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# The Determinants of Libyan Red Meat Import Demand Equation For the Period (1970-2010)

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# 239- The Determinants of Libyan Red Meat Import Demand Equation For the Period (1970-2010)

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## Abstract

In 2010, Libya's red meat supply stood at about 77 thousand tonnes, about 25 percent was imported. Given the insufficient levels of domestic red meat production, the government mainly relies on imported red meat to fill the gap. The objective of this study is to examine factors affecting import demand for red meat in Libya, also investigates whether there is exists a long run relationship between red meat import quantity and its major determinants by using annual data for the period 1962-2010. Based on abounds test known as Auto-Regressive Distributed Lag model (ARDL). The results of the bounds test reveal that the quantity of red meat imports and its determinants namely red meat import price, Gross Domestic Product and domestic meat production are cointegrated. The results also indicate that the demand for red meat imports is elastic with respect to import price level in the short run. However, in the long run, the price elasticity becomes greater while the income elasticity level remains less than one. Thus, this indicates that red meat imports are generally considered as necessary good.

Key Words: bounds test, Cointegration, Import demand, Red meat.

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# Introduction

Libya depends on international trade to satisfy more than 50 percent of its food requirements. The demand for red meat continued to grow at a rate higher than the increases in local production and the rate of population growth. The local production of this commodity declined significantly in the last decade because of deterioration of natural resources and production infrastructure. This situation resulted in widening the food deficit gap and increased dependency on imports. Red meat is considered one of the major sources of animal protein for the Libyan people which complements the proteins from milk products (yogurt, cheese, butter, ghee) and food legumes (beans, peas and lentils). Red meat imports has been fairly significant relative to total supply for many years, and it has a huge impact on domestic supply as they averaged 11.9 thousands tonnes during 1970 – 2010 (FAO - Food and Agriculture Organization,2010).

Generally, understanding the current structure of the red meat industry in Libya is helpful in understanding the changes that occurred in the red meat sector. Principally, there are two main sources of red meat in Libya: domestic production and imports. In 2010, the country's red meat supply stood at about 68 thousand tonnes, about 9 percent was imported.

**Table 1: Libya's domestic production, Quantity and Value of Red meat Imports 1962-2008**

| Year | Quantity imported ( tonnes) | Domestic Production(tonnes) | Import price Libyan dinner/tonnes |
|---|---|---|---|
| 1970 | 4236 | 46091 | 399 |
| 1980 | 16591 | 117490 | 590 |
| 1990 | 5090 | 62800 | 702 |
| 2000 | 3291 | 42050 | 1403 |
| 2010 | 18915 | 57980 | 4932 |
| **Average** | **11955** | **68268** | **1224** |

Source: F.A.O, Trade Book, Various Issues 1962-2010.

The Libyan  imports of red meat have been increasing over the current and last decades.  imports of beef, sheep (the two major components of red meat imports) increased from 4236 in 1970 to 18915 tonnes in 2010, The rise of red meat imports can be attributed to several factors, such as increased income, decreased domestic red meat production, and increased global integration. whereas domestic production of red meat decreased from 46 to 57 thousand tonnes at the same period. The major contributor of the increase in imports of red meat was sheep meat which went from 1286 to 8832 thousand tonnes for the same period. (FAO,2010)

The instability in red meat imports, as shown in the Table 1 can be explained by the following: The fluctuation and the variation of imports and the local red meat production from year to other, resulted from the amount and the distribution of rainfall, and the carry over of buffer stock from year to year.

The main trade partner are the European Union (83.8%). Arab league countries are also playing a significant role in the Libya's market as shown in figure(1).

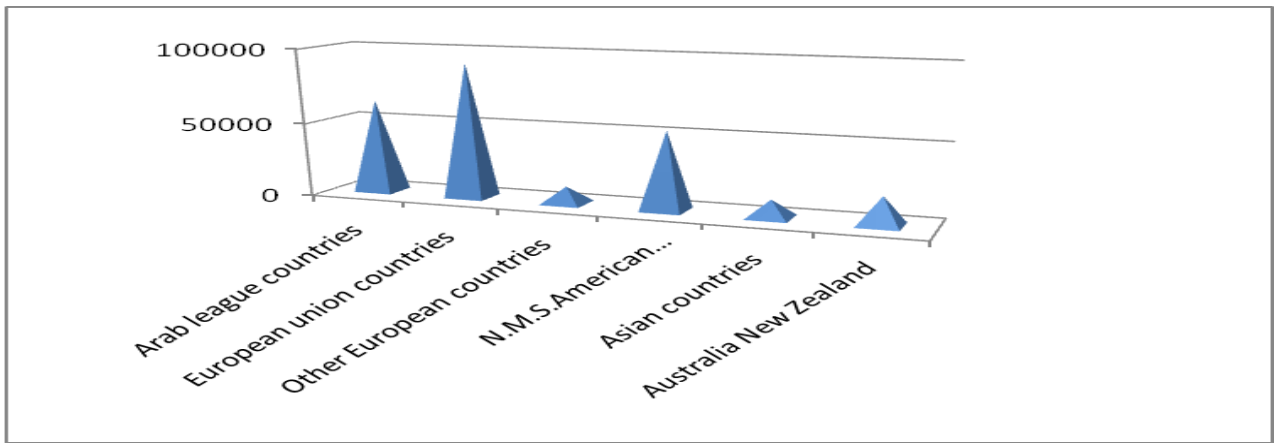


Figure 1: Value of Meat Imports During 2008 by Countries of Source

The objective of this paper is to examine factors affecting import demand for red meat in Libya, and to investigate whether there exists a long run relationship between the Libyan red meat import quantity and its major determinants (economic activity proxied by Gross Domestic Product(GDP), red meat import price and domestic red meat production on the basis of yearly data for the period 1962-2010, obtained from Food and Agricultural Organization (FAO).

## Materials and Methods

Understanding the demand for red meat and livestock and the factors shaping it would clarify the underlying demand parameters affecting this growing market and aid in policy formulation. Understanding the demand and its parameters would be of importance to meat and livestock producers as well as policy makers in developing effective policies targeted toward increasing producers income and market shares. Susanto, etl (2008)

Estimation of import demand has been focused on many empirical studies of international trade behavior. Single equation and simultaneous equations, are most commonly used in estimating import demand, because of the lack of data on the countries of origin of imports, we can not apply the simultaneous equations model here.

Thursby, and Thursby (1984) shows that single equation models are appropriate as long as they are well specified and they generate unbiased and/or consistent, and efficient estimates. A comparison of nine types of single equation models of import demand in five countries revealed that the models including dynamic behavior through the incorporation of lagged dependent variable were frequently accepted.

The single equation model of import demand for agricultural commodities can be in general viewed as a function of income, prices and relevant demand shifters. The following specification is considered for the red meat import demand equation in Libya:

$RMI_t = F (RMIP_t, RMPROD_t, GDP_t, U_t)$ (1)

Where:

$RMI_t$ = red meat imports (000's tonnes)

$RMIP_t$ = relative price of imports (Libyan dinner (LYD))

$RMPROD_t$ = red meat production(000's tonnes)

$GDP_t$ = Gross Domestic Product (million LYD)

$U_t$ = Error term

Import prices were calculated from import quantity and value data which obtained from FAO trade year books, which gave the unit-value for imports. These values were then converted to Libyan dinar, Gross Domestic Product obtained from Central Bank of Libya.

So many econometric methods have been proposed for investigating long-run equilibrium (cointegration) among time series variables; including Engle and Granger (1987), and Johansen (1988), for the purpose of this study the Autoregressive Distributed Lag (ARDL) modelling approach is utilized. Which developed by Pesaran and Pesaran (1997) and Pesaran et al.. (2001), the ARDL modeling approach has several advantages in comparison with other single cointegration procedures, and result from the ability to estimate the long run and short run parameters of the model simultaneously, while avoiding the problems posed by non-stationary time series data. In addition, this approach does not require a prior determination of the order of the integration amongst the variables, unlike other approaches which require that the variables in the time series are integrated of the same order. Another advantage is that the model takes a sufficient number of lags to capture the data generating process in a general-to-specific modeling.

To investigate the existence of a long-run relationship, Pesaran et al. (2001) proposed the bounds test based on the Wald or F-statistic. The asymptotic distribution of the F statistic is non-standard under the null hypothesis of no cointegration relationship between the examined variables, irrespective of whether the explanatory variables are purely I(0) or I(1). The hypothesis of the existence of a cointegrated relationship between red meat import quantity and its determinants is tested using the ARDL bounds test. If the hypothesis of no cointegration is rejected, a stable long-run relationship between the red meat import quantity and its major determinants exists. The cointegration relationship for the import demand equation is estimated using the bounds test, which is based on the following Unrestricted Error Correction Model (UECM):

$$\Delta RMI_t = b_0 + b_1\Delta RMIP_{t-1} + b_2\Delta GDP_{t-1} + b_3\Delta RMPROD_{t-1} + b_4\Delta RMI_{t-1} + b_5 RMIP_{t-1} + b_6 GDP_{t-1} + b_7 RMPROD_{t-1} + b_8 RMI_{t-1} \quad (2)$$

The null hypothesis is tested by considering the UECM for red meat import equation in (2) excluding the lagged variables $RMP_t$, $GDP_t$, $RMPROD_t$, and $RMI_t$. More formally, we perform a joint significance test, where the null and alternative hypotheses are:

$H_O$: $b_5 = b_6 = b_7 = b_8 = 0$

$H_A$: $b_5 \neq b_6 \neq b_7 \neq b_8 \neq 0$

For some significance level, if the F-statistic falls outside the critical bound, a conclusive inference can be made without considering the order of integration of the explanatory variables. For example, if the F-statistic is higher than the critical bound, then the null hypothesis of no

cointegration is rejected. In the case when the F-statistic falls between the upper and lower bounds, a conclusive inference cannot be made. Here, the order of integration for the explanatory variables must be known before any conclusion can be drawn.

## Results and Discussion

The model was initially estimated using the auto regressive distributed lag model (ARDL). The method was applied to solve the problem of the stationarity that occur in the time series variables. Therefore, prior to undertaking cointegration tests, we first specify the relevant order of lags of the ARDL model. The lag selection criteria considered include Akaike's information criterion (AIC) and Schwarz's information criterion (SC). Most ARDL models are estimated using symmetric lags, i.e. the same lag length is used for all variables in all equations of the model. The lag structure that generates the minimum AIC or SC is selected as the optimal lag structure. Both criteria select a model that includes one lag in our model.

The first step in the analysis is to examine the time series properties of the variables through the modified Dickey-Fuller generalized least square test (DF-GLS test). The DF-GLS unit root tests have high power compared to standard ADF unit root tests. We applied DF-GLS tests for both levels and their first differences and the results are show in Table 2.

Table 2: Modified Dicky-Fuller (DF-GLS) Unit Roots Tests

| variable | Level | First Differences |
|---|---|---|
| $LRMI_t$ | -0.872 (-1.948) | -7.864(-1.948) |
| $LRMIP_t$ | -0.931 (-1.948) | -9.983(-1.948) |
| $LRMPROD_t$ | -0.902(-1.948) | -5.206(-1.948) |
| $LGDP_t$ | -1.850(-1.948) | -1.317(-1.948) |

All variables are in logarithms.

the critical values at the 5% per cent level are in brackets.

Table 2 reports DF-GLS test results for stationarity of all the time series over the study period. For the levels of the series none rejects the null hypothesis of nonstationarity at the 5 percent

level. In general, the evidence suggests the presence of I(1) for most of the variables, with the exception of the LGDP variable which mean all variables are first difference stationary.

In order to investigate the existence of a long-run relationship or cointegration among the variables in the model, the bounds test has been performed. As a Result, the computed F-statistic is 4.12 that found to exceed the bounds upper critical value of 3.49 at a 5% significance level. This implies that red meat import quantity and its determinants GDP, red meat import price and red meat production are cointegrated.

The selected model, based on the SBC criteria, is an ARDL(,1,0,0,0). The model passes the standard diagnostic tests namely the serial correlation, functional form, normality, and heteroscedasticity tests. All variables are expressed in logarithm form.

The estimated parameters along with their t tests are shown in the following equation:

$$\mathbf{LRMI_t = 9.173 + 0.442LRMI_{t-1} - 1.534LRMIP_t + 1.234LRMPROD_t + 0.248LGDP_t} \quad \mathbf{(3)}$$

$$\mathbf{(4.058)\quad (3.706)\quad (-3.829)\quad (3.429)\quad (2.998)}$$

$R^2$ % 85

Adjusted $R^2$ %83

F-stat. 58.645[.000]

The results shown in equation 3 revealed that importation of red meat is positively related to the red meat import lagged one year and the GDP.

The red meat import quantity is found to be price elastic, the coefficient estimated being -1.534, whereas the value of income elasticity of demand for imports is less than one, implying that red meat imported is considered as a necessary good which relates to the general level of economic activity in the economy.

The demand for imports appears to be sensitive to import price changes. This implies that a lowering of import prices through removal of tariff and non tariff barriers will lead to a proportionate rise in the flow of imports. The continuing increase in GDP is likely to be a major factor affecting Libyan red meat import in the future.

The long run estimates for the coefficients of red meat import equation reveal that all selected independent variables are statistically significant and have the appropriate sign as show in equation 4.

$$\mathbf{LRMI_t = 16.4605 - 2.752LRMIP_t + 2.215LRMPRODt + 0.445LGDP_t} \quad \mathbf{(4)}$$

$$\mathbf{(3.518)\quad (-3.723)\quad (6.129)\quad (3.443)}$$

The estimation of long run coefficients show that the own long run price elasticity of red meat imports was found to be elastic with the magnitude of 2.75, also the results found that red meat imports are income elastic with the magnitude of 0.44 in the long run.

The estimated coefficients of the error correction models of the red meat import equation, presented in the following equation:

$$\mathbf{DRMI_t = 9.173 - 1.534DRMPI_t + 1.234DRMPROD_t + 0.248\ DGDP_t - 0.557ECT_{t-1}} \quad \mathbf{(5)}$$

$$\mathbf{(4.058)\quad (-3.706)\quad (3.429)\quad (2.998)\quad (-4.665)}$$

The estimated coefficient of the error correction term (-0.55) is statistically significant and has the appropriate (negative) sign. Hence, this suggests the validity of a long run equilibrium relationship among the variables in the import equation. The estimated coefficient value of -0.55 suggests that the system corrects its previous period's disequilibrium by 55 per cent a year.

## Conclusion

The objective of this study was to explain the determinants of red meat imports demand in Libya by estimating a dynamic import demand function utilizing an Autoregressive Distributed Lag model (ARDL). The results of the bounds test reveal that the quantity of import demand and its determinants namely red meat import price, domestic red meat production and GDP are cointegrated. Thus, an error correction model was estimated because it is the most efficient model to utilize for dynamic estimation. Estimations from an ECM specification of red meat imports show that previous imports play an important role in influencing current imports demand, imports have income elasticity of demand which exerts significant influence on imports. The ECM specification was supported by all the diagnostic tests and validated by a significant error correction term coefficient. The results suggest the following main implications: the

consistent significance of GDP in influencing red meat imports suggests that stabilization policies have had a significant impact in determining import behavior in Libya.

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