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DETERMINANTS OF SOUTH AFRICA'S EXPORTS OF AGRICULTURE, FORESTRY AND FISHING PRODUCTS TO SADC: A GRAVITY MODEL APPROACH

ABSTRACT

The objective of the study is to examine agricultural, forestry and fishing exports determinants between South Africa and SADC countries using a gravity model approach. This paper uses annual data covering the year 2005 to 2014. The result of the study indicates that exporter's GDP, importer's population, South African inflation, exchange rate have a negative association with South African exports of agriculture, forestry and fishing. On the other hand, the results indicate that importer's GDP and exporter's population have a positive impact on South African export of agriculture, forestry and fisheries products. The results imply that increase in GDP suggests self-sufficiency and less need to export. Price and exchange rate stability are important for export of these products. The results also indicate that increase in GDP of SADC countries are important for exports of these products.

Keywords: Gravity Model, Agricultural Exports, South Africa, SADC
JEL Classification: A10, C01, C51, F30, F36

RIASSUNTO

Le determinanti delle esportazioni di prodotti agricoli, della silvicoltura e della pesca dal Sud Africa verso i paesi della Comunità di Sviluppo dell'Africa Meridionale

Obbiettivo di questo studio è quello di esaminare le determinanti delle esportazioni di prodotti agricoli, della silvicoltura e della pesca dalla Repubblica del Sud Africa verso i paesi della Comunità di Sviluppo dell'Africa Meridionale (SADC) attraverso un modello gravitazionale. Questo articolo usa dati annuali che coprono il periodo 2005-2014. Il risultato dello studio indica che il PIL del paese esportatore, la popolazione del paese importatore, l'inflazione del Sud Africa

e il tasso di cambio sono in relazione negativa con l'export sudafricano di prodotti agricoli, della silvicoltura e della pesca. Dall'altra parte, il risultato indica che il PIL del paese importatore e la popolazione del paese esportatore hanno un'influenza positiva sull'export sudafricano di tali prodotti. I risultati implicano che un aumento del PIL determina una minore necessità di esportare. La stabilità dei prezzi e del tasso di cambio così come l'aumento del PIL sono importanti per l'export di questi prodotti.

1. INTRODUCTION

South Africa is one of the upper middle class country according to World Bank classification. The economy is second largest in the continent after Nigeria. The South Africa economy is praised for its great governance and economic policies. The economy of South Africa contributes almost 24% to Africa's gross domestic product (GDP). South Africa is a member of several trade blocs as a way to improve its economic growth. Although South Africa is being perceived to be at better living standards compared to its counter parts in Africa, the economy is not without socio-economic problems.

Unemployment in South Africa is one of the major concern for economic policy makers to fight it. Unemployment in 1994 was 22% and stood at 25% in 2014 (StatsSA, 2014). These statistics clearly show a serious concern since unemployment is the root of poverty and inequality. Through the good practice of economic policies South Africa can benefit from agriculture, forestry and fishing (DAFF) to generate 1 million jobs by 2030 through agriculture projects. Agriculture alone contributes about 0.2% to GDP growth, whereas 0.4% and 0.1% is contributed by forestry and fishing respectively (DAFF, 2013).

DAFF (2013) annual report indicates that leading exports commodities to SADC[1] include soya-bean oil, sugar, food preparation, sunflower oil, wheat, maize and apples. The report also shows that South African exports to its SADC trading partners have escalated from R5.3 billion to almost R15 billion between the year 2007 and 2012. During the year 2011 and 2012 South Africa export to SADC increased of 16% compared to 6% to COMESA[2]. Total export value of

[1] South African Development Community (SADC) is a trade region formed by most southern African economies. The region is formed by countries such as Angola, Botswana, DRC Congo, Lesotho, Madagascar, Mauritius, Malawi, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe.

[2] Common Market for Eastern and Southern African (COMESA) consist of twenty member states which are Djibouti, Ethiopia, Egypt, Libya, Sudan, Comoros, Madagascar, Mauritius, Seychelles, Burundi, Kenya, Malawi, Rwanda, Uganda, Swaziland, Zambia, Zimbabwe, DR Congo and South Sudan.

agricultural products increased by less than 1%, from R10,7 billion to R10,8 billion between the first quarter of 2011 and the first quarter of 2012 and forestry products increased by 3%, from R2,4 billion to R2,5 billion. Whereas fishery decreased considerably by 30%, from R625 million to R440 million between the first quarter of 2011 and the first quarter of 2012.

The study is structured as follows: Section 2 reviews previous studies; Section 3 presents model specification; Section 4 presents data description and their source. Section 5 describes estimation methods of the study. Section 6 presents the empirical results and Section 7 concludes the study.

2. PREVIOUS STUDIES

Considering some socio-economic problems in many developing economies, regional integration can play a significant role in expanding their economic wealth through international trade. The work of previous studies such as Nikbakht and Nikbakht (2011), Lubinga and Kiiza (2013) and Tay (2014) have studied bilateral trade benefits among the countries through their regional trade agreements. The study by Nikbakht and Nikbakht (2011) investigated the bilateral trade benefits between 8 Muslim developing countries which are Iran, Turkey, Pakistan, Bangladesh, Malaysia, Egypt and Nigeria. The study was motivated by the fact that these countries have a dispersed location, between Africa and Asia. Their study found that GDP has a significant positive impact for both importing and exporting country. The results also show that distance has a negative impact between trading partners and is significant. Lubinga and Kiiza (2013) analysed the effects of real exchange rate volatility on the level and volatility of Uganda's bilateral trade flows with several major trade partners such as Switzerland, Belgium, Netherlands, Kenya, South Africa, United Kingdom and France. The results show that real exchange rate volatility depresses Uganda's bilateral trade flows. The results also indicate that GDP of Uganda and trading partners has a positive impact on exports.

Tay (2014) used gravity model to examine trade in education using a nexus of international trade theories. The study revealed that conventional determinants of bilateral trade such as GDP, population and common language have a positive and highly significant impact on trade in education. Greene (2013) employed gravity model to examine government policies and other measures of market access for Unites States (U.S) exports of advanced technology goods to India. The study found that *per capita* income coefficient for the exporting (United States) and

importing (India) countries had the positive sign, as expected. Whereas, population as a proxy for market size has a negative and insignificant coefficient. The results also show that distance has a negative and statistically significant estimated coefficient. Iqbal and Islam (2014) analysed bilateral trade between Bangladesh and its 15 major trading partners of European Union (EU). Their study covered the period 1980-2010. The results reveal that GDP of Bangladesh is positively correlated with its exports, whereas EU GDP is negatively correlated with Bangladesh's exports. The study also indicated that the coefficient of real exchange rate and distance have a negative impact on Bangladesh's exports. Following is the study by Pham *et al.* (2014) in assessing the trade service flow between Vietnam and EU. The study indicates that Population and GDP *per capita* are found to have expected influence on total services trade. Also distance variable performed according to expectations, only that it is not statistically significant. Suvankulov and Ali (2012) found a sizeable positive effect of population, GDP *per capita* both in country of origin and destination on exports. The study also revealed that common language between trading partners has a very strong positive effect on bilateral trade.

There have been studies such as Eita and Jordaan (2007), Jordaan and Kanda (2011), Eita and Jordaan (2012) in the South African context that incorporate a gravity model to analyze South Africa's exports flows. However, no empirical studies on determinants of exports of agriculture, forestry and fisheries in South Africa are limited or non-existent. The aim of the current study is to investigate the determinants of South African agricultural, forestry and fishing exports with its SADC trading partners. The novelty approach of the current study is as follows: it is the first study to our knowledge to augment gravity model by using consumer's prices and exchange rate effect on exports of agriculture, forestry and fishing. The study also estimates the model by using dummy variables of regional trade agreements such COMESA and SACU within SADC block. Secondly, the study explores the potential trade between South Africa and it SADC trading partners.

3. Model specification

Gravity model was initially exercised to bilateral trade flow by Tinbergen (1962), the model was derived from its characteristics of Newtonian physics theory. In physics, from gravity theorem the bigger and the closer the subjects are to each other the stronger is attraction. Likewise in international trade, gravity modelling postulates that the volume of exports between two trading

countries is the increasing function of income and distance between them is the decreasing factor (Wall, 1999). In its general formulation, the gravity model has the following formation:

$$XFij = A\frac{YiYj}{Dij} \tag{1}$$

where XF_{ij} represents the flow of goods between two trading countries, Y_i is the economic mass of a country (exporting country) and Y_j is the economic mass for exports receiver. All of them are measured by gross domestic product (GDP). D_{ij} is the distance between the two trading countries, A is the constant between the two economies. Equation (1), can be expressed in a stochastic log-linear type of basic gravity modelling as follows:

$$lnXFijt = \gamma_0 + \theta_1 lnIM\_GDPit + \theta_2 lnEX\_GDPjt + \delta lnDISTij + \varepsilon ijt \tag{2}$$

where

$lnXF_{ij}$: is the logarithm of exports of agricultural, forestry and fishing from country i to country j (SADC countries) in year t which is the variable of interest.

$lnEX\_GDP_{it}$: is the logarithm of gross domestic product for exporting country i. According to the economic theory it is expected that as GDP of exporting country grows, the production capacity (supply side) of goods produced within the domestic borders increases and the surplus is converted to exports.

$lnIM\_GDP_{jt}$: is the logarithm of gross domestic product for importing country j. According to the economic theory it is expected that as GDP of importing country grows, the potential demand (demand side) for agricultural, forestry and fishing goods from South Africa increases.

$DIST_{ij}$: is the distance between South Africa and each SADC country for trade flow of goods. The economic theory suggests that the farther are SADC countries from South Africa, the less is the trade flow of goods which is subject to higher transportation cost.

ε_{ijt} represents the white noise error term.

Among the empirical literature, there is mouthful of econometric papers that have investigated trade by using gravity model. The current study adopts its empirical model from the studies of

Jordaan and Eita (2007), Nikbakht and Nikbakht (2011), Lubinga and Kiiza (2013). The current augmented gravity model for this study is developed as follows:

$$\ln XF_{ij}t = \gamma_0 + \theta_1 \ln IM\_GDPit + \theta_2 \ln EX\_GDP_{jt} + \delta DIST_{ij} + \theta_3 \ln EX\_POP_{it} + \ln IM\_POP_{jt} + \ln SA\_PR_{it} + \ln SA\_RER_{it} + \varepsilon_{ijt} \quad (3)$$

From equation (3), the augmented variables are described as follows: $lnEX\_POP_{it}$ represents the logarithm of population for exporting country. The economic theory suggests that if population grows in an exporting country (South Africa) it leads to more division of labour and it means greater economies of scale in production and this stimulates more variety of exports. Also according to Nilsson (2000) and Jordaan and Eita (2012) a higher population in an exporting economy means greater domestic market and more domestic consumption and less to export in agricultural, forestry and fishing goods.

$lnIM\_POP_{jt}$ represents the logarithm of population for importing country. The economic theory suggests that as population grows in importing country, the higher is the demand for agricultural, forestry and fishing goods from South Africa.

$lnSA\_PR_{it}$ is the logarithm of general South African consumer prices as an exporting country. The economic theory suggests that as South African prices increase, this will discourage exports, as it will be expensive for importing country to demand agricultural, forestry and fishing goods.

$lnSA\_RER_{it}$ represents the logarithm of South African real exchange rate. The economic theory suggests that for importing country, the weaker is the Rand the more it will encourage exports of agricultural, forestry and fishing goods.

The literature clearly indicated that the use of fixed effect model is invalid for variables that are time invariant over time. Martinez-Zarzoso and Nowak-Lehmann (2003) have suggested that the second regression can be estimated using the fixed effects as the dependent variable. The equation is presented as follows:

$$FE_{ij} = \gamma_0 + \theta_1 \ln DIST_{ij} + \theta_2 DUMENG_i + \theta_3 COMESA_i + \theta_6 SACU_i + \varepsilon_{ijt} \quad (4)$$

where FE_{ij} represents individual effects derived from model (3), $DUMENG_i$ is the dummy for SADC countries that use English as their official language, $COMESAi$ is the dummy for some of the countries in SADC that also belong to COMESA trade bloc, $SACU_i$ is the dummy for SADC countries that also belong to Southern African Custom Union (SACU).

4. DATA DESCRIPTION AND SOURCES

The data on agricultural, forestry and fishing exports is obtained from Department of Trade and Industry (DTI) for the period 2005- 2014. The exports of agricultural, forestry and fishing ($lnXF_{ij}$) data is obtained for SADC countries such as Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Mauritius, Malawi, Mozambique, Namibia, Seychelles, Swaziland, Tanzania, Zambia and Zimbabwe, except Madagascar due to data unavailability. Total population (POP_{it}) of each SADC countries is collected from World Bank database of World Development Indicators (WDI). The variable distance ($DIST_{ij}$) data between South Africa and respective SADC countries is extracted from http://www.timeandate.com website and is computed as distance in kilometers between capital cities. South African real exchange rate (SA_RER_{it}) and South African consumer prices ($lnSA\_PR_{it}$) data is collected from African Development Indicators (ADI).

5. ESTIMATION METHODS

The study uses panel data econometric technique to estimate equation (2) and (3). The study can adopt various panel estimation techniques. Panel data involves the use of pooled, fixed and random effect model. The pooled method is restricted and assumes a single constant and the same parameters over time and across countries. This presumption might be inappropriate since each country has different individual effect. Therefore, the test of poolability can be applied to test for homogeneity in the dataset[3]. The second method is fixed effect model: this technique is appropriate in a study where there is a correlation between individual effects and exogenous variables. Also according to Binh *et al.* (2011) the random effect model is effective when there is no correlation explanatory variables, of which it can consider time invariant variables unlike the fixed effect model. Since this study examines exports determinants of agricultural, forestry and fishing and 13 SADC countries, the fixed effect model is more appropriate than random effect model. These countries were selected on the base of data availability and their affiliation to SADC trade block, therefore fixed effect model is presumed.

[3] The study applied the F-test on pooled model to test for null hypothesis of homogeneity for all countries. The results indicate that p-value for F-test is 0.0000. Therefore, the study rejects the null of homogeneity for all countries. See the results under appendix.

Prior to estimation of equation (3) and (4) the study adopts two panel unit root tests which are Levin *et al.* (2002) (LLC) and Hadri test. The LLC panel unit root test assumes the null hypothesis that a series has a unit root (non-stationary). While on the other hand, the Hadri panel unit root test null hypothesis assumes that the series has no unit root (Hadri, 2000). The test is much more similar to the time series test of (KPSS) developed by Kwiatkowski *et al.* (1992).

6. Empirical results

The study examined panel unit root for all the variables included in the models. The study uses the LLC and Hadri test for panel unit root. Table 1 present panel unit root results.

The LCC test confirms that all the variables are stationary at levels, except exporter's population and importer's GDP. The results for Hadri unit root show that all the variables are stationary at levels. Therefore, the study adopts the discretion of at least one test to assume that all variables are stationary. The Hadri test results indicate that all variables are stationary at levels, therefore there is no need to test for cointegration. In this case according to Jordaan and Eita (2012) it is advised to estimate directly using fixed effects or random effects. Since the study indicated earlier under estimation method that trading partners are pre-determined, therefore fixed effect method is appropriate. Table 2 below shows the results for fixed effect model.

Table 1 - *Panel Unit Root Results*

	LLC		Hadri	
	levels	First difference	levels	First difference
lnERPS	-1.98093	-7.28778	5.18326	1.44129
	(0.0238) **	(0.0000)	(0.0000) ***	(0.0748)
LnEX_GDP	-3.16548	-11.6543	7.17965	4.09947
	(0.0008) ***	(0.0000)	(0.0000) ***	(0.0000)
LnEX_POP	569.081	(24.8972)	7.02923	6.35337
	(1.0000)	(0.0000) ***	(0.0000) ***	(0.0000)
LnEXC	-2.70853	-4.13433	6.03178	0.20265
	(0.0034) ***	(0.0000)	(0.0000) ***	(0.4197)
LnIM_GDP	-0.85932	-6.56365	6.68436	3.46105
	(0.1951)	(0.0000) ***	(0.0000) ***	(0.0003)
LnIM_POP	-7.26140	-22.3012	7.01510	1.76700
	0.0000 ***	(0.0000)	(0.0000) ***	(0.0386)
LnSA_PR	-10.8377	-9.61252	-10.8377	1.12578
	(0.0000) ***	(0.0000)	(0.0000) ***	(0.1301)
LnSA_RER	-6.03608	-10.4666	1.69767	5.55888
	(0.0000) ***	(0.0000)	(0.0448) **	(0.0000)

***/**/* denotes the rejection of the null hypothesis at 1%, 5%, 10%.

TABLE 2 - *Panel Regression Results*

	Basic gravity model	Pooled effect model	Fixed effect model
LOGEX_GDP	36.08058	-10.951	-15.87381
	(0.0269) **	(0.2695)	(0.6986)
LOGIM_GDP	1.261273	0.9468	10.56825
	(0.0000) ***	(0.2695)	(0.1720)
DIST	0.000238	-0.000625	
	(0.6175)	(0.5508)	
LOGEX_POP		121.6270	177.0332
		(0.0991) *	(0.0152) **
LOGIM_POP		0.768862	-52.94186
		(0.2100)	(0.0048) ***
LOGSA_PR		-10.882	-11.11838
		(0.0762) *	(0.0503) *
LOGSA_RER		-45.8058	-47.33260
		(0.0840) *	(0.0538) *
DUMENG		-0.820034	
		(0.5040)	
COMESA		3.826437	
		(0.0185) **	
SACU		-0.343335	
		(0.9086)	
Constant	-964.9071	-1656.069	-1888.575
R-squared	0.208441	0.346916	0.480780
Adjusted R-squared	0.189594	0.29203	0.396582

***/**/* denotes statistically significant at 1%, 5%, 10%.

The results of fixed effect model show that exporter's GDP has a negative impact on exports of agricultural, forestry and fishing. This negative impact can be attributed to the fact that lately South Africa economic growth has not been performing well, therefore this might have crippled the supply capacity of exports. Importer's GDP has a positive impact on export of agriculture, forestry and fishing. These results are consistent with prior expectations of economic theory.

The exporter population variable has a significant positive relation with exports of agriculture, forestry and fishing. These results are not surprising since South Africa is one of the country with bigger population within SADC, therefore this population gives to economy a boost to division of labour to realise economies of scale. In contrast, the importer population has a negative and significant impact to export of agriculture, forestry and fishing. This negative coefficient may indicate that as the population increases, the country becomes self-sufficient and there will be less need to import these products.

South African inflation measured with consumer prices has a negative impact on exports of agriculture, forestry and fishing. The coefficient of South African consumer prices is statistically significant at 5%. This result implies that higher consumer prices discourage the export of agriculture, forestry and fishing. After estimating the fixed effect model, next is to determine the cross-sectional specific effects of factors impacting on exports of agriculture, forestry and fishing. The cross-section specific effects results are reported in Table 3.

The results have some unique characteristics that could encourage exports of agriculture, forestry and fishing between South Africa and SADC countries such as Angola, DR Congo, Mauritius, Mozambique, Namibia, Zambia and Zimbabwe. In an opposite fashion, countries with negative specific effects which constrain trade between South Africa and SADC countries are Botswana, Lesotho, Malawi, Seychelles, Swaziland and Tanzania. Starting from these results it is very important for South African policy makers to clearly identify market that can optimize trade between South Africa and SADC economies.

TABLE 3 - *Cross-section Specific Effects of SADC Countries*

Country	Fixed effects
ANGOLA	55.43472
BOTSWANA	-61.17280
DEMOCRATIC, REPUBLIC OF CONGO	125.7005
LESOTHO	-39.71623
MAURITIUS	76.39357
MOZAMBIQUE	63.94061
MALAWI	-76.38305
NAMIBIA	73.18771
SEYCHELLES	-49.70446
SWAZILAND	-202.9502
TANZANIA	-69.42363
ZAMBIA	47.40298
ZIMBABWE	57.29027

TABLE 4 - *Second Stage Regression*

Dependent variable: individual effects

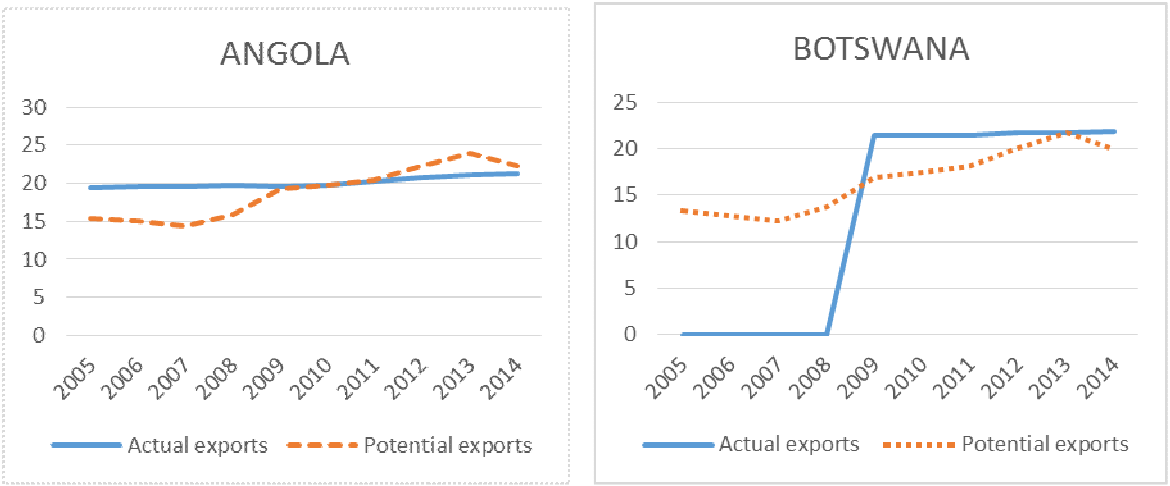
Independent variables	Parameters
DIST	-0.072507
	(0.00000) ***
DUMENG	9.1549
	(0.3362)
COMESA	-44.80762
	(0.00001) ***
SACU	-230.6723
	(0.0000) ***
R-squared	0.7156
Adjusted R-squred	0.7065

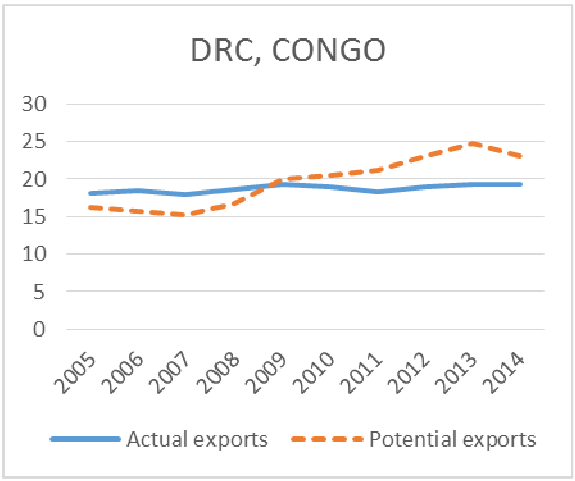
***/**/* denotes statistically significant at 1%, 5%, 10%.

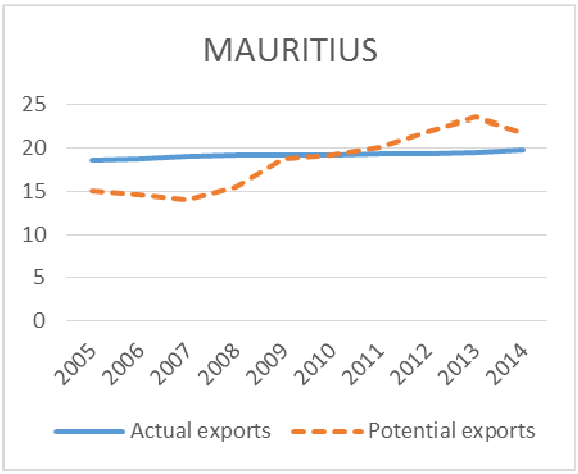
Table 4 presents the results for second stage regression. The study finds that distance between South Africa and its SADC trading partners has a negative impact on exports, the probability value is also statistically significant at 1%. English as an official language for some SADC countries has a positive impact in stimulating exports increase of agriculture, forestry and fishing. The results also show that sub-regional blocks, such as SACU and COMESA within SADC, have a negative impact on South Africa exports of agriculture, forestry and fishing. Equation (3) of this study was simulated to generate the potential of South Africa exports to SADC countries.

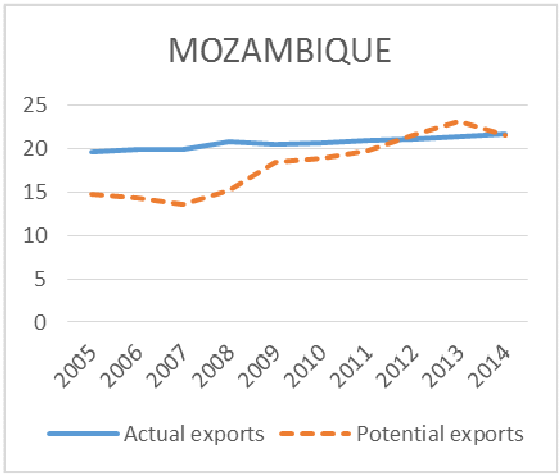
Figure 1 provides results on South Africa's potential of exports of agriculture, forestry and fishing among SADC countries. It can be observed that South African government still have an opportunity to exploit potential on exports in countries such as DRC Congo, Mauritius, Malawi, Seychelles, Tanzania and Zambia. In all other countries the results show that the actual exports are greater or equal to the potential of exports of agriculture, forestry and fishing.

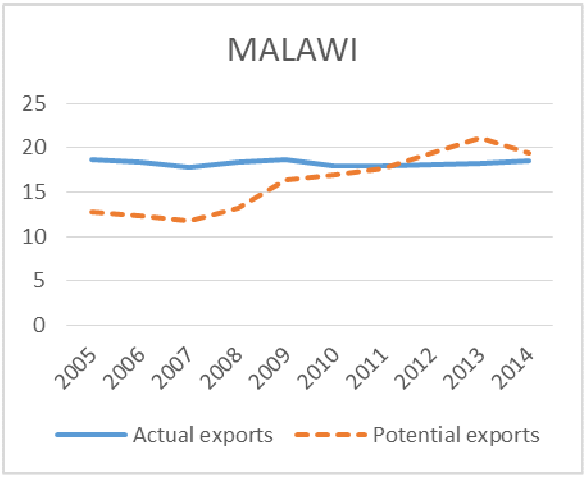
FIGURE 1 - *Export of Agriculture, Forestry and Fishing Potential*

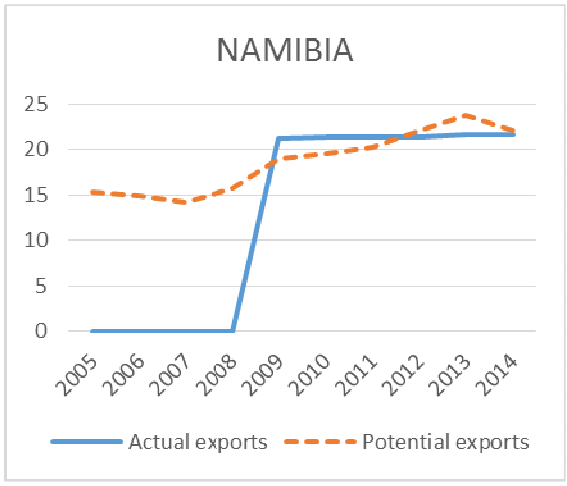


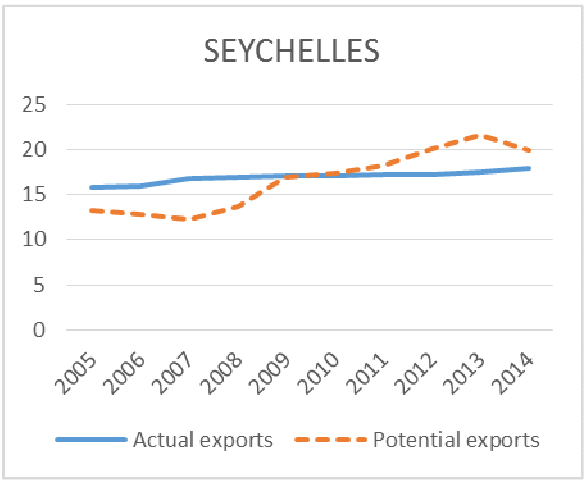








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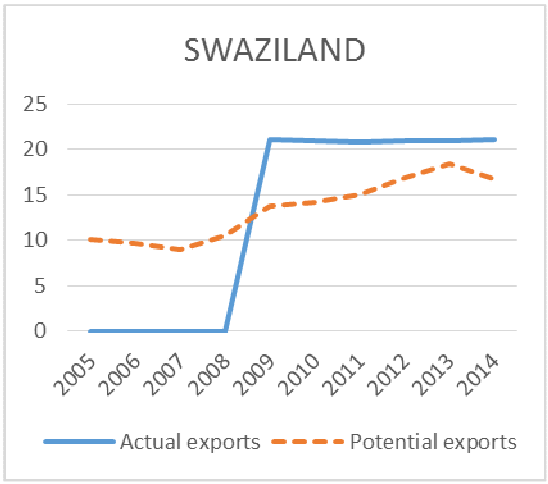
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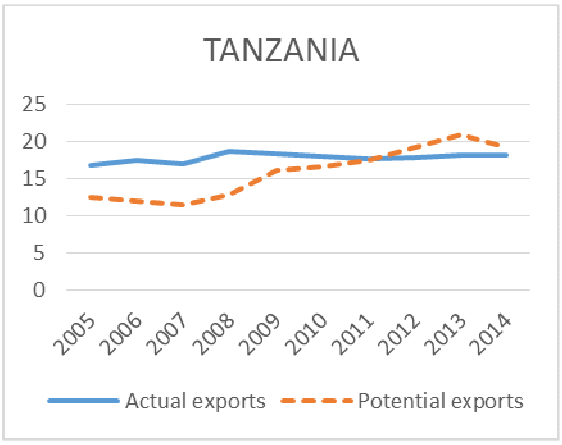
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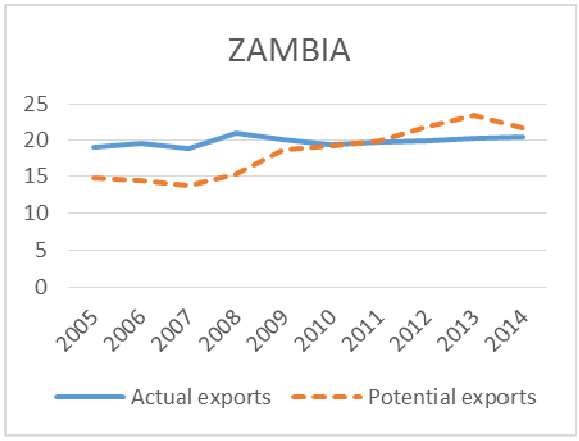
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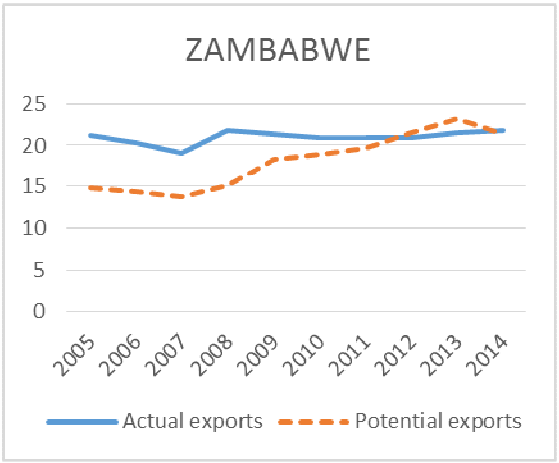
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7. Conclusion

The main interest of this study was to investigate the factors determining exports of agricultural, forestry and fishing for South Africa and SADC trading partners. The study used the data spanning from 2005 to 2014 to examine determinants of exports to SADC countries. The paper used the famous bilateral gravity model to examine the benefits of trade between South Africa and SADC countries.

The results of the study indicated that exporter GDP has a negative impact on exports of agriculture, forestry and fishing. These results are similar to those found by Jordaan and Eita (2012). On the contrary the importer GDP was found to be positive towards exports. The paper found that South African prices (inflation) have a negative impact on exports. This means that South African prices are heavy for SADC countries to acquire exports goods in South Africa. Not far away from these results there are findings on real exchange rate which has a negative effect towards exports of agriculture, forestry and fishing. An increase in the exporter's (South Africa's) population is associated with an increase in exports of agriculture, forestry and fishing products. If importer's (other SADC countries') population is rising, exports of these products decrease. The negative effect of real exchange rate shows that a deterioration of South Africa's competitiveness discourages exports of agriculture, forestry and fishing products to SADC countries. The negative effect of inflation suggests that an increase in South African prices makes it expensive for SADC countries to import agriculture, forestry and fishing products. Hence, South Africa's exports of these products to SADC countries decrease. The positive effect of the exporter's population indicates South Africa exports more when its population grows because of economies of scale. The negative effect of the importer's population implies that there is higher degree of self-sufficiency (in the importing country) and less need to import.

The results also show that distance between South Africa and SADC economies is a discouraging factor since it was found to be negative. It was also found that membership to SACU and COMESA discourages exports of agricultural, forestry and fishing, whereas English language seems to stimulate exports positively. The study recommends that policy makers should consider favorable inflation state and exchange rate to encourage exports of agriculture, forestry and fishing which will ultimately generate much needed jobs. Furthermore, policy makers should consider how to exploit the potential with some economies such as DRC Congo,

Mauritius, Malawi, Seychelles, Tanzania and Zambia to export agriculture, forestry and fishing products.

In conclusion, one should remember that these findings between South Africa and SADC economies do not consider Madagascar due to data unavailability. Therefore, the SADC structure it is not totally represented in the whole analysis of the study.

REFERENCES

Binh, D.T.T., N.V. Duong and H.M. Cuong (2011), "Applying Gravity Model to Analyze Trade Activities of Vietnam", Forum for Research in Empirical International Trade, Working Paper.

DAFF (2013), "Trends in the Agricultural Sector", Printed and published by the Department of Agriculture, Forestry and Fisheries: Pretoria.

Eita, J.H. and A.C. Jordaan (2007), "South Africa Exports of Metal Articles of Base Metals: A Gravity Model Approach", *Journal for Studies in Economics and Econometrics*, 31(3), 81-95.

Greene, W. (2013), "Export Potential for U.S. Advanced Technology Goods to India using a Gravity Model Approach", United States International Trade Commission, Office of Economics Working Paper No. 2013 -03B.

Hadri, K. (2000), "Testing for Stationarity in Heterogeneous Panel Data", *The Econometrics Journal*, 3(2), 148-161.

Iqbal, M.H and A.F. Islam (2014), "Determinants of Bilateral Trade between Bangladesh and the European Union: Approach of Gravity Model under the Panel Data", *Issues in Business Management and Economics*, 2(5), 087-093.

Jordaan, A.C. and J.H. Eita (2012), "Determinants of South Africa's Exports of Leather Products", *Agrekon*, 51(2), 38-52.

Jordaan, A.C. and P. Kanda (2011), "Analysing the Trade Effects of the EU-SA & SADC Trading Agreements: A Panel Data Approach", *South African Journal of Economic and Management Sciences*, 14(2), 229-244.

Kwiatkowski, D., P.C.B Phillips, P.Schmidt and Y. Shin (1992), "Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root", *Journal of Econometrics*, 54(1-3), 159-178.

Levin, A., C.F. Lin and C.S.J Chu (2002), "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties", *Journal of Econometrics* 108(1), 1-24.

Lubinga, M.H and B. Kiiza (2013), "Exchange Rate Uncertainty and Bilateral Trade Flows: Insights from Uganda", *Business and Economic Research*, 3(1), 227- 229.

Martinez-Zarzoso, I. and F. Nowak-Lehmann (2003), "Augmented Gravity Model: An Empirical Application to Mercosur-European Union Trade Flows", *Journal of Applied Economics*, 6(2), 291-316.

Nikbakht, Z. and L. Nikbakht (2011), "The Analysis of Bilateral Trade: the Case of D8", *Business Intelligence Journal*, 4(1), 179 -186.

Nilsson, L. (2000), "Trade Integration and the EU Economic Membership Criteria", *European Journal of Political Economy*, 16(4), 807-827.

Pham, V.N, N.T. Dao and Q.H. Doan (2014), "Analyzing the Determinants of Services Trade Flow between Vietnam and European Union: Gravity Model Approach", *Munich Personal RePEc Archive* (MPRA), MPRA Paper No. 63995.

StatsSA (2014), Employment, Unemployment, Skills and Economic Growth. An Exploration of Household Survey Evidence on Skills Development and Unemployment between 1994 and 2014, Statistics South Africa: Pretoria.

Suvankulov, F. and W. Ali (2012), "Recent Trends and Prospects of Bilateral Trade between Pakistan and Turkey: A Gravity Model Approach", *Journal of International and Global Economic Studies*, 5(1), 57 -72.

Tay, C. (2014), "An Econometric Model on Bilateral Trade in Education using an Augmented Gravity Model", *Journal of Industrial Engineering and Management*, 7(2), 401-412.

Tinbergen, J. (1962), Shaping the World Economy. Suggestion for an International Economic Policy, The Twentieth Century Fund: New York.

Wall, H.J. (1999), "Using the Gravity Model to Estimate the Costs of Protection", *Federal Reserve Bank of St. Louis Review*, 81(1), 33-40.

http://www.timeanddate.com, accessed: 24 June 2016.

