in Sub-Saharan Africa to increase the flow of exports among themselves

was the inability and/or unwillingness of countries to carry out the preferential trade liberalization measures that represent the prerequisite for trade creation among integrating markets. They conclude that failed preferential trade liberalization among the majority of Sub-Saharan Africa (SSA) regional groupings is itself a function of several factors. These include fiscal revenue constraint, the uneven distribution of costs and benefits of integration among participating countries to various schemes, the associated difficulty in devising proper compensation schemes from the gainers to the losers, and the inward-looking, import-substituting economic philosophies that have guided the policy action of the majority of African governments.

2.2. Empirical evidence

According to Mukwaya (2019), regional trade agreement leads to a 72 percent increase in manufacturing exports between members within 12 years of the ratification of the trade agreement. This was based on manufacturing exports from 45 African countries using data from 1990 to 2015. He used a structural gravity model estimated using the Poisson pseudo maximum likelihood estimator that controls for heteroscedasticity and allows for bilateral zero trade values between trading partners.

Yang and Gupta (2005) observe that even if the RTAs in Africa had been successfully implemented, the impact of these arrangements on promoting intra-regional exports has been small. The study found that since mid-1990s, intra-African trade has stagnated at about 10 percent of total African trade. For many RTA, intra-arrangement trade as a share of their total external trade is found to have remained below intra-African trade as a share of total African external trade for the period 1970–2003. Results also show that Africa's share in global trade declined from about 4 percent in the 1970s to about 2 percent in 2003. They argue that the potential of the RTAs in exploiting economies of scale and enhancing competition has been limited by the lack of trade complementarity among RTA partners, small market size, poor transport infrastructure, and high trading costs at the border. They conclude that to increase regional exports, African countries need to undertake more broad-based liberalization and streamline existing RTAs, supported by improvements in infrastructure and trade facilitation. Early action to strengthen the domestic revenue base would help address concerns over revenue losses from trade liberalization.

Previous empirical studies done on various regional integration schemes give mixed results. While some

studies have found a positive correlation between regional economic integration and exports performance (Ajayi, 2005; Carrère, 2004; Musila, 2005), some other studies have found little or no empirical evidence to support a correlation between the two (Avom, 2005; Carrillo-Tudela & Li, 2004; Elbadawi, 1995; Jebuni, 1997; Kagira, 2001; Longo & Sekkat, 2004; Ogunkola, 1998). Considering the period 1962–1996 within the framework of an augmented gravity model, Carrère (2004) used the Hausman-Taylor (1981) approach and showed that African regional trade agreements generated significant export growth between member countries. For the particular case of the Franc zone, the study revealed that monetary unions (UEMOA and CEMAC) had largely reinforced the positive effect of the preferential trade agreements on intra-regional exports.

Ajayi (2005), who reviewed the process of economic integration in West Africa, found that participation in the Economic Community of West African States (ECOWAS) preferential trade agreement appeared to have increased exports among the member countries. However, the challenges of political instability, maintaining fiscal resources, and finding a suitable monetary unit presented considerable concerns for the creation of a single West African Union. Musila (2005) used the gravity model to estimate the intensity of trade creation or trade diversion in COMESA, CEEAC, and ECOWAS. Using annual data for the years 1991–1998, this study found that the intensity of trade creation or trade diversion varied from region to region and from period to period. Indeed, empirical results showed that the intensity of trade creation was strongest in ECOWAS countries, followed by those in the COMESA area. The effect of trade creation in the CEEAC area was not empirically corroborated. The estimated results also suggest that the effects of trade diversion were weak in the three regional organizations.

However, other studies done on regional trading blocs in Africa have generally concluded that the experience of economic integration in Africa has been a failure with respect to increasing exports among member countries (Elbadawi, 1995; Fouratan, 1992; Robson, 1998). Fouratan (1992), who studied the effect of regional integration in Sub-Saharan Africa (SSA), concluded that the structural characteristics of the Sub-Saharan African economies, the pursuit of import-substitution policies, and the very uneven distribution of costs and benefits of integration arising from economic differences among the partner countries, had prevented any meaningful trade integration in the region. Of the seven or eight groupings in SSA, only SACU had achieved any noticeable degree of integration in

the market for goods. Otherwise, intra-group exports had remained limited and stagnant.

From a sample of 28 countries in SSA and 62 other countries as their trade partners over two sub-periods (1980–1984 and 1986–1990), Elbadawi (1995) observed that the experiences of regional integration in Sub-Saharan Africa had been a failure. He also concluded that the two monetary unions, CEAO and UDEAC, and especially CEAO, experienced extremes of performance given that the effects of the trade integration scheme on intra- and inter-regional exports were positive during the first subperiod but negative during the second.

According to Jebuni (1997), full trade liberalization is a more useful trade policy than merely engaging in preferential trade agreements. In his comparative study on trade liberalization and regional integration in Africa, he argued that regional trade integration may be difficult to enforce since it may lead to losses in government tariff revenues and instability in the balance of payments. He observed that African countries usually face high transportation costs for intra-regional exports compared to the costs involved in trade relations with industrialized countries. Finally, he concluded that these factors undermine the arguments in favour of trade integration in Sub-Saharan Africa.

In the case of ECOWAS, Ogunkola (1998) carried out a comparative analysis of the determinants of subregional exports by considering a pre-integration period (1970–1972) and a post-integration period (1978–1980). The study's results show that the intra-ECOWAS exports remained very weak despite the integration efforts in the subregion during the two periods considered.

Kagira (2001) examined the effects of regional integration on the performance of intra-industry trade in Eastern and Southern Africa. The PTA Treaty specified eight groups of non-tariff barriers (NTBs) that had to be relaxed and eventually eliminated. These included quantitative restrictions, export and import licensing, foreign exchange allocation, stipulation of import sources, prohibition of advance import deposits, conditional permission for imports, and special charges for acquiring foreign exchange. By 1992, significant progress had been made in the relaxation of these NTBs. Despite these efforts, the success of integration programmes in terms of increased exports among the COMESA member states had been marginal.

According to empirical studies by Carrillo-Tudela and Li (2004), most regional trading blocs in Africa are faced with the problems of regional imbalances, price variations, open competition, language barriers, political hostilities, inconsistent customs

regulations, and differences in internal tariffs. These factors have limited the success of regional integration initiatives in Sub-Saharan Africa. Similar results were obtained by Longo and Sekkat (2004), who revealed that the different integration schemes did not produce effects of trade creation or trade diversion and therefore were not able to lead to growth in intra-African exports. Finally, Avom (2005) found that the impact of monetary union on exports inside CEMAC was not significant.

2.3. Theoretical framework of the trade gravity model

To assess the effect of COMESA RTA on intra-regional exports, the gravity model of international trade was used because of its considerable empirical robustness and explanatory power. Tinbergen (1962) and Pöyhönen (1963) were the first authors to apply the gravity model to analyze international trade flows. The theoretical framework of the gravity model was by Krugman (1979), Bergstrand (1985, 1989), and Deardorff (1998). These studies applied a partial-equilibrium, reduced form of the gravity model. Anderson et al. (2003) incorporated general equilibrium features for trade and developed a structural gravity model. Since then, the gravity

$$X_{ijt} = \beta_0 Y_{it}^{\beta_1} Y_{jt}^{\beta_2} N_{it}^{\beta_3} N_{jt}^{\beta_4} D_{ij}^{\beta_5} U_{ijt} \quad (1)$$

where X_{ij} is export of goods by country i to country j , Y_i and Y_j are the GDP of the exporter and importer, N_i and N_j are GDP per capita of exporter and importer, D_{ij} is the distance between the two countries.

For the purpose of estimation, equation (1) is expressed in log form as;

$$\ln X_{ijt} = \ln \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln N_{it} + \beta_4 \ln N_{jt} + \beta_5 \ln D_{ij} + U_{ijt} \quad (2)$$

Trade theories based on imperfect competition and the Heckscher-Ohlin models justify the inclusion of only the core variables; namely income, population, and distance. However, additional variables can be incorporated into the gravity equation to control for differences in geographical factors, historical ties, and the overall trade policy the fact that export flows between nations can be affected by factors besides the core variables. There is no universal agreement on which variables to include in the gravity equation beyond the core factors. Hence, the basic gravity model can be expanded by adding other variables, which are thought to explain the impact of various policy issues on export flows.

Thus, we can estimate the following equation:

$$\ln X_{ijt} = \ln \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln GDPPC_{it} + \beta_4 \ln GDPPC_{jt} + \beta_5 \ln GDPPCDIF_{ijt} + \beta_6 \ln D_{ij} + \beta_7 \ln IF_{it} + \beta_8 \ln IF_{jt} + \beta_9 \text{Language}_{ij} + \beta_{10} \text{Border}_{ij} + \beta_{11} \text{comesa} + U_{ijt} \quad (3)$$

model has become a popular instrument in empirical foreign trade analysis. It has been extensively used for assessing trade policy implications and, particularly recently, for analyzing the effects of RTAs on trade.

2.4. The model

In its basic form, the gravity model of bilateral trade hypothesizes that exports between two countries are proportional to their economic mass (measured by GDP and population size) and inversely proportional to the distance between them. Empirical works (e.g. Bergstrand, 1985; Bougheas et al., 1999; Breuss & Egger, 1999; Chen & Wall, 1999; Egger, 2000; Helpman, 1987; Limão & Venables, 1999; Mátyás, 1997; Soloaga & Winters, 1999; Wei, 1996 among others) have provided a number of alternative specifications for the gravity model. In the context of international trade, the basic formulation of the gravity model is as follows:

Where t is the subscription for time, i is the exporter country, j is the importer country (trading partner), X_{ij} denotes exports from country i to country j , GDP is the real gross domestic product, GDPPC is the exporter/importer's GDP per capita, IF is the exporter/importer infrastructure level, language, border is dummy for a common border.

GDP is included in the model to capture the factors associated with the level of economic development (Frankel, 1997). In particular, a higher GDP signifies greater potential supply from the exporting country and increased demand in the importing country. Therefore, the coefficients of the GDP variables were expected to be positive. GDP per capita income has also been incorporated in the model rather than population, the main argument being that what matters more in trade is not the size of the population *per se*, but effective demand which can more appropriately be measured by the GDP per capita. A large GDP per capita income may indicate a large domestic market, high level of self-sufficiency and less need for

trade. However, a large GDP per capita income may promote economies of scale in production, hence promoting the desire to trade in a greater variety of goods. Thus, the estimated coefficient for the GDP per capita income could be positive or negative.

The absolute difference in per capita income ($GDPPCDIF_{ijt}$) has been added to the model to capture technology differences between countries in explaining trade patterns. Two hypotheses exist on the effect of this variable on trade. The first is the Linder hypothesis which posits that countries with similar levels of per capita income will have similar tastes, they will produce similar but differentiated products and trade more among themselves (Bankole, 2019). The second is the Heckscher–Ohlin hypothesis which suggests that GDP per capita differences are highly correlated with differences in factor endowments and hence smaller differences could reduce trade, especially comparative advantage-driven intra-industry trade. Therefore, the effect of this variable may either be positive or negative. A negative sign would support the Linder hypothesis, while a positive sign would support the Heckscher–Ohlin hypothesis.

The infrastructure variable measures the level of infrastructure development in the country. This variable takes into account the quality of trade and transport-related infrastructure such as ports, railroads, roads, and information technology. More developed infrastructure is supposed to foster the movement of bilateral exports. Limão and Venables (2001) show that infrastructure is quantitatively important in determining transport costs. They estimate that poor infrastructure accounts for 40 percent of predicted transport costs for coastal countries and up to 60 percent for landlocked countries. Therefore, the coefficient estimates for the variables IF_{it} and IF_{jt} were expected to be positive.

Sharing a common language can enhance export flows between countries by facilitating communication. Ease of communication facilitates foreign trade through translation as well as through the ability to communicate directly (Melitz, 2007). Linguistic links and other historical and cultural links are particularly important at reducing the cost of unfamiliarity in international trade, or what Linne-mann (1966) called psychic costs, and Garnaut (1994) subjective resistance. Therefore, the coefficient for this variable was expected to have a positive sign.

Sharing a common geographical frontier is expected to promote bilateral trade. The immediate consequence of geographical proximity is the

reduction in transport costs, short delivery time, fewer interest payments on export credits, and low spoilage (Ekanayake et al., 2010). Near the border, consumers find it easy to cross over to shop in the other country and firms can source intermediate inputs in the other country, much more readily than would be possible if the countries did not share a common border. Therefore, the estimated coefficient of the variable $Border_{ij}$ was expected to have a positive sign.

The variable *comesa* is a dummy variable that takes the value 1 for the period after the formation of COMESA (1994–2010) and zero otherwise, capturing the effect of COMESA on intra-regional export flows. Regional integration is expected to promote intra-regional exports. Therefore, the coefficient of this variable was expected to have a positive sign. A positive value would imply that the formation of COMESA increased export flows among COMESA member countries, and vice versa.

The distance variable measures the physical distance between the economic centres of the trading partners. In measuring distance, sometimes authors locate countries at their geographical center, capital city or most populous city (Melitz, 2007). This study used distances measured from capital cities. Distance is a proxy for transportation costs. The greater the distance, the higher the transportation costs. Three kinds of costs are associated with doing business at a distance: (i) physical shipping costs, (ii) time-related costs and (iii) costs of (cultural) unfamiliarity (Rahman, 2009). Transportation costs raise the price of a good in the importing country, thus reducing its demand. Therefore, distance was expected to have a negative effect on exports.

2.5. Data type and sources

The study uses annual panel data on COMESA member countries for the period 1980 to 2010. The data on exports (in US\$) were generated from the IMF *Direction of Trade Statistics* and the UN *Commodity Trade Statistics* (UN Comtrade) databases. Information on GDP in USA dollars was obtained from the *World Development Indicators* databases of the World Bank, the UNCTAD, *Handbook of Statistics 2011* database, and from International Monetary Fund, *World Economic Outlook database, 2011*. Data on GDP per capita in USA dollars was from the International Monetary Fund, *World Economic Outlook database, 2011*. Distance in kilometers was

Table 1. Empirical results dependent variable: exports (1980–2010) in US\$.

Variable	Fixed Effects	Random Effects	GMM
Exporter's GDP	1.488*** (0.503)	0.731*** (0.048)	1.402*** (0.068)
Exporter's GDP per capita	−0.913 (0.596)	−0.431** (0.190)	−0.409** (0.20)
Importer's GDP per capita	0.220** (0.112)	0.31*** (0.121)	0.307** (0.122)
GDP per capita difference	0.225*** (0.090)	0.295*** (0.095)	0.281*** (0.101)
Distance		−1.745*** (0.111)	−1.732*** (0.123)
Exporter's Infrastructure level	0.776*** (0.039)	0.007 (0.016)	0.662*** (0.042)
Importer's Infrastructure level	0.778*** (0.037)	0.337** (0.157)	0.668*** (0.040)
Common Official language		0.611*** (0.235)	0.593*** (0.226)
Common border		1.085*** (0.232)	1.104*** (0.255)
Comesa	0.367 (0.217)	0.300** (0.146)	0.303** (0.143)
Constant	9.089 7.393	1.261 1.367	1.518 1.359
R-Squared	0.448	0.437	0.420
Number of Observations	1860	1860	1860
No. Of country	19	19	19
No of Instru.			14
Hausman test	497.91***		
AR(1), p-value			0.00
AR(2), p-value			0.24
Hansen test: overidentification, (p-value)			0.48
Difference-in-Hansen test, (p-value)			0.62

Standard errors in parentheses.

***, **, *: statistically significant at 1%, 5% and 10% levels, respectively.

obtained from www.indo.com/distance/index.html (2011).⁴ Common language and common border were available in the *World Fact Book 2011*. Infrastructure data was obtained from *World Bank (2008)*, *African Development Indicators* plus Infrastructure levels for various countries, measured by the Logistics Performance Indices, available at <http://data.worldbank.org/indicator/LP.LPI.INFR.XQ> (2011).⁵ The summary of the description of the variables and sources of data is presented in Appendix A.

The use of panel data helps to capture the relevant relationships among variables over time, reduces the collinearity among the explanatory variables, improves the efficiency of econometric estimates, and controls for unobservable individual heterogeneity and dynamics (Baltagi, 2005). If individual effects are correlated with the regressors, OLS estimates omitting individual effects will be biased.

Therefore, this study uses panel data estimation for the empirical gravity model of trade.

3. Empirical results and discussion

3.1. Diagnostic tests

The gravity model (Equation 3) is first estimated using fixed effects and random effects (see results in Table 1 respectively). The Hausman test is then applied to check whether the fixed effects model is more appropriate than the random effects model for this study. This is true if the null hypothesis of no correlation between the individual effects and the regressors is rejected. The Hausman test statistic shows that the null hypothesis is rejected, which implies that the random effects coefficients are inconsistent (though they remain relatively efficient)

⁴ This service uses data from the US Census and a supplementary list of cities around the world to find the latitude and longitude of two places, and then calculates the distance between them in kilometers (in a straight line).

⁵ Data are from Logistics Performance Index surveys conducted by the World Bank in partnership with academic and international institutions and private companies and individuals engaged in international logistics. Respondents evaluated the quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology), on a rating ranging from 1 (very low) to 5 (very high). Scores are averaged across all respondents.

suggesting that the fixed effects (within) regression is more appropriate than the random effects. However, following [Martinez-Zarzoso and Nowak-Lehmann \(2003\)](#), time-invariant variables in the gravity model (such as distance, common language, and common border) cannot be directly estimated with a fixed effects model. Hence, the instrumental variables Generalized Method of Moments (GMM) regression is applied, using 14 instruments, for the levels and lags of the 1st order. The instrumental variables GMM regression is an efficient estimator of panel data models. It provides consistent estimates, addresses the endogeneity problem, and allows for efficient estimation in the presence of heteroskedasticity ([Baum et al., 2003](#)).

3.2. Estimation results and discussion

Table 1 summarizes the empirical results obtained from estimating Eq. 3.6, using fixed effects (within), random effects, and the GMM. The dependent variable is exports, in US dollars, from country i to country j .

The effect of GDP of the exporting country is positive and statistically significant at the 1 percent level of significance in all estimated models, which is in line with the theoretical expectation. Thus, a higher GDP means higher production capacity which in turn translates into the ability of the economy to export more (supply side). This is consistent with the findings of [Carrillo and Li \(2002\)](#).

The results further show that the effect of GDP per capita income of the exporting country is negative and statistically significant at the 5 percent level in the random effects and GMM models. This result suggests that a country with a high GDP per capita income would have a larger domestic market to absorb a considerable share of domestically produced goods, thereby reducing the amount of goods that could be exported. This result is consistent with the findings of [Foroutan and Lant \(1993\)](#).

The effect of GDP per capita income of the importing country is positive and statistically significant at the 5 percent level in all estimated models. This result suggests that higher GDP per capita income for a trading partner country means higher absorption capacity, implying that the trading partner country is able to import more (demand side). This is consistent with the findings of [Achay \(2006\)](#), who applied the gravity model to a 1970–2000 sample of 146 countries and found that the exporter's GDP per capita had a positive impact on the volume of bilateral trade.

The effect of GDP per capita income difference is positive and statistically significant at the 1 percent

level of significance in all estimated models. Its positive sign suggests that bilateral trade flows between COMESA member countries are related positively to inter-country differences in the level of technological advancement. Large technological differences tend to promote bilateral trade between COMESA member countries. Therefore, the Heckscher–Ohlin hypothesis was found to be valid in the COMESA trading bloc. This result is consistent with the findings of [Carrillo and Li \(2002\)](#).

The effect of infrastructure in importing countries is positive and statistically significant in both the fixed effects and GMM models, suggesting that investment in transportation services and infrastructure is expected to promote exports in the COMESA trading bloc by reducing transport costs. [Limão and Venables \(2001\)](#) stressed the importance of investment in infrastructure as a way to reduce transport costs and promote trade. Using an upper limit Tobit, they found that improving the transport infrastructure considerably reduced cost, insurance and freight (CIF)/free on board (FOB) factor and hence had a significant impact on bilateral volumes of trade. Similar results were supported by [Francois and Manchin \(2006\)](#).

The effect of official common language is positive and statistically significant, which is in line with the predicted theory. Sharing of an official common language promotes bilateral trade between the COMESA trading partners. [Melitz \(2007\)](#) posits that the absence of a common language and the consequent presence of linguistic barriers can be a major obstacle to foreign trade. This result is consistent with the previous findings of [Achay \(2006\)](#), [Eita and Jordaan \(2007\)](#), [Foroutan and Lant \(1993\)](#), [Martinez-Zarzoso and Nowak-Lehmann \(2003\)](#), and [Ram and Prasad \(2000\)](#). In their empirical studies, these authors found a strong positive effect of the language variable and concluded that historical, cultural, and colonial ties had a significant impact on the pattern of trade in their study samples.

The effect of common border is statistically significant at the 1 percent level of significance in the random effects and GMM models and in line with the predicted theory. Sharing a common border facilitates trade. Thus, COMESA member countries with common frontiers tended to have more bilateral trade. This result is consistent with the findings of [Carrillo and Li \(2002\)](#) whose empirical study on regional integration schemes in Latin American showed that adjacency had a very strong effect on the bilateral volume of trade.

The effect of geographical distance is negative and statistically significant at the 1 percent level in the random effects and GMM models, which is consistent with the theoretical expectation. These results

provide strong support for the hypothesis that transportation costs are an important determinant of trade flows in the COMESA trading bloc. This implies that neighbouring COMESA countries, with low transportation costs between them, tend to trade more intensely among themselves than those that are further apart. This result is consistent with the findings of Achay (2006), Frankel (1997), Krugman (1991a), among others. These authors assessed the role played by geographical proximity in the regionalisation process, and found that the geographical distance, among other factors, had a negative impact on the volume of trade in their study samples.

To assess the effect of COMESA on intra-regional exports, a comparison of the pre-COMESA period (1980–1993) with the post-COMESA period (1994–2010) was done through the introduction of a *comesa* dummy variable. The effect of this dummy variable is positive and statistically significant at the 5 percent level of significance in all estimated models. This suggests that the formation of COMESA has had a positive effect on export flows in the COMESA trading bloc. Results from the GMM model show that intra-COMESA exports have grown by approximately 35 percent $[(\exp^{0.3} - 1) \times 100]$ since the formation of COMESA. This result suggests that the formation of COMESA has increased the propensity of COMESA member countries to trade with each other rather than with non-members. Similar studies have been done on other regional integration schemes. Chan-Hyun (2001), Martinez-Zarzoso and Nowak-Lehmann (2003) and Ram and Prasad (2000) found that regional integration had a positive and statistically significant effect on bilateral trade flows in their study samples.

4. Summary and policy implications

4.1. Summary

This paper has examined the effect of COMESA RTA on intra-regional exports. The study uses panel data on COMESA member countries for the period 1980 to 2010. An augmented trade gravity model was estimated using fixed effects, random-effects the GMM. The findings suggest that the formation of the COMESA trading bloc has improved export performance among its member countries, implying intra-bloc export bias. The results show that intra-COMESA exports have grown by approximately 35 percent since the formation of COMESA. Furthermore, Exporter's GDP, importer's GDP per capita, per capita GDP difference between trading partners, infrastructure level, official

common language, and contiguity have had positive effects on export flows among the COMESA member countries. However, exporter's GDP per capita and distance between trading partners have had negative effects on export flows among the COMESA member countries.

4.2. Policy implications

The study has shown that regional economic integration has had a positive effect on trade among COMESA member countries. This result suggests that in order to enhance export flows in the COMESA region, the process of economic integration should be deepened. This process might include: (1) improving the investment in transport and communications infrastructure that reduces long-distance cost of doing business; (2) harmonizing customs procedures among COMESA member countries; (3) eliminating non-tariff barriers to trade; (4) establishing a common external tariff (CET); and (5) promoting value addition and regional value chains.

Availability of data and materials

All the data that support the findings of this study are available from the corresponding author (Tom Mwebaze), upon reasonable request. It can also be accessed online on the World Bank website.

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Authors' contributions

All the authors (T. Mwebaze, E. Hisali, and H. Tumwebaze) contributed to the study conception, design study, and writing (original draft) of the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors have no competing interest to declare that are relevant to the content of this article.

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Appendix A

Table A1. Variables definition and data sources.

Variables	Description	Source
Exports	Value of Exports of Country i to Country j (US\$)	IMF Direction of Trade Statistics & UN Commodity Trade Statistics
Exporter's GDP	Gross Domestic Product of Country i (US\$)	World Development Indicators Databases of the World Bank, the UNCTAD, <i>Handbook of Statistics 2011</i> Database & from International Monetary Fund, <i>World Economic Outlook</i> Database, 2011.
Importer's GDP	Gross Domestic Product of Country j (US\$)	World Development Indicators Databases of the World Bank, the UNCTAD, <i>Handbook of Statistics 2011</i> Database and from International Monetary Fund, <i>World Economic Outlook</i> Database, 2011
Exporter's GDP per capita	Gross Domestic Product per Capita of Country i (US\$)	International Monetary Fund, <i>World Economic Outlook</i> Database, 2011
Importer's GDP per capita	Gross Domestic Product per capita of Country j (US\$)	International Monetary Fund, <i>World Economic Outlook</i> Database, 2011
GDP per capita difference	Difference in per capita GDP between the Trading Partners.	International Monetary Fund, <i>World Economic Outlook</i> Database, 2011
Distance	Captures distance in kilometers between the Capital Cities of the two Trading Partners.	www.indo.com/distance/index.html (2011) ⁶
Exporter's Infrastructure level	Level of Infrastructure Development in Exporting Country (<i>index 1–5</i>)	WorldBank(2008), <i>African Development Indicators</i> plus Infrastructure Levels for various Countries, measured by the Logistics Performance Indices, http://data.worldbank.org/indicator/LP.LPI.INFR.XQ (2011). ⁷
Importer's Infrastructure Level	Level of Infrastructure Development in Importing Country (<i>index 1–5</i>)	WorldBank(2008), <i>African Development Indicators</i> plus Infrastructure Levels for various Countries, measured by the Logistics Performance Indices, http://data.worldbank.org/indicator/LP.LPI.INFR.XQ (2011)
Common Official language	Dummy Variable equals 1 if Country i and j speak the same Language and zero otherwise	World Fact Book 2011
Common Border	Dummy Variable equal 1 if Country i and j share Official Common Land Border and zero otherwise	World Fact Book 2011
Comesa	Dummy Variable equals 1 for the period after formation of Comesa, and zero otherwise.	World Fact Book 2011

Table A2. Summary Statistics, Complete Sample.

Variables	obs	Mean	Std	Min	Max
Exports	589	3.22E+09	7.69E+09	1.52E07	6.31E+10
GDP	589	1.055E+10	2.188E+10	1.467E+08	2.190E+11
GDP per capita	589	1342.7	2323.2	100.0	14,382.6
Distance	589	2952.2	1634	57.3	8053.9
Infrastructure level	589	2.01	0.30	1.35	2.63
Common off. language	589	0.55	0.49	0	1
Common Border	589	0.12	0.32	0	1

⁶ This service uses data from the US Census and a supplementary list of cities around the world to find the latitude and longitude of two places, and then calculates the distance between them in kilometers (in a straight line).

⁷ Data are from Logistics Performance Index surveys conducted by the World Bank in partnership with academic and international institutions and private companies and individuals engaged in international logistics. Respondents evaluated the quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology), on a rating ranging from 1 (very low) to 5 (very high). Scores are averaged across all respondents.

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