

An Empirical Application of the Gravity Model to Assess the Trade Potential of Comprehensive Economic Partnership Agreements between the European Union and Southern African Countries

Roseline Tapuwa Karambakuwa¹, Albert Makoche Kanwa² and Terrence Kairiza³

^{1,3}*Department of Economics, Bindura University of Science Education, P. Bag 1020, Bindura, Zimbabwe*

²*Department of Economics, University of Zimbabwe, P.O Box MP167, Mount Pleasant, Harare, Zimbabwe*

E-mail: ¹<rkarambakuwa@gmail.com>, ²<almac772002@yahoo.co.uk>, ³<tkairiza@yahoo.com>

KEYWORDS Cotonou. Lome. Imports Quota. Tariff. Trade

ABSTRACT The research sought to assess the determinants of trade flows between European Union and Southern African countries for the period 2001 to 2012, and to determine the trade potential of a Comprehensive Economic Partnership Agreement between the European Union and Southern African countries. Econometric modeling was done using the gravity model of trade. Estimation was done using the fixed effects model. The research concluded that the factors that had a positive relationship with trade flows between Southern African and European Union countries were population and GDP of Southern African countries. Interim EPAs were found to be reducing the trade flows, meaning that the impending comprehensive EPAs had the potential to reduce trade flows between the two groupings.

INTRODUCTION

The African Caribbean Pacific (ACP) and European Union (EU) economic integration, which dates back to 1975, aims at promoting bilateral trade between the two trading blocks. Negotiations are currently in place between the two groupings towards the establishment of Economic Partnership Agreements (EPAs), which would be legally binding bilateral trade contracts between the EU and individual ACP countries. Since 2009, ACP countries signed interim EPAs with the EU, which are temporary agreements to be replaced by the full, comprehensive EPAs once the negotiations are complete. According to the European Commission (2013), EPAs aim to ultimately lead to development, sustainable growth and poverty reduction through trade. The interim EPAs establish a framework for reciprocal non-preferential free trade between EU and ACP, and they are compatible with the World Trade Organization's trad-

ing rules. However, most African countries believe that EPAs would give them a net welfare loss, as they believe that the EPAs are unsupportive of overall development aspirations and options and unresponsive to their key aspirations. This led to some amendments on the EPAs giving a watered-down version of the original EPA (Action Aid Ghana 2013).

In April 2013, the European parliament reversed an earlier decision to wait until beginning of 2016 for ACP member states to conclude EPA negotiations and set a new deadline of October 2014 or else they would face withdrawal of preferential access to EU. However, according to Julian (2013), even though the deadline is approaching, some negotiating ACP countries that have not yet signed interim EPAs are still far from reaching an agreement with EU and these countries have been delaying for years. According to McDonald et al. (2013), the deadline is too premature, is not in tandem with African integration goals and should be delayed until next decade. The current round does not address how EPAs would affect Africa in terms of trade and does not provide requisite structural safeguard measures necessary to protect sub-Saharan Af-

Address for correspondence:

Karambakuwa Roseline Tapuwa

Telephone: 00263717623

E-mail: rkarambakuwa@gmail.com

rican economies from negative consequences of trade concessions. McDonald adds that Africa will not be able to negotiate agreements with other major trading partners unless they provide concessions not included in EPAs.

Background to the Study

The ACP group of states, an organization created by the Georgetown Agreement in 1975 comprises 79 member states from African, Caribbean and Pacific regions. The majority of ACP members, 48 countries, are from sub-Saharan Africa, while 16 are from the Caribbean and 15 from the Pacific. Its main objective was to negotiate and implement together cooperation agreements with the European Community (ACP Secretariat 2011). The European Union has twenty-eight member states. Its history dates back to 1957 when the Treaties of Rome were signed by six member states. The Treaty of Maastricht of 1992 led to the creation of an economic and monetary union including a common currency and created the European Union. ACP-EU Cooperation started with the First Yaoundé agreement, signed in 1963 and the Second Yaoundé agreement, signed in 1969 between eighteen African states and six European states. The main aims of the agreements were financial, technical and trade cooperation, primarily in the sectors of economic and social infrastructure (ACP Secretariat 2011).

The Lome Conventions, signed between 1975 and 1989, provided the basic framework for economic cooperation between the EU and ACP countries. The Conventions sought to assist ACP states' development and promote close relations with EU through preferential non-reciprocal tariffs for ACP exports to the EU markets, better market access and better market prices (EU 2013). Commodity protocols were special commodity agreements whereby ACP were guaranteed markets for beef, sugar, rum and bananas based on a quota and the prices of the commodities was fixed to minimize fluctuations in ACP income. The EU compensated ACP countries for falls in prices, through the stabilization of export receipts on agricultural products (STABEX), which gave funds to offset losses on a wide number of agricultural products like cocoa, coffee, groundnuts, tea and others, as a result of crop failures and price falls. In addition, a country heavily dependent on a particular mineral

and suffering export losses could access loans, which were designed to lessen a country's dependency on mining. These loans were called SYSMIN (EU 2013).

The Lome Conventions were replaced by the Cotonou Agreement, which was signed in Cotonou, Benin in 2000. The fundamental principles of the Cotonou Agreement were equality of the partners, ownership of development strategies, participation and dialogue, fulfillment of mutual obligations, differentiation and regionalization. The agreement was designed to establish a comprehensive partnership, based on development cooperation, economic and trade cooperation, and the political dimension. Through the Lome Convention and Cotonou Agreement, exports from the ACP countries were given generous access to the European market. However, preferential access failed to boost local economies and stimulate growth in ACP countries and the proportion of EU imports from ACP countries dropped from eight percent to three percent of EU imports (European Commission 2013).

Negotiations for Economic Partnership Agreements (EPAs) between EU and ACP countries were launched in September 2002. They are a response to continuing criticism against the non-reciprocal and discriminating preferential trade agreements offered by the EU that were incompatible with WTO (Farber and Orbie 2009). The ACP-EU EPAs are economic arrangements meant to eliminate trade barriers by full abolition of tariff and non-tariff restrictions so as to increase trade. According to the European Commission (2013), the interim EPA covers several issues, which are duty-free and quota-free entry of imports into the EU from Southern African countries. The countries would gradually open their markets to EU goods while differences in levels of development would be considered. Each party would reintroduce quotas if their economy were under threat from another country's goods. The technical barriers or Sanitary and Phytosanitary (SPS) measures were also specified so that exporters meet EU standards. They aim to reduce costs for both consumers and producers, as well between the countries taking part in the agreement. This would lead to lower prices for distributors and consumers, thereby increasing the combined economic productivity of the ACP and EU countries. South Africa, Angola and Nigeria have not yet signed the interim EPAs.

Statement of the Research Problem

Since 1975, ACP countries have had bilateral relations with the EU through the Lome Conventions, Cotonou Agreement and Interim Economic Partnership Agreements. ACP countries were offered preferential non-reciprocal tariffs for exports to the EU markets, better market access based on a quota system, better market prices and export compensation. Twenty-seven out of seventy-nine ACP countries had signed interim EPAs as at the end of 2013 but these countries did not appear to have significantly increased their trade with EU as compared to those that did not sign the interim EPAs. Negotiations for full comprehensive EPAs to include all ACP countries are currently in place, which might mean that ACP countries might have to forgo opportunities to negotiate with other trading partners once they sign the comprehensive EPAs. Given this background it becomes important for Southern African countries to understand the determinants of trade between themselves and the European Union so as to decide the extent to which they can commit themselves to full comprehensive EPAs with the EU. Such a decision can be made if the determinants of trade between EU and Southern Africa are established such that the potential of trade from the comprehensive EPA with the EU can be established.

Research Questions

In addressing the problem, the study raises the following questions:

1. What are the factors that determine trade flows between Southern African countries and the European Union countries?
2. What is the trade potential of a Comprehensive Economic Partnership Agreement between the European Union and Southern African countries?
3. How relevant is the Trade, Development and Cooperation Agreement (TDCA) in determining trade flows between South Africa and the EU?
4. What is the relevance of the economic size (GDP) of countries on trade flows between European Union and Southern African countries?

Justification and Significance of the Study

The study will benefit researchers since they will be able to refer to findings for information

pertaining to economic integration between the EU and ACP. In addition, policymakers will use findings from this study to make the necessary policy decisions. Policymakers from both Southern African and European Union countries will understand the significant determinants of trade between these two regions. This will help them know how they should proceed in their negotiations for new comprehensive EPAs. Findings from this study can also be used by all other regional trading blocs in the world in order for them to make important decisions pertaining their integration.

EPA Sub-regions

Table 1 shows the EPA sub-regions and the twenty-eight countries that had signed interim EPAs in the sub-regions as at end of 2013.

Trade, Development and Cooperation Agreement (TDCA)

South Africa's trade relations and development cooperation with the European Union is governed by the Trade, Development and Cooperation Agreement of 1999, which has established a free trade area that covers ninety percent of bilateral trade between the EU and South Africa (European Commission 2013). The agreement has led to increased trade between South Africa and EU. Other countries that are in the South African Customs Union (SACU) with South Africa, namely Swaziland, Lesotho, Namibia and Botswana are likely to be indirectly benefiting from this agreement through trade with South Africa. The interim EPA has a clause allowing South Africa together with Angola to join it rapidly whenever they want to.

Trade between Southern Africa and European Union Member States

Between 2007 and 2010, EU agricultural exports to the ACP group as a whole grew by 37.5 percent. In contrast, between 2007 and 2010, the value of ACP agricultural exports to the EU grew by 19.8 percent (CTA Agritrade 2011). Between 2009 and 2010, EU imports for countries with EPAs from Southern Africa rose by sixteen percent while from West Africa they rose by twenty-nine percent (Xenellis 2010). Total trade flows

Table 1: Interim EPA signatories from ACP by November 2013

<i>Region and countries</i>	<i>Year interim EPA was signed</i>
Caribbean – 15 CARIFORUM states namely; Antigua and Barbuda, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Suriname, Saint Lucia, St. Christopher and Nevis, St. Vincent and the Grenadines, Trinidad and Tobago, The Bahamas, Barbados and Belize.	2008
Pacific – Papua New Guinea and Fiji	2009
West Africa – Cote d'Ivoire. (Ghana initiated but not yet signed EPA)	2008
Central Africa - Cameroon	2009
Eastern and Southern Africa – Mauritius, Seychelles, Zimbabwe, Madagascar.	2009
East Africa Community - No EPA signed yet. However Burundi, Rwanda, Tanzania, Kenya, Uganda initiated the framework in 2007 and are negotiating for a comprehensive regional EPA.	
Southern African Development Community (SADC) Botswana, Lesotho, Swaziland, Mozambique.	2009

Source: Data extracted from European Commission (2013) and Caribbean Community (CARICOM) Secretariat 2011

between the Southern African countries and European Union member states over the period study 2001 to 2012 have increased over the twelve years from USD 32 million in 2001 to USD 83 million in 2012, which represents a one hundred and fifty-nine percent increase in trade over the years. The EU-Africa Summit of April 2014 in Brussels aimed to reinforce links between the two continents, with continental integration being one of the themes. Despite this increase in trade between EU and Southern Africa over the years, the EU is not currently Southern Africa's major trading partner, as shown in Table 2. The Table indicates that exports and imports for Southern Africa are currently highest in the Asia Pacific region, with forty-five percent of exports going to the region and forty-five percent of imports coming from the region. This followed by the EU region at twenty-seven percent for both imports and exports. The least trading partner for Southern Africa is the rest of Africa with percentage export to the rest of the continent against all exports being three percent and imports thirteen percent.

Implications of Free Trade

Karingi et al. (2005) assumed that amongst the EU countries, the largest gainer of EPAs would reap up to eighty percent of increased exports to SADC. These would be Portugal (32% of the additional exports), France (12% of the additional exports), followed by the UK (12%). This would be followed by Italy (9%), Belgium (8%) and Germany (7%). In Southern Africa, Angola and Tanzania together would represent eighty-seven percent of the increased exports for the EU and would be important in EPA negotiations while Mozambique, Botswana and Namibia would take up six percent, four percent and three percent respectively, of the EU's gains in exports to the region. Table 3 shows a World Bank estimate of where the welfare gains from full liberalization would come from and how they would be distributed across countries. The Table indicates that liberalizing trade would produce forty-five percent of total world gains for developing countries and fifty-five for developed countries. This means that free trade stands to benefit both developing and developed economies

Table 2: SADC Exports and imports 2000 – 2010

<i>Economic community</i>	<i>Asia Pacific economic cooperation</i>	<i>European Union</i>	<i>Rest of world</i>	<i>Intra SADC</i>	<i>Rest of Africa</i>	<i>Total</i>
% Export	45	27	15	10	3	100
% Import	45	27	15	15	13	100

Source: SADC facts and figures

Table 3: Percentage distribution of potential gains from free trade

<i>Full Liberalisation of</i>				
<i>Economy and food</i>	<i>Agriculture and clothing</i>	<i>Textiles Merchandise</i>	<i>Other</i>	<i>All Goods</i>
Developed	46	6	3	55
Developing	17	8	20	45
All	63	14	23	100

Source: Anderson and Martin (2005) "Agricultural Trade Reform and the Doha Agenda." The World Economy 28 pp. 1301-1327

but the larger benefit would go to developed economies.

While there are benefits of free trade, opening up the economy by ACP would generally reduce further the custom revenues of the countries that they were supposed to get from EU. These customs revenues represent a significant part of the total revenues of the countries. In the context of this research, interim EPAs may be negatively affecting the Southern African countries, especially Lesotho, Namibia and Swaziland, where customs revenues represent more than a third of the total revenues (Karingi et al. 2005). In addition, free trade floods imports from EU, thereby negatively affecting the ACP infant industry. Domestic production falls as cheap imports increase and domestic producers suffer as producer surplus and welfare falls. This leads to job losses and increased poverty and inequality. Even though consumers in ACP benefit from cheap imports and a wide choice of products from EU in the short-term, in the long-term they suffer from unemployment as free trade causes transfer of jobs from poor developing countries to developed countries.

Literature Review

Theoretical Framework

The gravity model of trade specifies that the volume of trade between two countries is proportional to their economic sizes or incomes and it is inversely related to geographic distance between the countries. Tinbergen (1962) and Poyhonen (1963) first applied the gravity model to assess and analyze international trade flows. Later, gravity models were used to explain migration and other social flows in terms of gravitational forces of human interaction (Eita 2007).

The first attempt to give a theoretical basis for gravity models was done by Anderson (1979) using the Armington assumption, where goods are differentiated by country of origin. Applying gravity models to trade was initially criticized as lacking basis and foundation from trade theory although the models exhibited high statistical explanatory power (Matyas et al. 2000). Critics also argued that gravity did not incorporate models of international trade such as Ricardo's comparative advantage and the Heckscher-Ohlin (H-O) model as the basis for trade (UNCTAD 2012).

These views however, do not hold anymore since there has been some advancement in empirical work and literature. Linnemann (1966) justified the use of the gravity model by arguing that it is a reduced form of a four equation partial equilibrium model of export supply and input demand with prices excluded. However, this was later found to be inconsistent with the multiplicative form of the partial equilibrium model. The gravity model of trade has been used in many studies aimed at analyzing the bilateral flows of trade and analyzing effects of regional trading arrangements on trade. The basic gravity model is specified as follows:

$$Trp = \frac{\alpha(Y_r Y_p)^{\beta_1}}{(Dist_{rp})^{\beta_2}}$$

Where $r \neq p$

Trp shows total merchandise between country r and p

Y_r is country r 's national income

Y_p is country p 's national income

$Dist_{rp}$ is the distance between country r and p 's commercial centres

β_1 is expected to be positive. Y , a country's income, is expected to be positive since a high Y means higher ability to produce and export. Distance is another determinant of bilateral trade between country r and country p . β_2 is expected

to be negative since it is a coefficient of transport costs, which are a resistant factor to trade.

Empirical Literature

Baxter and Kouparitsas (2006) carried out a research with ninety-two countries to find out the determinants of international trade. The research found out that bilateral factor endowments are robust determinants of trade and the higher the trade, the more equal are the endowments across two countries. Bilateral trade was found to be lower if two countries shared the same level of development and had similar industrial structures. Fixed exchange rates were found to be positively related to bilateral trade. In 2006, Achey used the gravity model on 146 countries for 5-year sub-periods between 1970 and 2000 to investigate the determinants of trade flow volumes between various countries in the world. The findings showed that most estimated coefficients were statistically significant. GDP, GDP per capita, common frontier, common official language, common currency and common colonial past had a positive effect on the volume of bilateral trade while geographical distance had a negative effect on the volume of trade.

Anderson and van Wincoop (2003) showed in their study that incorporating multilateral resistance measures such as trade barriers could greatly improve gravity model estimation. They argued that measuring multilateral resistance using remoteness variables based on measures of distance did not capture border effects thus, it was much better to consider impact of trade barriers on prices on solving the gravity model. However, according to Feenstra (2004), the contribution by Anderson and van Wincoop is difficult to implement, thus has not been widely adopted. Feenstra (2004) showed that the same results as Anderson and van Wincoop (2003) could be generated by the inclusion of country specific fixed effects with a little loss in efficiency. However, this approach by Feenstra has a weakness in that it does not allow for multilateral resistance to be calculated explicitly. To solve this, Baier and Bergstrand (2005) came up with an alternative solution, which gives results consistent with Anderson and van Wincoop (2003) while allowing for multilateral resistance terms to be solved. This solution uses a Taylor series expansion to approximate for price effect terms.

De Groot et al. (2004) studied the effect of institutions on trade flows, using a gravity model approach, thus incorporated factors such as geographical proximity, language, trade policy and common history as explanatory factors for variation in bilateral trade. The results were that having a similar institutional framework promoted bilateral trade by thirteen percent, on average.

To analyze Bangladesh trade flows with its trading partners, Rahman (2004) applied a generalized gravity model. Panel data estimation techniques were used and the study concluded that Bangladesh's trade was positively determined by its openness of trade, size of economies and per capita GDP differential of trading countries. Filippini (2003) analyzed trade flows between some developed countries and East Asian industrializing countries using the gravity equation. The findings were that all coefficient signs were consistent with the assumptions of the model. There was high propensity of Asian countries to exchange high tech products with Japan and USA and China played an important role as exporter and importer. Martinez-Zarzoso (2003) applied the gravity model to assess Mercosur-European Union trade and trade potential. They used panel data to test 20 countries from Mercosur and EU, and concluded that variables added to the standard equation namely infrastructure, income differences and exchange rate were important determinants of bilateral trade.

The determinants of trade in COMESA were tested by Geda (2002). The research concluded that COMESA intra-trade was not significantly different in its trade with non-members and that the performance of regional blocs was constrained mainly by political, institutional and economic constraints at the implementation level of the agreements. The study also concluded that the failure of bilateral trade agreements to affect trade flows was caused by multiple memberships in various trade blocks, lack of policy harmonization, lack of credible compensation mechanisms, and lack of private sector involvement. Grunfield and Moxnes (2003) applied the gravity model to the bilateral export of services and foreign direct investment using data from OECD. They concluded from their results that the standard gravity model effects found on trade in goods apply to services too. Trade between two countries is positively related to their

size and negatively related to distance between them. They also concluded that the presence of a free trade area is not significant for services trade.

This finding was contradicted by Kimura and Lee (2004) who concluded that FTAs positively correlated with services trade and found common language not to be significant to trade in services, contradicting findings by Park (2002) who concluded that language was positively related to trade in service sector. To compare the estimates of trade in goods and those of trade in services, Kimura and Lee (2004) applied the standard gravity model. They included standard gravity model variables and added a measure of remoteness as a repressor. They used a mixture of OLS and time fixed effects. Their conclusions were that distance between countries was more important in services trade than in goods trade. Bussolo (1999) concluded in his study that a unilateral trade liberalization would be by far better for a country in terms of real GDP growth rates and trade than a regional EPA with the European Union.

RESEARCH METHODOLOGY

The Augmented Gravity Model

In addition to income level and distance, which are in the basic model, the augmented gravity model includes several variables accounting for other factors that may affect bilateral trade flows such as population, and dummy variables for membership in a trade bloc and common language. The traditional gravity model has been criticized in that it only uses income and distance to model transport costs. The model follows the general expression of the linear augmented gravity model by Achey (2006) as follows:

$$\ln T_{rpt} = \alpha + \beta_1 \ln Y_{rpt} + \beta_2 \ln Z_{rpt} + \beta_3 V_{rpt} + \beta_4 W_{rpt} \quad (1)$$

Where,

T_{rpt} is the total merchandise trade for country r to country p during year t .

Y_{rpt} shows a vector of variables, gross domestic product and population, that change over time for trade partners r and p during year t .

Z_{rpt} indicates a vector of variables that are constant over time but change with trading partners. They include weighted distance measured in kilometers between countries and the surface area of partner countries expressed in square kilometers.

T_{rpt} indicates a vector of dummy variables that change over time and also change according to the trading partner. For example, value of 1 if countries r and p belong to same regional community in year t or 0 otherwise.

W_{rpt} indicates dummy variables specific to partner countries r and p but are not time dependent, for example, language = 1 when both countries have common official language or 0 otherwise.

Empirical Gravity Model Specification

Panel data for the period 2001-2012 will be used to estimate the augmented gravity model in log linear form. This form of the model allows for the interpretation of coefficients as elasticity, except for dummy variables, which are not expressed in log form. According to Gelman and Hill (2007), the coefficients on the natural log scale are directly interpretable as approximate proportional differences. Bilateral trade flows between countries are explained by their economic sizes (GDP), distance, population and dummy variables. The model, following Martinéz-Zarzoso (2003) is specified as follows:

$$\begin{aligned} \ln TTF_{rpt} = & \alpha + \beta_1 \ln(GDP_{rt}) + \beta_2 \ln(GDP_{pt}) + \beta_3 \ln(POP_{rt}) + \beta_4 \ln(POP_{pt}) \\ & + \beta_5 \ln(Dist_{rpt}) + \beta_6 (InterimEPA_{rpt}) + \beta_7 (Colony_{rpt}) + \beta_8 (landlocked_{rpt}) \\ & + \beta_9 (TDCA_{rpt}) + U_{rpt} \end{aligned} \quad (2)$$

Variable Definition and Justification

Trade Flows (T_{rpt}) refer to trade flows of the country r with country p in year t , for example bilateral trade flows between Zimbabwe and United Kingdom in the year t . It is a sum of imports and exports. Rahman (2004) specifies that most empirical literature on the gravity model used total bilateral trade flows as the dependent variable. This study aims to determine how total trade flows (TTF) are affected by explanatory variables. The use of total trade flows will eliminate the problem of zero trade flows.

Gross Domestic Product (GDP_{rt}) is a measure of a country r 's capacity to produce goods for the local and export markets, and indicates the range of product varieties available for export. It is measured in nominal terms and expressed in US dollars. The coefficients of GDP are expected to be positive as income positively affects trade flows. It is an indicator of the size of a country in the model and measures the trad-

ing capacity of a country. GDP is predicted to positively affect bilateral trade.

Gross Domestic Product (GDP_{pt}) is an indicator of capacity to consume locally produced and imported goods for country p . GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Data are in current US dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates.

Distance ($Dist_{rpt}$) between two countries, measured in kilometers, appears as a proxy for transportation costs and all other trade costs between partners. For countries that are close to one another, transportation costs are lower. Coefficient is expected to be negative since it is a resistance factor, which reduces exports between countries. It is expected to have a negative effect on bilateral trade. For this research, the distance between individual Southern African countries and European Union countries was calculated.

Population (POP_r) represents the number of people in the country r in year t . Population is defined as the total number of people in a country. Oguledo and Macphee (1994) point out that population size affects trade volume through firstly the absorption effect whereby a large country with a large population is likely to have a diversified production base and self-reliance thus trades less as it meets its needs. Secondly, population size affects trade volume through the economies of scale effect whereby a country with higher population exports more than that with a lower population. The importer's population indicates import demand. Expected sign of coefficient can either be positive or negative.

Population (POP_p) represents the number of people in country p in the year t . Expected sign of coefficient can either be positive or negative.

Interim EPAs ($Interim\ EPA_{rpt}$) is a dummy variable capturing trade between EU15 and Southern African countries who signed interim EPAs. It captures trade impact of interim EPAs on bilateral trade between EU15 and the Southern African countries with interim EPAs. The variable takes the value of 1 if both trading partners are members of interim EPA and 0 otherwise. The coefficient indicates amount of additional trade, which is not influenced by the coun-

try's economic and geographical characteristics but influenced by interim EPA membership. The coefficient can be negative or positive. Positive and statistically significant estimated EU-ACP coefficient means intra bloc trade creation, thus EU-ACP membership stimulates intra trade creation between EU and Southern African countries. A negative coefficient means that intra bloc trade diversion.

Colony ($Colony_{rpt}$) is a dummy variable showing countries r and p that have a colonial history. A colonial history means that the countries may have increased trade since they have stronger economic ties and many similar characteristics. They have common language and with common language it becomes easier to negotiate international transactions and there is more likelihood of cultural similarities and closer ties. The countries with a common language trade more and have reduced transaction costs than those without a common language. Darku (2009) found that trade flows between Tanzania and the EU were positive because of linguistic ties. The dummy variable $colony_{rpt}$ assumes the value of 1 when countries r and p speak the same language and 0 otherwise. The coefficient is expected to be positive.

A country is *Landlocked* ($Llocked_{rpt}$) when the transportation costs increase. Eighty percent of trade is by sea transportation thus, proximity to the sea helps countries boost trade flows (Achey 2006). A study by Longo and Sekatt (2001) concluded that there would be a two percent reduction in African trade if either exporter or importer were landlocked. This implies that landlocked countries are at a disadvantage of reduced trade. The dummy variable $Llocked_{rpt}$ takes the value of 1 if both trading partners r and p are landlocked and 0 otherwise. The coefficient is expected to have a negative sign.

TDCA ($TDCA_{rpt}$) is a dummy variable capturing the trade and development agreement that South Africa has with EU called the Trade, Development and Cooperation Agreement (TDCA), which governs trade between South Africa and EU.

Estimation Procedure of the Gravity Model

Panel data framework was used to estimate the augmented gravity model. Panel data was collected to establish the determinants of trade between fifteen ACP member countries in South-

ern Africa and fifteen European Union countries who are members of the EU15. The Southern African countries are Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique Namibia, South Africa, Swaziland, Seychelles, Tanzania, Zambia and Zimbabwe. The fifteen European countries (EU 15) are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom. The EU 15 was chosen since these were the countries that had joined EU by 2000 and this research considers the period 2001 to 2012.

Among several advantages, panel data helps disentangle time invariant and country specific effects so as to capture the relationships between relevant variables over time. It also gives the ability to monitor the possible unobservable trading partner-pair specific individual effects thereby removing the problem of biased OLS estimates in the event that there is correlation (Martinez 2003). According to Hsiao (2006), panel data blends inter individual differences and intra individual dynamics giving it several advantages over cross-sectional or time-series data. These advantages are that it usually contains more degrees of freedom and more sample variability than cross-sectional data hence improving the efficiency and accuracy of econometric estimates. The Hausman test determines whether to use the fixed or random effects approach by testing the following null hypothesis:

H_0 : Ho: Difference in coefficients is not systematic.

H_1 : Ho: Difference in coefficients is systematic.

The fixed effects model should be used if the null hypothesis is rejected.

RESULTS

Model Estimation and Results

Multicollinearity Tests Results: The correlation matrix shows the strength or degree of linear association of a variable with itself or between two variables (Gujarati 2003). Collinearity between variables is shown on the following correlation matrix in Table 4. The Table shows that the main diagonal entries from the upper left to the lower right corner give correlation of one variable with itself, which is and should always be 1. The other entries are pair-wise correlations among variables. Severe multicollinearity problem is there if the correlation figures are high and there is no collinearity problem if the correlation figures are low. From the correlation matrix, the conclusion is that the model does not have multicollinearity challenges.

On specification tests results, the results of the Hausman test were as follows:

$$\chi^2(5) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 58.10$$

$$\text{Prob} > \chi^2 = 0.0000$$

($V_b - V_B$ is not positive definite)

The above results that the test statistic $\chi^2_{\text{calculated}} = 58.10$ and that the p-value is 0.0000. This means that the researchers reject the null hypothesis that the difference in random and fixed coefficients not systematic at all levels of significance. The fixed effects model is an efficient estimator of the data and it is therefore adopted. Table 5 shows the regression results.

DISCUSSION

Regression Results

Population and GDP of EU countries were insignificant in determining trade floors. The

Table 4: Correlation matrix

	Trade flo	Popn SA	Popn EU	GDP SA	GDP EU	Distance	Land locked	Interim EPA	TDCA	Colony
Trade flow	1									
Popn SA	0.3029	1								
Popn EU	0.5389	-0.0364	1							
GDP SA	0.5384	0.6105	-0.0302	1						
GDP EU	0.5698	-0.0168	0.9505	0.0308	1					
Distance	-0.0047	-0.3515	-0.0766	-0.103	0.0019	1				
Landlocked	-0.3198	-0.0662	-0.2637	-0.1086	-0.225	0.0151	1			
InterimEPA	-0.075	-0.1222	0.029	-0.064	0.0818	0.2548	0.017	1		
TDCA	0.4184	0.2849	-0.0082	0.6917	-0.007	0.1917	-0.059	-0.107	1	
Colony	0.2755	-0.0212	0.2511	-0.0282	0.2588	0.0625	-0.061	0.0153	-0.0068	1

Source: Regression results

Table 5: Regression results with dependent variable being total trade flow

<i>Variables</i>	<i>Coefficient</i>	<i>Standard error</i>	<i>P> t </i>	<i>[95% Conf. Interval]</i>
Popn SA	2.77***	(5.230)	0.000	1.732326
Popn EU	-0.58	(-0.620)	0.536	-2.420781
GDP SA	0.53***	(6.229)	0.000	.3607225
GDP EU	0.13	(1.159)	0.246	-.0926548
Distance				
Landlocked				
InterimEPA	-0.27***	(-4.573)	0.000	
TDCA				
Colony				
Constant	-40.55***	(-2.814)	0.005	-68.81251

(5.2317) = 131.57

Prob > F= 0.0000

R² : within = 0.5211

: between = 0.3280

: Overall = 0.2089

*** p<0.01 - statistical significance at 1% level
 ** p<0.05 - statistical significance at 5% level
 * p<0.1 - statistical significance at 10% level

following were significant at one percent level, population of Southern African countries with a positive coefficient, GDP of Southern African countries with a positive coefficient and Interim EPA, which has a negative coefficient. This means that increasing population and GDP of Southern African countries would lead to increased trade. However, the interim EPA has actually reduced trade between EU and Southern African countries. These findings concur with the empirical findings of Achey (2006) that GDP had a positive effect on volume of bilateral trade. The fixed effects model dropped the following variables during the estimation, distance, colony, TDCA and landlocked.

CONCLUSION

Several conclusions were made from the study. The factors that positively determine trade flows between Southern African countries and the European Union countries are population of Southern African countries and GDP of Southern African countries. Interim EPAs between EU and some Southern African countries have the effect of reducing their trade flows. Given that the interim EPAs have similarities with the impending comprehensive EPAs, which EU and African countries are currently negotiating for, the conclusion is that the comprehensive EPAs would also reduce trade flow between the trading blocks.

RECOMMENDATIONS

The findings of this study can be used to formulate policy at the country, regional and glo-

bal level. Population and GDP of Southern African countries contribute to increased trade flows. Thus, countries in Southern Africa need to concentrate on economic growth so as to boost GDP. They need to concentrate on areas of comparative advantage to achieve this. With population growth in Southern Africa there is increased intake of EU commodities leading to increased trade. EU countries wishing to increase trade with Southern Africa can focus on more exports to countries in Southern Africa with higher population. Countries from EU and Southern Africa need to revise the provisions of the EPA, which are similar to the provisions of the interim EPA. The study has already seen that the interim EPA are reducing trade flows, which shows there are inherent problems with the design of the interim EPA. Thus, before full adoption of a comprehensive EPA, there is need to redraft the provisions or alternatively, abandon it altogether and come up with a new agreement.

AREAS FOR FURTHER RESEARCH

Since trade in services contributes significantly to international trade, future research could focus on the service trade between EU and SA countries. Future research could also find out whether economic integration between EU and Southern African countries in form of EPAs is trade creating or trade diverting. In addition, researchers could assess the bilateral relations that Southern African countries have with other countries such as China, and find out whether or not such relations have more benefits than the bilateral relations with EU. This will

help conclude on whether or not bilateral relations with EU are the best option for Southern African countries. It is also of paramount importance to study how to address supply side constraints in Southern African countries in an effort to increase their exports to the EU and thereby increasing trade between the two blocks. Studies on determinants of trade among Southern African countries and among EU countries are also very important so that countries could conclude whether or not economic integration with countries in the same region is better than that with countries in a different region.

REFERENCES

- Achey L 2006. Assessing Regional Integration Potential in North Africa. *Twenty First Meeting of the Intergovernmental Committee of Experts (ICE)*, Morocco.
- ACP Secretariat 2011. African, Caribbean, and Pacific Group of States. From <<http://www.acp.int/content/secretariat-acp>> (Retrieved on 12 February 2015).
- Actionaid Ghana 2013. *Ghana Under Interim Economic Partnership Agreement (EPA) Analysis of Socio-economic Development and Policy Options Under the Interim EPA Regime with the European Union, Ghana*. Actionaid: Ghana.
- Anderson JE 1979. A theoretical foundation for the gravity equation. *American Economic Review*, 69(1): 106-116.
- Anderson K, Martin W 2005. Agricultural trade reform and the Doha Agenda. *The World Economy*, 28: 1301-1327.
- Andersen JE, vanWincoop E 2003. Gravity with gravitas: A solution to the border puzzles. *American Economic Review*, 93(1): 170-192.
- Baier SL, Bergstrand JH 2005. *On the Endogeneity of International Trade Flows and Free Trade Agreements*. Department of Finance and Business Economics. South Bend, Indiana: University of Notre Dame.
- Balassa B 1965. *Trade Liberalisation and Revealed Comparative Advantage*. Newhaven: Yale University, Economic Growth Centre.
- Baltangi B 2005. *Economic Analysis of Panel Data*. Chichester: Hoboken, J Wiley and Sons.
- Baxter M, Kouparitsas M 2006. What Determines Bilateral Trade Flows? *NBR Working Paper No. 12188*. Cambridge.
- Busse M, Borrmann A, Grobmann H 2004. *The Impact of ACP – EU Economic Partnership Agreements on ECOWAS Countries: An Empirical Analysis of the Trade and Budget Effects*. Hamburg: Hamburg Institute of Internal Economics.
- Bussolo M 1999. *Regional or Multilateral Agreements? An Evaluation of Southern Africa Trade Policy Scenarios*. London: Overseas Development Institute.
- Cariforum 2011. *What Is Cariforum?* Caribbean Community (Caricom) Secretariat.
- Cheong D 2010. Methods for Ex Ante Economic Evaluation of Free Trade Agreements. *ADB Working Paper Series on Regional Economic Integration* No. 52. Manila: Asian Development Bank.
- Darku AB 2009. The Gravity Model and the test for the Regional Integration Effect: The case of Tanzania. *The Journal of Developing Areas*, 43: 25-45.
- Deardoff A 1998. *Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? The Regionalism of the World Economy*. Chicago: University of Chicago Press.
- De Groot H, Linders G, Rietveld P, Subramanian U 2004. The institutional determinants of bilateral trade patterns. *Kyklos*, 57(1): 103-123.
- Dwivedi DN 1999. *International Economics*. Delhi: Konark Publishers.
- Eita JH 2007. *Determinants of Namibian Exports: A Gravity Model Approach*. Windhoek Namibia: University of Namibia.
- European Commission 2013. Trade - Overview of EPA Regions. From <<http://www.acp-eu-trade.org/index.php?loc=epa/background.php>> (Retrieved on 10 March 2015)
- European Commission 2013. Trade Statistics. From <<http://ec.europa.eu/trade/policy/countries-and-regions/statistics/regions/#esa>> (Retrieved on 13 March 2015)
- Farber G, Orbie J 2009. *ECDPM Discussion Paper 71*. New ACP-EC Waiver at the WTO. New York: Routledge.
- Feenstra 2004. *Advanced International Trade: Theory and Evidence*. Chapter 5. USA: Princeton University Press.
- Filippini C, Molini V 2003. The determinants of East Asian trade flows: a gravity equation approach. *Journal of Asian Economics*, 14(5): 695-711.
- Gasiorek M, Winters L 2004. What role for the EPAs for the Caribbean? *The World Economy*, 27(9): University of Sussex and GREQAM (Groupe de Recherche en Economie Quantitative d'Aix Marseille, France).
- Geda A 1999. *Trade Liberalization and the Coffee Sub-sectors: Some Implication for the Food Sub-sector in Ethiopia*. Ethiopia: Action Aid.
- Gelman A, Hill J 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge, New York: Cambridge University Press.
- Grunfield L, Moxnes A 2003. *The Intangible Globalisation: Explaining Patterns of International Trade in Services*. Norway: Norwegian Institute of International Affairs Paper No. 657.
- Gujarati D 2003. *Basic Econometrics*. International Edition. 4th Edition. India: McGraw Hill Higher Education.
- Hsiao C 2006. Panel Data Analysis – Advantages and Challenges. *IEPR Working Paper 06.49*. Institute of Economic Policy Research, University of Southern California.
- Julian M 2013. 'EU-Africa Trade Partnership Negotiations Stalled' Euractiv, Development-Policy. From <<http://www.euractiv.com/development-policy/eu-africa-economic-partnership-n-news-532274>> (Retrieved on 17 March 2015).
- Karingi S, Oulmane N, Sadni – Jallab M, Lang R, Perez R 2005. The EU-SADC Economic Partnership Agreement: A Regional Perspective. African Trade Policy Centre. *ATPC Work in Progress* No. 28. Economic Commission for Africa.

- Lecombe HS 2001. *Effectiveness of Developing Country Participation in ACP-EU Negotiations*. United Kingdom: Overseas Development Institute.
- Linnemann H 1966. *An Econometric Study of International Trade Flows*. Amsterdam, Netherlands: North – Holland.
- Longo R, Sekatt K 2001. Obstacles to Expanding Intra-African Trade. *OECD Development Centre Working Papers* 169. Paris.
- Martinez-Zarzoso I, Nowak F 2003. Augmented gravity model: An empirical application to Mercusor – European Union Trade Flows. *Journal of Applied Economics*, VI(2): 291-316.
- Matyas L 1998. The Gravity Model: Some econometric considerations. *World Economy*, 21(3): 397-401.
- Oguledo VI, Macphee CR 1994. Gravity models: A reformulation and an application to discriminatory trade arrangements. *Applied Economics*, 26: 107-120.
- Pöyhönen P 1963. A tentative model for the volume of trade between countries. *Weltwirtschaftliches Archiv*, 90: 93-99.
- Rahman 2004. The Determinants of Bangladesh's Trade: Evidence from the Generalised Gravity Model. *The Economic Society of Australia's 33, Conference of Economists*, University of Sydney, NSW 2006, Australia.
- Tinbergen J 1962. *Shaping the World Economy: Suggestions for an International Economic Policy*. New York: The Twentieth Century Fund.
- UNCTAD, WTO 2012. A Practical Guide to Trade Policy Analysis. *United Nations Conference on Trade and Development and World Trade Organisation*, Geneva.
- Xenellis G 2011. EU 27 Trade in Goods with ACP Countries: A Continued Small Trade Surplus in 2010. *General and Regional Statistics External Trade. Eurostat Statistics in Focus*. European Commission.