PRICE AND INCOME ELASTICITIES OF SUDANESE MEAT EXPORTS

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Abstract- the current paper investigates price and income elasticities of the export demand for Sudanese meat based on panel analysis, it uses data from the main importing countries of the Sudanese meat, during the period 1990-2014. the long run evidence indicates that the quantity exported of Sudanese meat is inelastic to the variation in exchange rate. Moreover, the real income of Sudanese meat trade partners is not revealed to be a significant determinant of quantity exported of Sudanese meat.

Keywords- Exports demand, income elasticity, price elasticity, panel analysis

I. INTRODUCTION

In most of the developing countries, increasing export is seen as an important role to achieve economic development and promote economic growth. That is due to the limited access of these countries to international financial markets. In his Nobel prize lecture, Lewis (1980) pointed out that, the secular slowdown in developed countries will inevitably reduce the development speed in developing countries unless the later find alternative engine of growth. And according to him that engine is to devote their effort to promote trade among the developing countries themselves through which they can earn scarce foreign exchange to finance their import of energy, and investment capital, which are both crucial to capital formation.

Before 1999`s the oil commercial production and exports, the agricultural exports were the backbone of Sudanese economy, live animal, meat, and skins were important items in Sudanese exports, contributing significantly to foreign exchange earnings, this importance increased after the separation when the economy lost 75% of the total oil production. Therefore, estimating income and price elasticities of foreign demand have many policy implications, and useful in projecting export and formulating the exchange rate and trade policies. That is the higher income elasticity of export demand, the more foreign earning from rapid economic growth in trading partners, and the more powerful export will be as an engine to domestic growth. In contrast the higher price elasticity of export demand, the more competitive of exported commodity in the international markets, and the more effective will be the devaluation policy in promoting export earnings and achieving external balance.

II. LITERATURE REVIEW IN BRIEF

The theoretical foundation of measuring the sensitivity of the exported or importedquantity, to the variation in the prices and income is the imperfect substitutes model presented by Khan and Goldsten 1985 (see Jones. and PETER, 1985). The underlying assumption of this model is that, neither imports nor exports are perfect substitutes for domestic goods. This assumption came from, the debating argument that, if the domestic and foreign goods are perfect substitutes, then either the domestic or foreign good swallowing up the whole market, and a given country would be either an exporter or importer of a traded good, but not both. However, in reality, we normally observe the coexistence of imports and domestic production of the same goods, so the hypothesis of perfect substitutes can be rejected. Moreover, the price differentials can be observed within and across countries for the same good, which means that the law of one price does not exist, except for the standard commodities which sold in the international market. Therefore, the finite supply and demand price elasticities can be estimated for most of the traded commodities as supposed by imperfect substitutes model.

The imperfect substitutes model by Goldsten and Khan 1985 constitute of eight equations for a country i's imports, and exports to rest of the world.

$$I_i^d = f(Y_i, PI_i, P_i) \quad , \quad f1, f3 > 0, f2 < 0 \tag{1}$$

$$X_i^d = g(Y^*e, PX_i, P^*e) \quad , \quad g1, g3 > 0, g2 < 0 \tag{2}$$

$$I_i^s = h[PI^*(1+S^*), P^*] \quad , \quad h1, > 0, h2 < 0 \tag{3}$$

$$X_i^s = j[PX_i(1+s_i), P_i] \, , \quad J1, > 0, J2 < 0 \tag{4}$$

$$PI_i = PX^*(1+T_i)e \, , \tag{5}$$

$$PI^* = PX_i(1+T^*)/e \tag{6}$$

$$I_i^d = I_i^s e, \tag{7}$$

$$X_i^d = X_i^s \tag{8}$$

The above equations determine the importquantities demanded by Home County from the rest of the world (I_i^d), and the export quantities demanded by the rest of the world from the home country (X_i^d), the

quantity of imports supplied to the home country from the rest of the world (I_i^s), and the quantity of export supplied from the home country to the rest of world (X_i^s), the price in domestic currency paid by importers in the two regions (PI_i and PI^*) , and the domestic currency received by exporters in the two regions (PX_i and PX^*), and (Y_i and Y^*) the nominal income in the two regions , and the price levels are(P_i andP^*), the proportional tariffs and subsidies are (T_i, T^*), (S_i, S^*) respectively, and (e) the exchange rate expressed as the amount of units of home country's currency per unit of the rest of the world.

The imperfect substitutes model can be summarized as follows, in standard demand theory, where the consumer maximizes his utility subject to budget constraint, so the export and import can be seen as a function of the level of nominal income in the importing countries, and their imported products own prices, and the prices of domestic substitutes. The income elasticity and substitute elasticity are expected to be positive, while the price elasticity of the traded product is expected to be negative.

If we assume that the demand function is homogeneous of degree zero, then equation (1) can be written as

$$I_i^d = f(Y_i/(P_i\ ), PI_i/P_i\ ) \qquad (9)$$

So the demand is a function of real income ($\frac{Y_i}{P_i}$) and relative price of imports ($\frac{PI_i}{P_i}$).

For n-country model, the symmetry between the demand functions in the real world disappears. This is because the home country imports face the competition only from domestic producers, where its exports face competition not only from domestic producers in importing countries but also from third country exports to that country, then the relative prices appear in equation (2) adjusted for exchange rate

$$X_i^d/X^{d*} = v\,(PX_i/PX^*e), \qquad v>0 \qquad (10)$$

where

X^{d*} is demand for exports to the rest of world from the third country.

Thus, normally it is assumed that, the dominant relative price competition occurs among exporters. Consequently, the relative-price term that typically appears is the ratio of the export price to competitor's export prices adjusted for the exchange rate.

III-RESEARCH METHODOLOGY

A-MODEL SPECIFICATION

Since the amount of exports adjustment depends on the sensitivity to price and income variation, it is important to calculate the price and income elasticities for Sudanese meat export, the theoretical foundation of the empirical analysis is the imperfect substitution model proposed by Goldstein and Khan (1985), which assumes that the exports are not perfect substitution for domestic products. The export demand function is specified as a function of real exchange rate, and foreign trade partners` real income.

With respect to the Sudanese trade partners, Saudi Arabia and Jordan are the two main importers of Sudanese meat accounting for more than 70 percent of total value exported during the study period, besides Egypt, Qatar, and United Arab Emirates.

Mathematically the quantity exported model can be specified as

$$\log X_{it} = \alpha_i + \beta_1 \log Y_{it} + \beta_2 \log E_{it} + \mu_{it} \qquad (11)$$

where

i :- denotes to Sudanese meat importing countries

X_{it} :- is the export of Sudanese meat at period t to country i

Y_{it} :- is gross domestic product of country i

E_{it} :- is the real exchange rate for country i.

The exchange rate is given as:

$E_{it} = \frac{P_d}{e_i * P_i}$, Where

e_i :is the official exchange rate for country i

P_d: the price of domestic goods (whole price index)

P_i: producer prices of country i

In the model β_1 is real foreign income elasticity, β_2 is the real exchange rate elasticity of export demand for Sudanese meat. According to theory, it's expected that $\beta_1$has a positive sign, indicating that export demand rises as the foreign income increases, β_2 has a negative sign, indicating that the depreciation of Sudanese pound will increase the demand for Sudanese meat exports.

B.DATA SET AND SOURCES

For this analysis, the annual time series of Secondary published data covers the period from 1990 to 2014. All data sets are drawn from a number of issues from different sources consist of; Central Bureau of Statistics of Sudan; Agricultural Statistics of Sudan, and other sources including FAO Trade Yearbook, World Bank Yearbook of Trade Statistics and United Nation commodity trade statistics. The data for exports of meat have been collected according to the Harmonized System Codes (HS Code) (01) and (02) for Live Animals and Meats & Edible Meat Offal respectively. The quantity of export is in terms of a metric ton. The real gross domestic product in U.S dollar, and official exchange rate.

C. The Econometric Methodology

UNIT ROOT TEST

To avoid the problem of spurious regression, the variables employed in the model have to be in stationary form. there are some tests of unit root within panel developed in the literature in the last decades including Livin and Lin(1993), Im Pesaran & Chu (1997), Maddala and Wu(1999), and Kao(1999). The current study follows tests of Livin and Lin, Im, Pesaran & Chu so as to examine unit root on our panel data set. However, the Autoregressive

distributed model (ARDL) does not require any prior test of stationarity, the unit root test could convince us whether to use ARDL or not.

HAUSMAN TEST:

In panel data regression there are different ways in estimating a model, according to the structure of the error term, in one-way error component regressions model, there is only one effect, either individual effect or time effect. while in tow-way error term component model, there are both time effect and individual effect.

$$u_{it} = u_i + v_{it} \quad (12)$$

u_t : - unobservable individual effect

v_{it} : - disturbance term

According to the cointegration structure of the residuals, different models can be applied fixed effect or random effect. To determine the appropriate model, the Hausman specification test used. The Hausman statistics can be computed as

$$H = (\beta_{FE} - \beta_{RE})'\{(\text{var}\,\beta_{FE})(\text{var}\,\beta_{RE})\}^{-1}(\beta_{FE} - \beta_{RE}) \quad (13)$$

This distributed as chi-squire

COINTEGRATION TEST:

To empirically analyse the long-run relationships and dynamic interactions among the variables, the model has been estimated by using the bounds testing (or autoregressive distributed lag (ARDL)) cointegration procedure, developed by Pesaran et al. The bounds test is used widely for testing the existence of relationship between variable in level which applicable irrespective of whether the underlying variables are purely integrated at level I(0), purely integrated at first difference I(1) or in the case of mixture order of variables cointegration (Pesaran et al, 2001).

Base on wald or F-statistic test in generalized Dicky – Fuller type regression which used to test the lag variable in level in unrestricted error correction model equation. The test is provided in set of critical values based on tow assumption, either all variable are I(0), or integrated I(1), if the computed F-statistic exceed the two critical values, we conclude that, there is evidence of long run relationship between the regressors, and if its value fall below the lower bound we cannot reject the null hypothesis of no cointegration, and if lies between the bounds inference is inconclusive and knowing the order of integration of regrossors required to take conclusive inference.

Basically, the ARDL approach to cointegration estimates the conditional error correction (ECM) version of the ARDL model for meat exports and its determinants

$$\Delta\log X_{it} = \alpha_i + \beta_1\log X_{t-1} + \beta_2\log Y_{t-1} + \beta_3\log E_{t-1} + \sum_{i=1}^{p}\beta_4\Delta\log X_{t-i} + \sum_{i=1}^{p}\beta_5\Delta\log Y_{t-i} + \sum_{i=1}^{p}\beta_6\Delta\log E_{t-i} + u \quad (14)$$

The orders of the lags in the ARDL model are selected by adopting the Akaike Information criterion (AIC) and the Schwarz Bayesian criterion (SBC), before the selected model is estimated.

If null hypothesis of no cointedration rejected, the following long-run model is estimated to get the long run elasticities:

$$\log X_{it} = \alpha_i + \beta_1\log Y_t + \beta_2\log E_t + u \quad (15)$$

The ARDL specification of the short-run dynamics can be derived by constructing an error correction model (ECM) of the following form:

$$\Delta\log X_{it} = \alpha_i + \sum_{i=1}^{p}\beta_1\Delta\log X_{t-i} + \sum_{i=1}^{p}\beta_2\Delta\log Y_{t-i} + \sum_{i=1}^{p}\beta_3\Delta\log E_{t-i} + \lambda ECM_{t-i} + u \quad (16)$$

Where

$$ECM_t = \log X_{it} - (\alpha_i + \beta_1\log Y_t + \beta_2\log E_t) \quad (17)$$

IV. ESTIMATION RESULTS AND DISCUSSIONS

A. HUASMAN TEST

The null hypothesis of no time and individual effect against no individual effect is tested using Hausman test. the null hypothesis of random effect accepted at 5% significance level, indicating that random effect regression is found to be the appropriate model.

B-UNIT ROOTS TESTS

To determine the nature of relationship described by equation (11), the three variables in the export demand equation (Quantity exported X, real exchange rate E, and real GDP Y) are tested for the presence of unit root. The results are reported in table (1). The null hypothesis of unit root is rejected at 1% significance for Quantity exported and real exchange rate at level, implying that they are I(0), and at first difference to Real GDP, implying that it is I(1).

Table 1- Panel unit root test

Test	Liven,lin&Chu	porb	Im,pasaran&shin	prob	ADF-Fisher	prob
Lnx	-4.82	0.00	-4.18	0.00	34.8	0.00
LnE	-4.50	0.00	-4.34	0.00	38.97	0.00
Lny	-1.27	0.10	1.8	0.96	4.35	0.93
ΔLnx	-7.62	0.00	-8.60	0.00	77.18	0.00
ΔLnE	-4.50	0.00	-4.34	0.00	38.97	0.00
ΔLny	-4.09	0.00	-3.84	0.00	32.94	0.00

Source: Researcher calculation

C-Bounds Tests For Cointegration

Since the panel unit root shows the existence of mixture conintegrating order I(0) and I(1), the ARDL(Autoregressive Distributed Model) approach is the most applicable to investigate the relationship between the variables in this study.

the following unrestricted error correction model is estimated

$$\Delta \log X_{it} = \alpha_i + \beta_1 \log X_{t-1} + \beta_2 \log Y_{t-1} + \beta_3 \log E_{t-1} + \sum_{i=1}^{p} \beta_4 \Delta \log X_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta \log Y_{t-i} + \sum_{i=1}^{p} \beta_6 \Delta \log E_{t-i} + u \quad (18)$$

This equation canbe viewed as ARDL model also it suggests that exports of meat tend to be explained by its past values.

The appropriate lag structure established by using minimum Akaike information criterion (AIC), and Schwarz criterion, we set initially lag 6 as starting, then lag 4, and finally lag 2, the results as presented in table (2) shows that, the optimum lag with minimum (AIC), and (SBC) values is lag 2.

Table 2- Selected Optimum Lag Base on difference Method

Lag structure	Akaike inf.	Schwarz
Lag 6	5.60	6.25
Lag 4	5.53	5.98
Lag 2	5.41	5.67

Source: Researcher calculation

The F-statistic (7.64) of Wald-test on the level variables of the new model, as displayed in Table (3) which include also the critical values for upper and lower Bounds test, the null hypothesis of no cointegration is rejected at 1% significance level. The computed F-statistic 7.64 is greater than the upper critical Bound value (6.309), indicating strongly the existence of long run relationship between the variables.

Table 3- Bounds Test for Cointegration Analysis

Critical value	10%	5%	1%
Lower Bound Value,I(0)	3.182	3.793	5.288
Upper Bound ValueI(1)	4.126	4.855	6.309

Source: Pesaran et al. (2001), Table Case 111: Unrestricted intercept and no trend.

Table 4- long run estimated elasticities (dependent variable logx)

Variable	Coefficient	t-Statistic	P- value
C	-6.025416	-0.307872	0.7588
LogY	0.813095	1.048546	0.2966
Log E	-0.254440	-2.740395	0.0071

Source: Researcher calculation

The long run estimates show that the real exchange rate is negatively correlated to the exported quantity when real exchange rate depreciated by 1%, the quantity exported will increase by 0.25%, indicating an inelastic response of the quantity exported of Sudanese meat to the exchange rate depreciation. This result suggests that the policies of exchange rate devaluation can hardly affect the quantity exported of meat. With respect to the real GDP, however, its coefficient is not statistically significant, its positive sign is theoretically consistent. The effect of the real GDP is expected because most of our sample countries depend merely on oil revenues as the main source of their economy's value added. Moreover, their real GDP fluctuation during the study period has no significant effect on consumer demand, consistently, the response of their total import from the world to the variation in their real GDP is also found insignificant.

The empirical estimates of the error correction model, show the results of short run dynamic adjustment of actual quantity exported to its long run determinant as presented in table (5)

Table 5- short run estimated elasticities (dependent variable Δlogx)

Variable	Coefficient	t-Statistic	P- value
C	1.253430	1.966526	0.0523
D(LogX(-1))	0.043279	0.411922	0.6814
D(LogX(-2))	-0.064677	-0.657587	0.5124
D(LogY(-1))	-7.360915	-0.801283	0.4250
D(LogY(-2))	-11.18142	-1.232498	0.2209
D(LogE(-1))	0.019168	0.217674	0.8282
D(LogE(-2))	0.013971	0.159975	0.8733
ECT(-1)	-0.513158	-4.790242	0.0000

Source: Researcher calculation

The error correction term ECM_{t-1} which measures the disequilibrium between the actual and equilibrium quantity exported found statistically significant and has a negative sign with 51% as adjustment speed, indicating a high rate of convergence to equilibrium. That is, the disequilibrium in previous period will be closer to steady state by 51% annually.

CONCLUSIONS

The purpose of the paper is to investigate the foreign income and price elasticities for Sudanese meat export during the period 1990-2014. Through the above analysis we get the following conclusions:

1)The foreign income is found to be insignificant in determining the quantity of meat demanded by Sudanese partners, in both, short run and long run periods.

2) The real exchange rate is found to be inelastic in the long run, which indicates that the exchange rate devaluation policy is not effective in promoting the exports of Sudanese meat.

3)-The higher inflation rate during the study period could weaken the exchange rate devaluation effect during the period because the traditional pastoralists who own 80% of livestock cannot meet all their basic needs from the livestock. So they sell it to buy cereals such as maize and sorghum which themselves represent the biggest category in consumer price index basket. Thus, the higher inflation rates push them supply more livestock and increase the exported quantity.

In Conclusion, the exchange rate policies are limited on promoting meat exports. In order to obtain a sustainable and stabilized meat export growth, the policies should be directed towards supply side policies such as, improving the pastures and removing the export taxes. On the other hand, adopting control quality measurement to increase the competitiveness of Sudanese meat exports.

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