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Competitiveness and Determinants of Livestock and Livestock products Exports from Kenya (1980-2013)

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Abstract: *Livestock and livestock products exports from Kenya showed a moderate improvement during the period (2000-2011). However, the country's livestock export base that earns valuable foreign currency is quite shallow and little has been done to empirically establish their performance and if this translates to any meaningful growth. This study sought to analyse Kenyan livestock and livestock products export trade flows with major trading partners using panel data for the period 1990- 2013. Revealed comparative advantage and revealed symmetric comparative advantage indices were used to analyse the export competitiveness of livestock and livestock products exports while a Random effects model was used in the regression analysis. RCA results indicated that although Kenya had been competitive in the export of livestock and livestock products in most of the years under study, RSCA results showed that the level of competitiveness was low throughout the period under consideration. Results of the random effects estimator indicated that Kenya's exchange rate, Kenya's Gross Domestic Product, importer's Gross Domestic Product and economic distance significantly affected livestock and livestock products exports from Kenya. The random effect model was significant at the 0.05 significance level and explained more than 72.3% of the dependent variable variance. Kenyan livestock exports were consistent with the gravity theory. Government Policies and institutional mechanisms that promote the production and export of quantity based livestock products to developed and bigger economies are also required.*

Key words: *Revealed Comparative advantage, competitiveness, Gravity Model, Random Effects*

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I. Introduction

The livestock sub-sector employs close to 50 percent of Kenya's agricultural labour force and is a principal source of livelihoods for the more than 6 million pastoralists and agro-pastoralists that live in the country's ASALs (Gitu, 2005). Estimates of the livestock sector's contribution to the country's Gross Domestic Product (GDP) range from 5.6 percent to 12.5 percent (Benhke and Muthami 2011), while the estimates for the contribution to agricultural GDP range from 30 to 47 percent (Muthee, 2006).

With the current international economic integration where there is free trade between members, common external tariffs, free movement of factors of production, common currency and common government, the world export patterns are shifting fast as a result of the decrease in trade barriers and technological developments. Kenyan livestock and livestock products exports have during the last two decades (1990-2010) showed a moderate enhancement but the country's livestock export base that earns valuable foreign currency is relatively shallow and less has been done to empirically establish their performance and if this interprets any meaningful economic growth.

The general objective of this article is to analyse the competitiveness and determinants of livestock and livestock products exports from Kenya. Livestock exports have significant implications to agriculture in that they affect the overall GDP of the sector and hence the entire economic growth of the country. A deeper knowledge and understanding of the determinants of livestock exports in Kenya is therefore indispensable in contributing towards enhancing the future livestock development strategy and build on the existing body of literature.

II. Literature Review

2.1 Theoretical Literature

The hypothetical framework for the study was based on the international trade theory. Ricardo's theory of comparative advantage: The theory postulates that if each nation specializes in the production of the

commodity in which it has a comparative advantage, gains from trade would be realized (Salvatore, 2007). Although the theory has gone through different transformations by various economists, Ricardo's theory of comparative advantage still plays a critical role in analysing bilateral trade flows and trade policy analysis.
Heckscher-Ohlin, Mill, 1966 stated that the difference in the comparative advantage of the factors of production between two countries is a precondition for the difference in comparative costs. This approach is based on the notion that even though the theoretical in autarky is not observable; a country's observable pattern of trade "reveals" its comparative advantage.

2.2 Empirical Literature

Edwards and Alves (2006) conducted a comparative analysis of determinants of South Africa's export supply using 28 manufacturing sub-sectors over the period 1970-2002. They used pooled estimation model with export volume as the dependent variable and exchange rate, infrastructure costs, tariff rates and variable cost as the explanatory variables. The generalized method of moment results indicated that all explanatory variables used are important determinants of export performance.

Sharma (2005) investigated the impact of export prices on the demand for exports. The study's findings indicated that the demand for a country's exports increases when its export prices fall with respect to the world prices. The depreciation of its currency compared to other currencies particularly the dollar, makes its exports cheaper on the international market. The results found that the demand for Indian exports increased when its export prices fell. The author further stated that the appreciation of the Indian rupee at one time adversely affected Indian exports.

Miano (2009) in a study investigated factors that determine tea export supply in Kenya by using time series data from 1970-2007: the author employed Simple linear model using Ordinary Least Squares (OLS). The variables under consideration were real exchange rate, input prices, and prices of tea substitutes, weather patterns, wage rate and structural adjustment programmes.

Were et al. (2002) used time series data for the periods between 1972- 1999 to study Kenya's export performance from a macroeconomic point of view at three sub-sectors (coffee, tea and other exports of goods and services) and how they were likely to respond to macroeconomic policies. The results showed that coffee exports were positively and significantly affected by real exchange rate and investment. All the coefficients used in the tea model were found to be insignificant.

Eita (2008) estimated the determinants of Namibian exports and concluded that increases in the importer's GDP and Namibia's GDP led to an increase in the country's exports. It was demonstrated that sharing a common border increases exports. To the contrary, an increase in distance and importers' per capita income is associated with a decrease in exports.

III. Methodology

3.1 Theoretical Framework

3.1.1 Competitiveness

Export competitiveness indices that are used in the context of the study are the Revealed Comparative Advantage index (RCA) (Balassa, 1965), and the Revealed Symmetric Comparative Advantage (RSCA) index. Although the indices are not satisfactory as a cardinal or ordinal measure, it provides a useful instrument for measuring comparative advantages of a country in particular sectors of the economy.

3.1.2 Revealed Comparative Advantage (RCA) Index

One of the most commonly used methodologies involves the notion of "revealed comparative advantage" brought forward by Balassa (1965). The Balassa index measures normalized export shares, concerning the exports of the same industry in a group of reference countries. Although pros and cons of the Balassa index are still debated in the international trade literature, it is still the most commonly used revealed comparative advantage index (de Benedictis, 2005).

The RCA index is measured by this formula:

$$RCA = \ln (XiP/XP) / (XiW/XW) \quad \ldots\ldots (1)$$

Where:

X iP is Kenya's total value of good *i* exports to the international market, *XP* is Kenya's total export to the international market, *XiW* is the value of total world exports of good *i*, *XW* is the value of total world exports. A positive value of RCA is interpreted as Kenya's competitiveness in livestock and livestock export products.

3.1.3 Revealed Symmetric Comparative Advantage (RSCA)

The Revealed Symmetric Comparative Advantage measure echoes the RCA in its symmetric form as an index of competitiveness. It is calculated as follows:

$$RSCA = (RCA-1 / RCA+1) \quad \ldots\ldots (2)$$

The value ranges from -1 to +1. The nearer the value is to +1, the higher the competitiveness of a country in the product of interest.

3.1.4 Gravity Model

The gravity model which derives its roots from the physical rule of universal gravity (Newton's second law of motion) declares very good results in empirical studies of bilateral economic relations. Largely, the strength of shared relation depends on the dimension of the object and trait of the environment meaning the larger and closer objects show a more concentrated interrelation.

In its general form, trade flows between countries are explained by their economic size (GDP), population, geographical distance and a set of dummies. The model specification follows conventional paths widely by (Tinbergen 1962; Poyhonen 1963; Eita 2007; and UNCTAD 2012).

Explicitly, the model can be expressed as;

$LnX_{ij} = \alpha + \beta lnY_i + \gamma lnY_j - \sigma lnD_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ *(3)*

Where;

X_{ij} is the exports of trading countries, Y_i and Y_j are the national income of trading countries, and *Dij* is the distance between the two countries. This baseline model, when estimated, gives relatively good results. However, several other factors influence trade levels.

The model changes if we want to test for discrete properties to:

$LnX_{ij} = \alpha + \beta lnY_i + \gamma lnY_j - \sigma D_{ij} + \sum_{S=1}^{P} \lambda_s Gs \ldots\ldots\ldots\ldots\ldots\ldots$ *(4)*

The gravity model however, has some shortcomings. The model does not make provisions for third- party effects between country X and Y. Furthermore, the model neglects supply-side constraints, which is evident in agricultural production such as weather patterns and pests.

3.2 Model Specification

The following gravity model was adopted for the livestock and livestock products exports:

$InX_i = \beta_0 + \beta_1 InER_i + \beta_2 InY_{jc} + \beta_3 InY_{ci} + \beta_4 InP_j - \beta_5 InD_{ij} + U_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ *(5)*

Where;

X is the Livestock and livestock products exports, X_i is the exports of live animals, meat and meat preparations, hides and skins, milk and cream, ER_i is the exchange rate of Kenya, Y_{jc} is the GDP of the importing country, Y_{ci} is Kenya's GDP, P_j is the population of the importing country and D_{ij} is the distance between Kenya and the trading partners. $B_0$to $\beta_4$are the parameter estimates while U_i is the error term.

3.3 Data description and sample period

The study covered the period of 1980-2013 between Kenya and 26 importing countries. The panel data on the various livestock products used comprised products on United Nations Harmonised System of Classification (HS) codes 0-21. The choice of panel data was informed by the fact that it increases the efficiency of the estimators and significantly reduces the potential problem caused by the omission of variables. The data sources included World Development Indicators from the world bank, Penn world tables version 8.1, International Monetary Fund (IMF) statistics, the UN COMTRADE database and the database (centre d'Etudes Prospective et d'Informations Internationales (CEPII)) of the French Research Centre in International Economics. The definition of the variables used are described in Table 1.

Table 1: Description of the variables in the gravity model

Variable	Meaning	Expected sign	Description
Xij	Exports of live animals, meat and meat preparations, dairy products, hides/skins/fur from Kenya to importer j	Dependent variable	Data on this part was collected from UNCOMTRADE database
Yci	GDP of Kenya	+	Supply capacity of Kenya
Ycj	GDP of the importer	+	Economic market size of the importer
ER_i	the exchange rate of the Kenya shilling	+	signifies the impact of bilateral currency devaluation
P_j	Total population of importer	+	Total market size
Dij	Distance between Kenya and trading partners	-	Represents transportation and transaction costs, thus a major hindrance to trade

IV. Results and Discussions

4.1 Competitiveness of livestock and livestock export products

Revealed comparative advantage and revealed symmetric comparative advantage indices were estimated to assess the international competitiveness of livestock and livestock export products from Kenya in international trade. The yearly average estimates indices are presented in table 2 and trends over time are depicted in fig1.

Table 2: RCA and RSCA for livestock and livestock products: 1990-2013

Year	RCA	RSCA	Year	RCA	RSCA
1990	1.60	0.23	2002	1.30	0.13
1991	0.80	-0.11	2003	1.40	0.17
1992	0.42	-0.41	2004	2.04	0.34
1993	1.10	0.05	2005	1.59	0.23
1994	1.81	0.29	2006	1.72	0.26
1995	1.24	0.11	2007	1.66	0.25
1996	1.40	0.17	2008	1.55	0.22
1997	0.87	-0.07	2009	1.49	0.20
1998	0.84	-0.09	2010	1.69	0.26
1999	1.35	0.15	2011	1.70	0.26
2000	1.54	0.21	2012	1.71	0.26
2001	1.66	0.25	2013	1.72	0.27

From the results, it could be observed that Kenya has been competitive in the export of livestock and livestock products over the period under study except the periods 1991-1992 and 1997-1998. The level of competitiveness was positive at 1.6 in and then sharply dropped to a level of uncompetitiveness in the period 1991-1992. This result was not unique since there were ongoing protests for electoral reforms and multiparty elections, which was followed by ethnic clashes. The RCA rose steadily but fluctuated between 1993 and 1996. This was due to the country regaining peace and economic reforms. In the period 1997-1998, RCA indices were below one also depicting a level of uncompetitiveness.

In 1997, there was an outbreak of the Rift Valley Haemorrhagic Fever disease, which led to losing of livestock and a complete ban on Kenyan exports of livestock and livestock products from some Middle East countries and neighbouring Uganda that are substantial markets. Uganda also banned the importation of Livestock and livestock products due to export standard requirements 1997. This was further complicated by the 1997 elections and the aftermath clashes. In 1998, a severe drought led to a dramatic loss of livestock and collapse of markets as production decline. This translated to decline in export trade of livestock and livestock products.

From 1999 to 2013, Kenya was competitive with positive RCA indices owing to peaceful elections in 2002 and the economic reforms by the new government, which injected funds for investments into the various sectors of the economy.

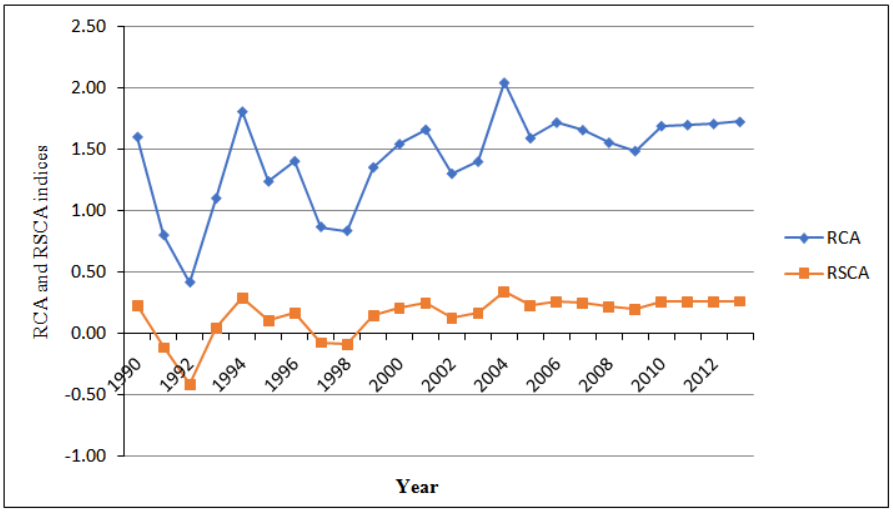

Figure 1: RCA and RSCA for livestock and livestock products exports

From the results of the RSCA, the level of competitiveness has been low throughout the period under consideration excluding 1991-1992 and 1997-1998. The low levels of competitiveness can be attributed to an inefficient market information system that led to market distortions at the detriment of the exporters. The highest RSCA index was 2.04 in 2004, which is relatively far from attaining a high level of competitiveness. The decline in exports to the Middle East and neighbouring Uganda has been because of the country not meeting the necessary sanitary and phytosanitary standards put up under the WTO statutes.

Other importing countries set high standards on livestock and livestock products imports that impede Kenya's ability to exploit the high potential in the international markets especially the EU market. The years 1989 to early 1990s was the period of market liberalisation, and livestock subsector did not respond positively to the export policies by the Structural Adjustment Programmes (SAPs).

4.2 Stationarity of the variables

This study used a balanced data set in the regression analysis with 26 number of panels and 23 periods. As common in panel data, the study first checks out for unit root tests in the model variables by applying some panel unit root tests to determine a hypothetically cointegrated relationship. The study used Breitung (2000) unit root test. This test exhibits good power even with small data sets and is also very suitable to balanced datasets although the power of the test appears to deteriorate when the period is fixed and the number of panels increased. It assumes that all panels share a common autoregressive parameter.

Table 2: Regression results for Breitung unit root test

	Level			***1st difference***		
Variable	**Statistic**	**P-value**	**Result**	**Statistic**	**P-value**	**Result**
X_{ij}	-6.8062***	0.000	stationary	-9.607***	0.000	stationary
lnY_{ci}	1.9419	0.9739	unit root	-14.933^{***}	0.000	stationary
lnY_{cj}	-0.3886	0.3438	unit root	-12.020^{***}	0.000	stationary
$lnER_i$	-1.9526**	0.0254	stationary	-9.821^{***}	0.000	stationary
lnP_j	9.2848	1.000	unit root	-1.787^{***}	0.037	stationary

Note: significance level at the 0.05 level
Source: Author's computation from STATA software version 13.0, 2017
Significance level at the 0.05 and 0.01 levels, *statistical significance: **< 0.05, ***<0.01

From the tests, the study accepts the null hypothesis of a unit root at levels but rejects the null of a unit root at first differencing. This, therefore, means that the variables are non-stationary at levels but are stationary on first differencing.

4.3 Hausman Test Regression Results

The study adopted the Hausman specification test (Hausman, 1978) to compare between a random effect model and its fixed counterpart. If the null hypothesis that the discrete effects are uncorrelated with the other regressors is not rejected, then a random effect is favoured over its fixed counterpart and vice versa. The null hypothesis was not rejected at the 0.05 level of significance, and therefore the random effect model (*Mixed or multilevel models*) was used in the estimation.

4.4 Random Effects Regression results

The table below shows the robust random effects regression results on the determinants of livestock and livestock products exports from Kenya.

Table 3: Regression Results for Random effects regression

X_{ij}	**coefficient**	**Robust Standard error**	**z**	**p>/z/**
$lnER_i$	0.255*	0.001	380.53	0.000
lnY_{ci}	0.773*	0.004	216.26	0.000
lnY_{cj}	0.009*	0.004	2.26	0.024
lnP_j	-0.003	0.002	-1.24	0.217
lnD_{ij}	-0.020*	0.009	-2.16	0.030
constant	-2.651	0.083	-31.98	0.000
chi ^{2}	2.35			
Prop > chi ^{2}	0.000			
R^2	0.723			

Source: Author's computation from STATA software version 13.0, 2016
Significance level at the 0.05 level, *statistical significance: *< 0.05

$InX_i = -2.65 + 0.77Y_{ci} + 0.26\ ER_{i+}\ 0.01Y_{jc} - 0.02D_{ij}$…… (6)

Overall, the random effect regression results explained more than 70% of the dependable variable variance (72.29%). The regression results conformed to the gravity equation assumption that trade is a positive function of the economy and negative function of the distance. All the variables are included in the logarithmic form in accordance with the gravity model, meaning that they can be interpreted as elasticities. Kenya's GDP, exchange rate, GDP of the importing countries and distance variables were all significant at the 0.05 significance levels. Holding all other factors constant therefore, a one percent unit increase in Kenya's GDP and the importer's GDP leads to a 0.77% and 0.01% increase in the exports of livestock and livestock products from Kenya. On the other hand, an appreciation of the local currency would increase the exports of livestock and livestock products by 0.26% whereas a percent increase in distance would reduce the exports by 0.02%. Distance therefore invariably affected the trade of livestock and livestock export products.

These results are in line with the works of Hatab et al. (2010) that looked at the Determinants of Egyptian Agricultural Exports using the Gravity Model and Idsardi (2010) who analysed the determinants of agricultural export growth in South Africa using the gravity equation adopting panel data spanning the years 2002 to 2009. Both studies found significant and positive coefficients in the importer's and exporter's GDPs. Comparing the computed model with other studies, we can understand that exports are usually negatively correlated with the size of the economy (e.g. Matyas 2000).

V. Conclusion and Policy Recommendations

This paper analysed the competitiveness and determinants of livestock and livestock product exports from Kenya using the gravity equation. Kenya has been competitive in the export of livestock and livestock products in the periods 1990, 1993-1996 and the period 1999-2013. In these periods, however, the level of competitiveness appeared to be low. Kenya was uncompetitive in two periods of 1991-1992 and 1997-1998. The two periods experienced political and economic challenges including the electoral reforms and ethnic clashes following the 1992 elections. The low level of competitiveness could be attributed to the high standards set by importing countries on livestock and livestock products that impede the country's ability to exploit the high potential at international markets like the European Union and the United States.

According to the results from the study, Kenyan livestock and livestock products exports were consistent with the gravity theory that trade between nations depended on the mass (economic size) and inversely proportional to the distance between them. The significant coefficient of Kenya's GDP demonstrates that the domestic supply capacity positively affects the exports of livestock products.

The government needs to develop and enhance policies that facilitate the enforcement of sanitary and phytosanitary standards (SPS) as per the World Trade Organisation statutes. It also needs to enforce standards that are nationally and internationally acceptable at all stages of export points. Therefore, to give a boost to livestock and livestock products exports, SPS measures should be taken up vigorously to ensure international hygiene standards and to harness the unexploited potential of exporting to advanced economies.

The strengthening of export supply capacity at is key to enhancing the exports of livestock and livestock products and therefore generation of the adequate exportable surplus would enable Kenya to benefit from the expanding global trade in livestock and livestock products. The overall market size does play an important role in livestock export growth and these markets should be targeted first. For Kenya to expand livestock exports, it appears that it needs to promote exports to countries with larger economies. Policies that encourage the production and export of quantity based livestock products need to be put in place.

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