Uganda's Food and Livestock Export Potential in the EAC Region[1]

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Abstract

The food and livestock sub-sectors are crucial for food self-sufficiency and foreign exchange earnings in agrarian economies like Uganda. Using an augmented gravity model, the overall objective was to establish the determinants of Uganda's export of food and livestock products and the potential for exporting these commodities to her trading partners. The findings reveal that trading partners' GDP, importer's population and regional trade agreements enhance the country's export trade. Historical and cultural similarities of trading partners impact bilateral trade positively. Uganda has the potential to export food and livestock commodities to over 85 countries world-wide. In the EAC, Uganda has the potential to export food and livestock commodities to Tanzania. From a policy perspective, the results of this study suggest that the government should take advantage of the identified export potential markets by increasing production to achieve an overall growth in trade. Agricultural support in the form of trade-facilitating infrastructure, value-addition, investment in export standards and augmented funding for the agricultural sector would increase domestic production and therefore enhance Uganda's export of food and livestock products.

Key words: *Food and Livestock, Export Potential, Gravity Model, Augmented Gravity Model, Panel Data and Uganda*

Introduction

The export-led growth hypothesis states that exports are one of the keys to achieving high economic growth. In Uganda, the export-led strategy is recognized in the economic recovery programme adopted in 1987/88, which involved structural transformation through the IMF/World Bank-funded Structural Adjustment Programmes (SAPs). As in many other developing countries, this transformation was meant to change the Ugandan economy from being inefficient and import dependent to one that is diversified, efficient and export oriented (Ajibefun and Daramola, 2003). This implies that agriculture had an important role to play in order to achieve the goals of the SAPs, specifically to sustain export earnings from traditional agricultural commodities like coffee and cotton that were facing a reduction in price on the international market. Over the past few years however, non-traditional exports (NTEs) have surpassed traditional exports (TEs) as regards export earnings, due to the improved performance of food and livestock in terms of exports.

The government of Uganda's current philosophy is centred on modernizing agriculture to boost agricultural productivity and increase value-added exports. Programmes and projects such as the Plan for the Modernization of Agriculture, National Agricultural Advisory Services and Uganda Export Promotion Board have been instituted to support the production and export of agricultural commodities. Food crop production is estimated to have grown by 2.9% in 2008/09 compared with 2.4% in 2007/08. Export commodities are categorized into TEs and NTEs. Traditional exports include coffee, cotton, tea and tobacco while NTEs include commodities other than the four listed above. Food exports make up the largest proportion of NTEs, whose contribution to total export earnings stabilized in 2007 at 70.1%, declining marginally to 69.3% in 2008 (MAAIF and UBOS, 2009).

Table 1: ***Uganda's Food and Livestock Exports to the EAC Region (US$ Millions)***

Year	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Burundi	3,569	4,857	8,934	12,110	3,583	5,464	10,094
Kenya	47,141	52,821	67,766	56,498	70,320	85,983	119,213
Rwanda	3,439	3,122	4,416	9,611	8,403	7,840	20,646
Tanzania	2,565	1,796	1,665	1,968	1,265	505	2,136

Source: *World Integrated Trade Solutions, World Bank*

In terms of the direction of trade, Uganda, Kenya, Tanzania, Rwanda and Burundi now form the East African Community (EAC) common market that became effective in July 2010 under the EAC Treaty. The EAC has brought about an immediate market of 130 million people, with trade between the five countries being duty free. European countries and the Common Market for East and Southern Africa (COMESA) member states are the major destinations for Uganda's exports. COMESA registered the highest market share of 42.1% in 2008, compared with 37.9% in 2007. This was followed by the European Union, whose market share increased slightly from 24.3% in 2007 to 26.7% in 2008. The Asian market share accounted for 5.7% and the Middle East saw a significant reduction in its market share to 8.1% in 2008 compared with 14.3% in 2007 (Statistical Abstract 2009, Uganda Bureau of Statistics).

Key constraints facing the agricultural sector and export capacity include, but are not limited to, the subsistence nature of production, risks relating to weather, market access and entry constraints, condition of transportation network and lack/availability of credit and other production inputs, some or all of which may be critical as far as production and Uganda's export potential is concerned. The overall objective of this study is to establish

the determinants of Uganda's exports of food and livestock products as well as the potential for exporting these commodities to her EAC partners.

Table 2: *Uganda's Exports by Region (US $ 000s): 2004 - 2008*

Export Region	*2004*	*2005*	*2006*	*2007*	*2008*
EAC	132,000	144,700	296,300	476,900	654,700
COMESA	177,995	249,336	283,747	506,509	725,152
Other African countries	37,823	38,931	37,763	87,745	72,493
European Union	181,756	252,708	263,752	324,395	460,218
Other Europe	113,676	82,466	49,074	91,361	158,982
Middle East	37,060	88,111	198,544	190,847	139,183
Asia	29,025	61,180	75,194	71,937	98,183
North America	19,185	18,340	16,442	23,777	19,835

Source: *Statistical Abstract 2009, Uganda Bureau of Statistics*

This is because food and livestock products dominate agricultural exports and are expected to lead in the contribution to national GDP and total export earnings, which they have failed to do in recent years despite liberalization. First, rising world prices (especially food items) due to increased oil prices and globalization have affected the domestic prices of agricultural commodities and their export performance. Secondly, an increase in the price of agricultural exports and exchange rate depreciation are expected to have a significantly positive impact on the livelihoods of farmers, except when an increase in the price of agricultural exports or a depreciation in the real exchange rate (REER) fail to stimulate supply (Kiptui, 2007; Kihangire, 2004). It should be noted that agricultural commodities are price elastic, other factors remaining constant. Thirdly, the prime

economic motive of regional integration is to widen and deepen the market for trading in commodities, but there is no current empirical evidence concerning Uganda's food and livestock sub-sectors (Draper, 2010). Fourthly, if the policy makers are knowledgeable about the specific determinants of food and livestock exports, they could be guided to establish "successful" policies that emphasize export expansion. Given the role of food and livestock in the Ugandan export sector, it is important to determine its trade potential between Uganda and her trading partners. A gravity model is a useful tool for determining the trade or export potential of a country. This model has its foundations in the physical sciences and has proved to be very important in analyzing bilateral trade flows. The gravity model is used to analyze the relationship between the volume and direction of international trade and the formation of regional trade agreements, whose members are at different stages of development.

Literature Review

Agricultural Export Sector

Empirical studies show that agriculture is a fundamental economic activity and is a key tradable sector for many developing countries. Ngaruko (2003) studied the factors influencing agricultural export performance in Africa compared with other regions, especially Asia. While human and physical capital is generally found to have played a central role in promoting Asian exports, this study argues that these factors do not explain Africa's case. A regression-based exercise shows that the impact of these factors on performance is subject to the quality of governance, thus suggesting that institutions are decisive when it comes to determining performance. Therefore, addressing institutions prior to, or at least during, an improvement in the macroeconomic environment and liberalization of the economy is a requirement if countries are to significantly improve their agricultural export performance.

As regards the agricultural sector, Were et al, (2002) examined the determinants of Kenya's export volumes by disaggregating total exports of goods and services into three categories: tea, coffee and 'other' goods and services. In general, the study established that the real exchange rate has a profound influence on export performance. The supply response to price incentive (real exchange rate depreciation) for the export of goods and services was positive and significant. Investment as a proportion of GDP, used as a proxy for supply constraints, had a positive and significant impact on the export volume of coffee but not on other goods and services. Contrarily, the incomes of trading partners were found to be paramount in explaining the volume of 'exports of goods and services' other than coffee exports.

To gain an understanding of the export supply response of selected agricultural commodities in Uganda, Rudaheranwa, et al (2003) employed Nerlove's (1958) dynamic approach to estimate the supply elasticity of these commodities. The study shows that the exchange rate impact is inelastic for food crops mainly destined for markets in the region, unlike cash crops, which show no significant response to the exchange rate. From a policy perspective, the study establishes that exchange rate appreciation may not hurt agriculture much. Non-price factors, if adequately addressed, could be more significant in terms of providing incentives for farmers. The demand-driven approach, by which farmers access agricultural inputs, seems to have reduced production incentives that should have accrued to farmers after liberalization, because some peasants are too poor to demand sufficient levels of agricultural inputs. This study's analysis however is partial and its conclusions cannot be accepted when the effect of the exchange rate on agricultural exports is analysed. This is because the study analysed one side (supply side) of the market but did not consider the demand for exports after production.

In contrast though, Atingi-Ego and Sebudde (2004) in their study determined the equilibrium exchange rate path and the level of misalignment of exchange rates and assessed their impact on the performance of non-traditional agricultural exports. The findings show that the magnitude of misalignment greatly declined during the period 1991–1999, when the exchange and payments system was liberalized as part of improved macroeconomic management. Further, an over-valuation of the exchange rate in excess of 15% impedes the performance of NTIs, suggesting that exchange rate policy should be aimed at minimizing over-valuation and, in fact, depreciating the REER to boost the competitiveness of NTIs. Similar to Atingi-Ego and Sebudde (2004), Cameron, Kihangire and Potts (2005) investigated the effects of exchange rate variability on Uganda's tropical freshwater fish exports. The empirical evidence suggests that Uganda's exports of fish were negatively and significantly correlated with exchange rate volatility. This is however an analysis of a single commodity and so may not be generalized to the entire agricultural sector. While it has been argued by some that the exchange rate is a factor, others point to the favourable economic prospects of the importing countries (Mckay et al., 1998).

Export Trade Potential

Given the growing popularity of the gravity model for depicting the bilateral volume of trade, scholars are extending its applicability to predicting trade potentials. Over time, two main strategies have been selected for the computation of trade potentials. The first one is derived from an *out-of-sample trade potential estimate,* which means that the parameters of the estimated gravity equation are applied to project "natural" trade relations between trading countries. In this case, the difference between the observed and predicted trade flows should represent the unexhausted trade potential. The second strategy is derived from *in-sample* trade potential estimates,

which means that all countries are included in the regression analysis and the residuals of the estimated equation should represent the difference between potential and actual trade relations. In spite of the strategy in use, authors tend to draw conclusions from the sign of the difference between potential and effective trade flows (Vicarelli and Benedictis, 2004).

Ozdeser and Ertac (2010) employed the gravity model to project trade potentials between Turkey and the "euro zone" countries, partly to explain the rise in the trade volume of Turkey since the establishment of the Customs Union between Turkey and the EU in 1995. The empirical results from the estimations suggest that Turkey's potential trade flows with the EU countries would increase by 40% if Turkey becomes a member of the EU and adopts the euro as its national currency. In comparison, Pradhan (2006) used the gravity model to estimate the magnitude of India's potential exports to the six-member Gulf Cooperation Council (GCC) countries that are currently negotiating a free trade agreement. The findings show that Oman is potentially India's most favourable export market, followed by Qatar, Bahrain, and Kuwait, but exporting to UAE and Saudi Arabia is potentially less favourable. This implies that currently India has overtraded with UAE and Saudi Arabia, which are India's largest two trading partners in the GCC. The possible reason for this is that India's export basket is not diversified but is confined to a limited number of products.

From the policy perspective, Prabir De (2009) estimated the trade potential of India using the augmented gravity model and then attempted to determine the importance of trade remedies in the pre- and post-global economic crisis period. The estimates of India's global trade potential reveal that India's trade potential is at its maximum with the Asia-Pacific region, followed by Africa and Latin America. The potential for an expansion in trade in the post-crisis period is greatest with countries such as China. However, India's

trade remains unrealized with a large part of the world, which provides further opportunities for expansion despite the slowdown in global demand. Therefore tariff liberalization and trade facilitation are complementary and if implemented simultaneously could help build up India's export momentum in the crisis period.

The unfavourable geopolitical situation and the small scale of the economy, together with the trade balance deficit and the exporting of raw materials, forced Armenia to look for new products and countries with which to trade. Hayrapetyan and Hayrapetyan (2011) estimated the trade potential of Armenia by disaggregating the products into 7 groups in relation to her regional and international trade, using the gravity approach. The key findings indicate that the trade relations of Armenia with most of her main trading partners do not have the potential to develop, implying that Armenia has exceeded her export potential with almost all of them. In a related study, Achy (2006) notes that North African countries remain partially open to international trade because their trade is marked by high geographic concentration and weak diversification of products. The results suggest that for the regional integration of North African countries to be effective today, it needs to be redefined and given credibility. As a remedy, accession of these countries to the World Trade Organisation (WTO) is a fundamental asset to their regional integration because WTO rules provide a common reference point for all countries, ensuring the visibility of partners and obstacles to trade would not be erected arbitrarily.

In an attempt to discover the effect of regional integration on export performance, Rahman et al, (2006) investigated the effect on the creation and diversion of trade of a number of regional trade agreements (RTAs), focusing on SAPTA, using the gravity model. The study found significant intra-bloc export creation in SAPTA, although, at the same time, there is

evidence of net export diversion in SAPTA. Specifically, Bangladesh, India and Pakistan are expected to gain from joining an RTA, while Nepal, the Maldives and Sri Lanka are likely to be negatively affected. Although none of the RTAs covered by the study was found to be creating exports, more than a third of the members of these RTAs were found to be positively affected by joining them.

Ruiz and Vilarrubia (2007) employed a gravity equation model to estimate exporters' and importers' omitted resistance to trade terms, using country-yearly dummies for exporting and importing countries. The results show that estimating the omission of time-varying multilateral resistance to trade terms in the gravity equation model introduces a major bias. Correcting this bias means computing the difference between actual and predicted export share, instead of level, as is usually done. In their study, a calculation of the trade potential of the Euro-Med region (Southern and Eastern Mediterranean countries) shows that the omission of time-varying multilateral resistance to trade terms greatly influences the computation of export potential as well as the estimated effect of signing a free trade agreement.

Methodology

The Analytical Model

The literature on export performance reveals two methodological frameworks; i) the imperfect substitutions model and ii) the gravity model of trade. The imperfect substitutions model is derived from the conventional equation of demand for and supply of exports on the premise that neither imports nor exports are perfect substitutes for domestic goods. Exports are imperfect substitutes in world markets for other countries' domestically produced goods, or third countries' exports. Demand for exports is specified as a function of REER and the real income of the rest of the world. Export

supply is a function of export price relative to domestic price and the domestic export capacity of the tradable sector. The imperfect substitutions approach, extensively utilized by Jongwanich, 2007; Cameron et al, 2004; Were et al., 2002; and Batten and Belongia, 1984, to export performance is however limited to time series data and does not explain the time-invariant factors that may influence trade flows, such as the cultural and historical characteristics of trading countries.

This study employed the gravity model of trade since it is highly suitable for panel data studies and offers the flexibility of adding other factors that may influence the flow of trade between countries besides the traditional supply and demand determinants of export performance. The gravity model, pioneered by Tinbergen (1962) and Poyhonen (1963), is used to analyse the relationship between the volume and direction of international trade and the formation of RTAs whose members are at different stages of development.

The basic gravity model of trade is derived from Newton's law of gravity that the volume and direction of international trade is determined by the attraction of two countries' masses, which are weakened by the distance between them and enforced by the preferential trade agreements they have made. Masses of countries are measured by GDP or population, and the distance between countries is measured by transport costs. Its comparison with gravity derives from GDP being a proxy for economic mass and distance as a proxy for resistance to trade. The basic gravity model explains the size of exports from country *i* to country *j* by three factors. The first indicates the total potential supply of the exporting country (*i*), the second indicates the potential demand of the importing country (*j*), and the third includes factors representing resistance to the flow of trade between countries. In its basic form, exports from country *i* to country *j* are

determined by their economic size (GDP), population, geographical distance and a set of dummies incorporating some institutional characteristics common to specific flows (Jordaan and Eita, 2007). The gravity model of trade is more appropriate when using panel data analysis and is suitable for examining the volume and direction of international trade and the formation of RTAs whose member countries are at different stages of development. The gravity model is generally shown as (Jordaan and Eita, 2007; Martinez-Zarzoso and Nowak-Lehmann, 2003; Jakab, Kovacs and Oszlay, 2001; Mátyás, 1997):

$$\ln EX_{ij} = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln Y_j + \alpha_3 \ln POP_i + \alpha_4 \ln POP_j + \alpha_5 \ln DIST_{ij} + \alpha_6 \ln REER_{ij} + \phi C_{ij} + \lambda_{ij} \quad (1)$$

where EX_{ij} is the export of goods (in this case food and livestock) from country *i* to country *j*, Y_i, Y_j is the GDP of the exporter and importer, POP_i and POP_j is the population of the exporter and importer, $DIST_{ij}$ is the distance in kilometres between the two countries, a_6 *REER* is the real exchange rate between countries *i and j,* C_{ij} represents any factor that influences trade between the countries, and $\ddot{e}_{ij}$ is the error term.

A high level of GDP indicates a high level of production in the exporting country and can be used as a proxy for the range of products available, thereby potentially increasing the supply of exports. A high level of GDP or income in the importing country represents the potential demand for imports. The coefficients $\acute{a}_1$ and $\acute{a}_2$ are expected to have positive signs. The population variables can influence exports in two ways. A large population indicates a large domestic market, a greater degree of self-sufficiency and less need to trade. It also means there will be a greater division of labour, implying that there will be economies of scale in production and trade in a variety of goods. An exporting (and importing) country, with a large

population, can increase or reduce the level trade, depending on whether it exports more (or imports less) or exports less (or imports more) than a country with a smaller population. Thus, the effects of population on both exporting and importing countries cannot be assigned *a priori*. This means that $á_3$ and $á_4$ are expected to have ambiguous signs (Oguledo and MacPhee, 1994). The coefficient of distance, $á_5$ is expected to be negative because it is a measure of transport costs. Exchange rate appreciation discourages the export of commodities because importers will need more foreign exchange to buy them, making the commodities more expensive. In this case, $á_6$ is expected to be negative. REER is measured as the ratio of the export-weighted producer price index of trading partners, expressed in domestic currency, to the domestic producer price index. In this study, an increase in REER represents depreciation. [Editor, because $á_6$ was not described, I had to interpret this sentence – I may be wrong]

A composite dummy variable C_{ij} represents various RTAs, and the historical and cultural characteristics of trading partners. These variables have empirically been found significant in studies that have analyzed trade flows between countries at different stages of development ((Jordaan and Eita, 2007; Martinez-Zarzoso and Nowak-Lehmann, 2003; Jakab, Kovacs and Oszlay, 2001). The introduction of dummy variables adjusts Equation (1) as:

$$\begin{aligned}\ln EX_{ij} &= \beta_{ij} + \alpha_1 \ln Y_{it} + \alpha_2 \ln Y_{jt} + \alpha_3 \ln POP_{it} + \alpha_4 \ln POP_{jt} + \alpha_5 \ln DIST_{ijt} + \alpha_6 \ln REER_{ijt} \\ &+ \alpha_7 BORDER + \alpha_8 LANG + \alpha_9 COLONY + \alpha_{10} COMCOL + \alpha_{11} WTO + \alpha_{12} EAC \\ &+ \alpha_{13} COMESA + \alpha_{14} EU + \lambda_{ijt}\end{aligned} \quad (2)$$

Where:

EX_{ijt} Exports by Uganda to country j in US dollars 000s

Y_i Uganda's GDP in US dollars 000s

Y_j Importer's GDP in US dollars 000s

POP_i	Uganda's population in millions
POP_j	Importer's population in millions
$DIST_{ij}$	The geographical distance in kilometers between Uganda's economic centre of gravity (capital city - Kampala) and the trading partner's economic centre of gravity (capital city)
$REER_{ijt}$	Real Effective Exchange Rate Index (2005 = 100)
BORDER	Contiguity dummy (Uganda and Importer share a border coded 1 and 0 otherwise)
LANG	English language dummy for trading partners whose official language is English, coded 1 and 0 otherwise
COLONY	Historical dummy if trading have been in a colonial relationship since 1945, coded 1 and 0 otherwise COMCOL Historical dummy if trade partner have had a common colonizer since 1945, coded 1 and 0 otherwise
WTO	WTO dummy if trade partner is a WTO member, coded 1 and 0 otherwise
EAC	EAC member state dummy (EAC countries coded 1 and 0 otherwise)
COMESA	COMESA member state dummy (COMESA countries coded 1 and 0 otherwise)
EU	EU member state dummy (EU countries coded 1 and 0 otherwise)
$\hat{a}_{ij}$	individual effects or country-specific effects
$ë_{ijt}$:	captures all the factors that influence exports but not included in equation (2)

BORDER is a dummy variable for contiguity where trading countries share a common border while LANG is a dummy for countries with a common language. These factors are believed to reduce trade transaction costs by easing mechanisms of trade. This means that $á_7$ and $á_8$ are expected to have positive signs. The historical relationship between trading

partners is depicted by two dummy variables; first, if trading partners have been in a colonial relationship since 1945 (COLONY) and if trading partners have had a common colonizer since 1945 (COMCOL). These relationships should promote trade and therefore $á_9$ and $á_{10}$ are positive coefficients. The agricultural sector is one of the most highly protected sectors in world trade, which therefore has implications for trading partners which are WTO members and otherwise. In this case $á_{11}$ is expected to be positive because WTO membership should cause a rise in the trade of trading partners. EAC is the dummy variable for membership of the East African Community, EU is the dummy variable for membership of the European Union and COMESA is the dummy variable for membership of the Common Market for East and Southern Africa, all of which are expected to increase trade between countries. Therefore $á_{12}$, $á_{13}$ and $á_{14}$ are expected to be positive because these RTAs promote trade among other benefits and form the basis for economic and regional cooperation.

Estimation Methodology

Panel data entails different models that can be estimated. These are pooled fixed effects and random effects. Since the specified regressions include individual effects, it is important to decide whether they are random or fixed. When estimating the flow of trade between a randomly drawn sample of trading partners with a large population, the random effects model (REM) is more appropriate, while the fixed effects model is more appropriate when estimating the flow of trade between an ex ante predetermined selection of countries. This study selected 168 countries from the total population based on Uganda's food and livestock exports and therefore followed the REM. Using the WITHIN approach to estimate country-specific fixed effects and time-invariant regressors simultaneously raises the problem of perfect multicollinearity. Therefore, the effects of time-

invariant regressors like distance and language can be estimated using the REM since presumably these effects are randomly distributed across the different countries (Sichei et al, 2008). Though equation (2) is not defined for observations with respect to zero trade, there are various approaches to handling the presence of zeros. These include discarding zeros from the sample, adding a constant factor to each observation on the dependent variable and estimating the gravity in non-linear form using the fixed effects Poisson maximum likelihood estimator.

Trade Potential Estimation

The two main approaches used for the computation of trade potentials presented in literature are "*out-of-sample"* and *"in-sample"*. The former uses the parameters of the estimated gravity equation to project "natural" trade relations between the predetermined trading partners. In this case, the difference between observed and predicted trade flows should represent the unexhausted trade potential. The latter uses *in-sample* trade potential estimates, where all countries are included in the regression analysis and the residuals of the estimated equation should represent the difference between potential and actual trade relations. However, the 'in-sample' estimation of the trade potential, based on the deviation of residuals from the linear prediction, is incorrect, because large deviations of residuals in the gravity equation based on the in-sample approach is not evidence of large deviations of trade from its potential, but rather an indicator of model mis-specification. This study therefore employed the "out-of-sample technique, based on Uganda's food and livestock exports. The general equation for the trade potential estimation index is given as;

$$\sigma_{it} = \frac{e^{Xijt}}{\varepsilon^{Xijt}} \qquad (3)$$

Where $\acute{o}_{it}$ is the export potential estimate, e^{Xijt} is the actual export trade value in US$ and $\mathring{a}^{Xijt}$ is the predicted export trade value in US$. A value greater than 1 shows a greater bilateral trade effect than predicted, while a positive index value of less than 1 depicts a smaller bilateral trade effect than predicted. A value equal to 1 depicts a bilateral trade effect that is equal to the predicted value and could imply zero trade potential between the trading partners.

Data Type and Source

The study utilized panel data of food exports between Uganda and 168 countries for the period 1994 – 2010, partly as a way of examining the effect of liberalization on the agricultural sector. Data on food and livestock exports was sourced from the World Integrated Trade Solution of the World Bank, United Nations Conference on Trade and Development, the International Trade Centre, United Nations Statistical Division and the WTO. GDP, population and REER data were collected from World Development Indicators Databank of the World Bank. Bilateral distance and the other variables relating to the cultural and historical relations of Uganda and her trading partners were sourced from the CEPII Gravity Dataset of the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) website. GATT/WTO membership of different countries over time was collected from the WTO website. Stata 10.0 was the statistical computer software that was used for estimation and overall data analysis.

Estimation Results

Basic Gravity Model

The study followed the REM to establish the importers of Uganda's food and livestock products. The Hausman statistic was used to test the null hypothesis that the predictors and individual effects are not correlated in

order to distinguish between the fixed effects model and REM. Failure to reject the null hypothesis implies that the REM is preferred. If the null hypothesis is rejected, the fixed effects model is appropriate. The Hausman test statistic showed that the null hypothesis was accepted, which indicates that the country-specific effects are not correlated with predictors. This suggests that the REM was appropriate and interpretation of the results focuses on the random effects estimation.

Table 3: *Basic Gravity Model Results*

	Total Exports		*Food & Livestock Exports*	
Variable	*Coefficient*	*Std. Dev*	*Coefficient*	*Std. Dev*
Constant	7.533*	2.6321	1.0379	2.9959
GDP Uganda	0.8108**	0.3225	0.8746**	0.4015
GDP Importer's	0.6406***	0.1077	0.4771***	0.1232
POP Uganda	-1.6029*	0.8639	-1.1495	1.079
POP Importer's	-0.1516	0.1345	-0.2106	0.1502
DISTANCE	-1.301***	0.2790	-0.5925*	0.3104
Adjusted R^2	0.5152		0.2975	
F-Test	114.13***		53.08***	
Observations	1502		1072	

Notes: i) ***, ** and * refer to significance at 1%, 5% and 10% respectively

The estimated coefficients computed from the basic gravity model are shown in Table 3. The results show that an increase in the importer's GDP and Uganda's GDP causes an increase in Uganda's total exports and food and livestock exports. The coefficients for the two variables are positive and statistically significant and are consistent with theoretical expectation. On

the demand side, these results could lead to the interpretation that Uganda's food exports are income inelastic, implying that for a given increase in the income of its trading partners, there is proportionately less inducement to export agricultural products. An underlying reason could be that Uganda exports unprocessed food items which face competition from "convenient" substitutes in the export market. On the supply side, however, positive and significant income elasticity means that the greater the GDP of importers and Uganda, the greater the flow of trade between trading partners, as predicted by the gravity model.

Uganda's population is negative in terms of export categories, although not significant for food and livestock exports. This result suggests that an increase in Uganda's population translates into an increase in domestic demand for these commodities, which reduces the quantity available for export. This shows that an increasing population requires food for consumption while at the same time agricultural commodities are key raw materials for the expanding manufacturing sector in Uganda. Though not significant, the importer's population has a negative impact on Uganda's exports, which diverges from the gravity model expectations. Distance has the expected negative and significant effect on Uganda's food exports. This implies that Uganda exports less to countries that are far away because distance translates into an increase in the cost of trade because of high transport costs. Therefore, since distance is a proxy for transport costs, any trade facilitation policies and agricultural support that reduce the costs of exporting will encourage exports of food and livestock.

4.2 Augmented Gravity Model

Table 4: Augmented Gravity Model Results

	Total Exports		*Food & Livestock Exports*	
Variable	*Coefficient*	*Std. Dev*	*Coefficient*	*Std. Dev*
Constant	-4.3408	5.2621	-6.9924	5.8036
GDP Uganda	0.2661	0.4071	0.4103	0.4849
GDP Importers'	0.6977***	0.1716	0.4976***	0.1910
POP Uganda	0.0283	1.0768	0.6665	0.2952
POP Importers'	-0.1031	0.2068	0.3089	0.2248
DISTANCE	0.0287	0.5263	-0.4928**	0.5748
REER	-0.3919	0.4138	-0.7753	0.4849
BORDER	6.9852***	2.507	7.2883**	2.5944
LANG	0.6913	0.7108	0.0654	0.7436
COLONY	2.3909	2.1266	3.2976	2.1746
COMCOL	0.8326	0.8006	-0.0336	0.8449
WTO	0.3314	0.4745	0.4459	0.5568
EAC	7.1039***	2.4232	5.6043**	2.5312
COMESA	0.3771	0.6484	1.1504**	0.7354
EU	1.053*	0.6231	0.8746*	0.6636
Adjusted R^2	0.7109		0.5978	
F-Test	97.37***		69.99***	
Observations	873		767	

Notes: i) ***, ** and * refer to significance at 1%, 5% and 10% respectively

The results of the augmented gravity model are presented tin Table 4. Unlike in the basic gravity model, Uganda's GDP has the expected positive but insignificant effect in both export categories. However, the impact of the importer's GDP is positive and significant. The positive income elasticity indicates that Uganda's exports could rise significantly if her trading partners maintain strong economic growth. There is evidence to support this argument

for Uganda because the faster economic growth of her immediate neighbours, namely, the Democratic Republic of Congo, Rwanda and Southern Sudan, have compelled Ugandan food farmers to produce for these regional and accessible markets. The population variable for both Uganda and her importers are positive but not significant for food and livestock exports. Therefore, economic size based on trading partners' population as depicted by the gravity model does not matter for Uganda's exports of food and livestock commodities. Distance has the expected negative and significant effect on Uganda's export of food and livestock. Therefore, the government should invest in transport infrastructure to enhance Uganda's exports of food and livestock commodities.

Estimates of REER are negative but not statistically significant for both export categories. A general observation is that the effect of exchange rate depreciation is greater on food and livestock exports than on total exports. This suggests that food and livestock exports are more exchange rate elastic than total exports. In this regard, depreciation in the exchange rate that could have resulted from escalating world food prices does not necessarily benefit the exporters of agricultural commodities. In this case, maintaining a stable exchange rate is important for macroeconomic stability and should be used as a short-to-long-term strategy for enhancing export growth.

The effect of trading partners sharing a border is positive and significant. This was expected, as trading partners sharing a border should experience ease of trading because they have minimum transport costs and fewer constraints to trade. Though not significant, the impact of trading partners using a common language is positive on trade flows. Therefore, Uganda and her trading partners having the English language in common helps them build networks of trust. Institutions that produce common cultural, literary and educational materials are also shared, thereby increasing the probability of migration (Sichei et al, 2008).

The historical relationship of trading partners is paramount in trade because it is expected to aid understanding and build trust between them. There is a positive impact of exporting to countries that are WTO members even though the coefficients are insignificant for both export categories. Also, trade with EU member countries substantively enhances Uganda's exports of food and livestock as well as total exports, because the EU market has been the leading destination for Uganda's export commodities over a long period of time. In relation to RTAs, being a member of the EAC and COMESA enhances Uganda's exports to other member countries. The positive values of the EAC and COMESA coefficients imply that Uganda is more likely to trade with members of the same RTA, other things being equal, than with non-members. This argument could be valid for three reasons. First, membership of COMESA tends to reduce barriers to Uganda's commodities that are exported to member countries. Second, Uganda is a key member of the EAC customs union, which implies that her export commodities are given preferential treatment by member states. Third, Uganda has been a regional "food basket" for the East and Central region of Africa, particularly for Southern Sudan and the Democratic Republic of Congo that have been experiencing civil unrest. These countries have had to depend on Uganda for food, which partly explains the volume of trade between them.

Trade Potential

Following the estimated gravity model for export flows, the coefficients were utilized to estimate the export trade potential of Uganda. Export potential was calculated as a ratio of the actual export value to the predicted export value. A value greater than one would depict exhausted trade potential between Uganda and a particular country, while a value less than one would depict that Uganda is yet to reach its maximum trade potential with that particular country. An alternative approach to computing trade

potential is to obtain the difference between the value predicted by the model and actual export volumes. Therefore, a large positive value would depict unexhausted potential while a high negative value would reveal maximum trade potential between Uganda and a particular country. The composition of food and livestock exports to different countries is based on Standard International Trade Classification (SITC.2 Revised).

Table 5: *Uganda's Export Potential to EAC Member Country and Region (US$ Millions)*

	Total Exports			*Food and Livestock Exports*		
Partner Name	*Actual*	*Predicted*	*Potential*	*Actual*	*Predicted*	*Potential*
Burundi	12227.49	189.18	53.61	3402.26	89.13	33.72
Kenya	72528.48	115713.60	0.59	46386.43	18864.90	2.36
Rwanda	41285.88	41306.00	0.86	8727.35	8364.63	1.19
Tanzania	11321.45	80916.91	0.12	1685.37	21784.87	0.08
EAC	2146.30	3720.71	0.58	940.65	767.24	1.23
COMESA(Non-EAC)	379.95	47.14	8.06	175.16	21.19	8.26
EU	511.17	144.03	3.55	365.82	91.95	3.98

Notes: i) Potential = Actual/Predicted ii) Export potential computed is the mean for the years 1994 - 2010

The results show that Uganda has the potential to expand her total exports to 95 countries and food and livestock exports to 70 countries all over the world. The top 10 countries where Uganda has exhausted the potential for food and livestock exports are; Switzerland, Singapore, Congo Republic (Brazzaville), Ethiopia, Israel, Burundi, Egypt, United Arab Emirates, the Netherlands and Zambia. The top 10 countries where Uganda has unexhausted the potential for food and livestock exports are; Malawi,

Bhutan, Chad, Austria, Brunei, Yugoslavia Serbia??, Cuba, Costa Rica, Cote d'voire and Qatar. From the EAC perspective, there is unexhausted potential for the export of Uganda's food and livestock commodities to Tanzania, which is equivalent to an estimated export value of 70 US$ million for total exports and 20 US$ million for food and livestock exports. While Uganda has exhausted her export potential to COMESA and EU as a whole, there are specific countries within these regions that Uganda could strategically exploit. Caution needs to be exercised when drawing conclusions from these results because there are notable instances where Uganda has exported observable quantities in a single period but nothing over time to some countries. However, the results could provide the government with a work plan for guiding in its efforts to boost and sustain the country's export sector.

Conclusion and Policy Inferences

This study employed an "augmented" gravity model for Uganda's annual exports of total as well as food and livestock exports to 168 randomly selected trading partners over the period 1994 to 2010. The traditional factors of the basic gravity model reveal precise and plausible income and distance elasticities as per expectations. Historical and cultural similarities also positively impact bilateral trade. Specifically, certain characteristics of trading partners enhance Uganda's exports of food and livestock commodities. These comprise Uganda's GDP, importer's GDP, importer's population, common border, English language, trade with EU member countries and membership of EAC and COMESA. This is in line with the assertion that regional integration fosters trade between member countries. Geographical distance and depreciation of the exchange rate inhibit the exports of food and livestock commodities. The negative effect of distance implies that high transport costs inhibit Uganda's exports of food items. This is not surprising given the fact that most of these agricultural exports

are perishable and require a swift and reliable means of transport, which many exporters may not be able to afford. Also, the results do not prove that rising global food prices induce the export of food and livestock commodities because the impact of REER is negative and insignificant.

In addition, the gravity model shows that Uganda has a market in the EAC region for total exports and for food and livestock commodities. However, exporters may face particular constraints in exploiting these export destinations. These include, among others, a country not being a member of WTO, the lack of a trade agreement with the country, non-tariff barriers and the emergence of new food producers. Agriculture remains one of the most protected sectors in world trade, which means that restrictions may be imposed on the export of some commodities to particular destinations.

From a policy perspective, the results of this study suggest that the government should use the potential export markets identified by increasing the production capacity of total exports but particularly food and livestock exports for overall trade growth. Specifically, infrastructure that will facilitate trade in the EAC should be developed and strengthened, because trade costs would be minimized as a result and the economic and market benefits of regional integration would be enhanced. However, a related study in future could estimate two models (one for imports and the other for exports) for food and livestock products to give greater insight into trade and its implications for Uganda's current account imbalance. Furthermore, supply-side factors, such as providing credit to crop exporters, subsidizing small-scale farmers, adding value at all levels of production, developing infrastructure and strengthening the role of the Uganda Export promotion Board, will increase production domestically to satisfy the growing regional market and enhance Uganda's exports of food and livestock commodities.

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Appendix 1: *Uganda Export Potential for Food and Livestock*

Top 10 Countries where Uganda has Exhausted Export Potential			
Partner Name	*Actual*	*Predicted*	*Potential*
Switzerland	69996.21	125.82	556.32
Singapore	12461.17	113.94	109.37
Congo, Rep.	2311.62	21.50	107.52
Ethiopia	1217.13	11.69	104.13
Israel	3889.04	71.69	54.25
Burundi	3402.26	89.13	38.17
Egypt	2076.29	55.45	37.45
United Arab Emir	3648.83	99.35	36.73
The Netherlands	21414.73	671.55	31.89
Zambia	627.37	20.30	30.91
Top 10 Countries where Uganda has Unexhausted Export Potential			
Partner Name	*Actual*	*Predicted*	*Potential*
Malawi	14.94	15.10	0.99
Bhutan	20.46	22.90	0.89
Chad	15.57	17.48	0.89
Austria	451.51	546.86	0.83
Brunei	68.20	83.30	0.82
Yugoslavia	32.73	40.64	0.81
Cuba	64.79	84.08	0.77
Costa Rica	65.10	86.19	0.76
Cote d'Ivoire	25.89	36.43	0.71
Qatar	46.95	68.43	0.69