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Red Meat Sector: An Econometric Framework

by

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Introduction:

This paper presents an attempt to identify and quantify major existing interrelationships in the red meat sector in Egypt using available time series data. The present study attempts to identify and quantify major factors affecting production, imports and consumption of red meat. However, due to severe data limitation and inaccuracy, the econometric analysis presented in this study is simple. Given the complexity of the livestock sector in Egypt, the equations presented seem to be reasonable in spite of its simplicity. The presented specified and estimated equations are considered as a first step toward constructing a complete recursive econometric model for the livestock sector in Egypt. Some of the estimated equations are unacceptable on statistical grounds but are reported to represent an invitation for further improvements.

In general, econometric research and modeling aims to simplify and explain the crucial essence of real world situations. Econometric research is based on a set of numerical data relating to certain economic and other variables and makes inferences from the data about the ways in which these variables are related. An econometric model is a formal representation of the notion that we have about a phenomenon. These notions are expressed by a set of assumptions and relationships--in terms of

mathematical systems--concerning the underlying notions and forces or laws regulating it. By basing the reasoning on a model, investigation of the logical consequences of the assumptions can be made, and researchers will be better equipped to understand the real world and act efficiently on it.

Actually, all sciences seem to make use of models. The isolation of phenomena and the establishment of abstract representations of them seems to be the point of departure of scientific method. In biological and physical sciences exact representation can generally be made. By constructing artificial situations or combining long series of observations, determination of how two or more variables vary simultaneously when the others are held constant and the general environment is unchanged can be made. The situation is very different in social sciences and especially in economics. Economists usually deal with phenomena that are bound up with essentially moving organizations of human communities. The economist seems to be forced to make simplified representations of real world problems.

Thus, given the complexity of the real world livestock sector in Egypt, this study represents a trial to simplify and quantify the effects of the major forces existing in this sector. Livestock provides draft power to agriculture, as well as over 25% of the gross value of agricultural output. Livestock development and policies are highly related to feed and food production, agricultural labor and wages, mechanization policies, government pricing and distribution policies for feed and food, and feed and food imports policies, to name a few. Also,

livestock production in Egypt takes place in traditional as well as new specialized livestock production activities. Each has a different organization, institutional, and socio-economic frame. Thus, a simplified econometric frame to understand and explain the crucial essence of the complicated and highly interrelated real world situation seems to be a must. Such econometric frame will help in quantifying some important economic indicators and provides a frame for obtaining forecasts. The present study deals only with discussion of the major estimated relations and their implications. Using the estimated relations to obtain forecasts is out of scope for the present study.

The study is divided to five more parts. The first deals with a general overview of the livestock sector, while the second deals with data and estimation methods. Estimated equations for the production of red meat are presented in the third part. Imports equations and demand estimates are presented in the fourth and fifth parts, respectively. Finally, a summary is presented and suggestions for further research are discussed.

The Livestock Sector, An Overview:

Red Meat domestic consumption in 1979 was estimated at about 400,000 M.T. Of this amount about 70 % was from local production (3, 9). Red Meat consumption increased by about 15% annually during the 1964-1979 period. However, domestic production is not able to meet domestic requirements.

Because of limited arable land, increased livestock production is hampered by the lack of domestic feed, particularly during summer months. Also, the great increase in demand for

meat relative to meat availability has resulted in sharp rising of meat prices. Meat prices have been increasing drastically. Retail prices of fed cattle and buffalo meat increased at an annual average rate of about 12.5 % over the last two decades. The retail price of red meat reached L.E. 3.25 per kilo at the consumer level by August, 1980 (14). Since October, 1980, meat prices have been fixed by the government at L. E. 2.30 - 2.50 per kilo, depending upon cuts and location. Feeder calves prices were also fixed at L.E. 1.05 - 1.08 per kilo liveweight. However, this policy does not work effectively, because the feedlot operators cannot get a positive margin under such fixed prices. Therefore, an unofficial (market) price exists. The actual beef retail market price has reached almost the same level as it was before the implementation of the fixed price policy.

Most of red meat importing is done by the government. The imports are generally utility grade beef which is sold through the government stores, mainly in urban areas, at L.E. 0.68 per kilo. Frozen red meat has become the main type of imported meat (14). It is of lower quality than domestic meat. It is cheaper and subsidized by the government. The average retail price of chilled and frozen imported cattle meat ranged from L.E. 0.39 per kilo in 1975 to about L.E. 0.95 per kilo in 1979 (6). Because of a drastic increase in domestic meat prices, the ratio of average import value of frozen red meat to domestic culled beef (comparable domestic utility grade) retail prices was reduced from more than two-thirds in 1965 to less than one-third in 1979. The U.S. market share for red meat is small and is expected to remain so in the future. Generally, the U.S. tends to export

high price, high quality fed beef and to import low or utility grade meat. In 1979, Egypt's imports of chilled or frozen red meat reached about 32,565 M.T. The U.S. market share was 6.2 percent. Also, the U.S. market share in Egypt's preserved red meat imports reached only about 1 percent in 1979. Australia, Argentina and to some extent the E.E.C. countries are the main exporters of frozen, chilled and preserved meat to Egypt (3).

Hide and feed subsectors are of special interest in specifying the interrelationship of the meat and other livestock products in Egypt. Unfortunately, no reasonably accurate data are available concerning the complete hide and feed subsectors. However, data on feed are relatively better in Egypt. Berseem is the most important green fodder, and straws are important in feeding ruminants (cattle and buffalo during summer). Prices, production and distribution of major feed concentrates are under government control (13). However, berseem and straw prices are determined through market supply and demand forces. Whereas, feed availability is an important and limiting factor for cattle and buffalo meat production, it has no impact on mutton and goats meat production. Sheep and goats in Egypt are either nomadic or semi-nomadic herds (11). Actually, red meat production in Egypt is mainly from cattle and buffalo. Sheep and goats are of less importance than in other Arab countries (2).

All current government policies related to the meat sector seem to have short run goals. These policies aim at achieving stable local meat prices and an implicit long run goal of reaching self sufficiency in meat.

Data and Analytical Procedures:

Data limitations and inaccuracy govern to great extent the specification and quantification of the equations presented in this study. For example, there is no easily available and accurate data on on-farm cattle and buffalo slaughter, death loss, off take rate carcass weight, civilian and military consumption, or production of the broiler industry, to name a few. Most of data published pertaining to the livestock-meat sector seem to be derived using fixed coefficients and intellectual guessing. Current efforts carried out by the Ministry of Agriculture to improve livestock statistics are timely and appreciated.

According to government statistics, there were about 2.5 million cattle, 2.5 million water buffalo, and 2.6 million sheep and goats in Egypt in 1979 (10). However, those numbers are estimated by linear extrapolation from the data of the three Agricultural Censuses of 1960, 1968, and 1970. In fact, from all data available concerning red meat production in Egypt, government inspected slaughter--inside slaughter houses--is the only actual figure, Table 1.

However, on-farm slaughter is very important in Egypt. Some trials were carried out to estimate on-farm slaughter (11). These trials depended upon calculating hide numbers, and they were not fully successful because most of the hide industry is under the management of private firms. These firms tend to underestimate production to avoid higher taxation. Also, some types of hides are reported in terms of tons or square feet, not in numbers of hides. There are no easily accessable time series

data available on hide production figures which can be used as a proxy to estimate on-farm slaughter. Accordingly, the available estimates have to be used regarding those figures.

In the present study some realistic figures concerning carcass weights and on-farm slaughter percentage (11) are used in the model. The on-farm slaughter percentage of culled cattle and buffalo and fed cattle and buffalo is assumed to be 50 percent of the total slaughter of the country of those types. On-farm slaughter percentages are assumed to be 30 percent and 40 percent of the total slaughtered number of baby buffalo veal and sheep and goats, respectively. Carcass weights per head are assumed to be 225 kg, 175 kg, 40 kg, and 18 kg for culled cattle and buffalo, fed cattle and buffalo, baby buffalo veal, and sheep and goats, respectively.

Camel meat and pork contribute minimally to total red meat production in Egypt, Their production is estimated to be about 5,000 M.T., and 1,000 M.T., respectively in 1979(10). Most of the camels slaughtered in Egypt are imported (7). The domestic off take rate of camels is negligible. The weight of such categories in total red meat production does not exceed 2 % (9). Accordingly, camel meat and pork were excluded from the analysis in the present study.

A complete econometric model for the livestock sector in Egypt should include specific behavioural equations to explain variations in all related variables including the number of on-farm animals, retail, wholesale, and farm prices, and considering all types of animals (1). The number on-farm according to types

and ages, replacements of the numbers, death loss number, off take numbers, replacements on feed lots, slaughter on-farm by type, government inspected slaughter by type, carcass weight variations, meat production by type, civilian consumption by type, military consumption by type, imports of live animals, imports of meat by type, retail price determination, wholesale price determination, and farm price determination by type should be included in the econometric analysis. This chain of ordering should also consider the interdependence of farm prices and the number of animals on-farm and off take rates. However, as indicated earlier data limitation concerning the livestock sector in Egypt is a serious constraint facing a complete specification of this model.

The presented econometric analysis is the first step toward building a more detailed and complete econometric model for the livestock sector. The specified and estimated relations for the red meat sector already constitute a complete recursive model where a directed chain of ordering of the related endogenous variables is present (Figure 5).

The econometric analysis presented in this study falls under the realm of positive economics where interest is only directed toward explaining existing situations and providing forecasts from previous historical development. There is no attempt made here to reach a conclusion on what ought to be. The specified and estimated relations are to provide information regarding explaining changes in the specified endogenous variables.

To estimate red meat domestic production, more than one equation is required to be specified and statistically estimated.

This is because of different types of red meat production sources and various corresponding structural variables and their supply shifters. Four behavioural equations are estimated for government inspected slaughter of culled cattle and buffalo, fed cattle and buffalo, baby buffalo veal, and sheep and goat. The total red meat production is estimated through an identity equation including the predetermined slaughtered numbers for camels and pork, and the assumed coefficients for on-farm slaughter and carcass weight for each group.

Because frozen red meat is the bulk of imported red meat, a red meat imports behavioral equation for such type is estimated. However, because there are some predetermined red meat types included in total production estimation and also because the imports equation is only for frozen meat, the derived consumption identity can not be satisfied for simulation purposes or forecasting with respect to supply and demand model. Therefore, a separate demand function is also required to be specified and statistically estimated.

Given the Egyptian market conditions and government intervention in pricing and distribution of the products, and data accuracy, the time series analysis should be viewed with caution. Accordingly, a pooling of time series and cross-section estimates for the red meat demand function will be more useful for projection purposes than the time series estimates. Expenditure elasticities were estimated using the 1974/75 family budget survey's data (14). The Engle curve estimate from the cross section data was used to adjust the income-consumption

estimate from the time series data through the conditional time series estimation.

A linear form is used for all estimated equations, except for the demand equations where a double logarithmic form is used. The behavioral equations are specified and statistically estimated using Ordinary Least Squares Method (17). The equations reported in this study are the best among several alternative fits. They have the smallest standard errors and largest number of a priori expected signs of the regression coefficients. Also, each of the reported equations have highest R^2 (coefficient of multiple determination) among alternative fits.

The equations were fitted using yearly data for the 1964-1979 period. Actual data for the 1978-1979 period were used to test for the equations ex-post prediction power outside the sample period.

The presence of positive serial correlation among disturbance terms is tested using Durbin-Watson Statistics. R^2, S.E. (standard errors), F-statistics, D.W. (Durbin-Watson Statistics), and Y (the dependent variable average) are reported with each estimated equation. For each estimated equation a percentage error index showing the percentage of estimated to actual values is calculated to indicate the accuracy of estimation. The actual and estimated values are presented in diagramatic form for some equations.

Production Relations:

In this section the estimated equations for red meat are

discussed. As indicated earlier some of the estimated equations are unacceptable but reported to present an invitation for further improvements.

Different specifications for the relationships of each of the four categories, were studied and estimated. The following equations were the best fitted among the alternative fits. The four categories are slaughtered culled cattle and buffalos (SLCBC), slaughtered fed cattle and buffalo (SLCBF), slaughtered baby buffalo veals (SLBV), and slaughtered sheep and goats (SLSG).

The code (L) after each variable represents the time dimension, i.e. (L) means in year L and (L-1) demotes a one year lagged variable. The value between brackets under each estimate is the calculated T-statistic value.

Culled cattle and Buffalo slaughter (SLCBC). The following equation was the best among the alternative fits.

$$\text{SLCBC (L)} = 325.2263 - \underset{(0.687)}{0.0963\ \text{BRA (L)}} + \underset{(1.319)}{0.0723\ \text{SUFOD (L)}}$$

$$- \underset{(0.383)}{188.3606\ \text{(RPCB/RPFB) (L)}} - \underset{(0.229)}{0.2595\ \text{TFMI (L-1)}}$$

$R^2 = .181$, SE = 486.3115, F = 0.4967, Y = 108.071, D.W. = 2.30

The equation does not fit well; however, all coefficients are associated with a priori expected signs, except the retail price ratio of culled cattle and buffalo to fed cattle and buffalo {(RPCB/RPFB)(L)}, Table 4. The standard error of the equation represents more than the average slaughter number (thousand head). R^2 is very low, and the variability in (SLCBC) due to the explanatory variables (F-value) is insignificant.

None of the regression coefficients is statistically significant at the 0.05 level. However, the negative sign of berseem area cultivated in the previous year is logical because the area of berseem on-farm determines the number of productive females (dairy animals) kept on-farm. Therefore, if the berseem area is larger then the off-take for slaughter of culled females will be lower. On the other hand, if the area available for summer fodder (SUFOD) (L) is larger it encourages the farmers to "finish" more aged cattle and buffalo for slaughter. This may show another dimension of the new policy to expand the new summer forages, assuming that it will increase with production. The a priori unexpected negative sign of the culled-fed retail price ratio {(RPCB/RPFB)(L)} and the very low corresponding T-statistic show that the off take of such category, i.e., livestock inventory, is isolated from the market incentives.

Previous studies (15) provided evidence that the cattle and buffalo herd size on traditional farms (about 95 percent of livestock holdings in Egypt) are mainly determined by some major social, structural and demographic variables on farm, rather than economic ones. This previous study showed that family size, number of adult females in the family, and the education level of the producer, in addition to the farm size, are the major variables that determine the herd size kept on-farm. Also, it showed that the larger the area devoted to berseem, the larger is the herd size of cattle and buffalo kept on farm or the smaller the portion sent to slaughter. However, the statistical estimation of this relation presented here seems to be

unacceptable. Economic analysis of this variable needs improvements.

Fed Cattle and Buffalo Slaughter (SLCBF). The equation presented is the best fitted for such a relationship.

$$SLCBF\ (L) = \underset{(0.362)}{107.1123} + 0.0268\ STRCL\ (L-1) - \underset{(0.598)}{6.90796}\ RPCB\ (L) + \underset{(0.919)}{8.4131}\ RPFB(L)$$

$R^2 = 0.845$, $S\ E = 55.46$, $F = 18.13$, $Y = 404.643$, $D.W. = 1.66$

The equation fits well, and all coefficients are associated with a priori expected signs. The standard error of the equation represents about 13 percent of the average slaughter number during the sample period. The importance of feed availability is presented in the equation through the use of straws quantities, STRCL(L) (Table 5). Out of all other feeds it was the only one with the a priori expected response sign with minimum standard error of the regression coefficient estimated, even though it is not significant. The following evidence explain such results. Most of cattle and buffalo fattening operations in Egypt are under commercial feedlots systems. The feeding plan of such operations in always straw and concentrate feed mix. The supply of the latter is completely secured through government policy. The government distributes a monthly regular quota of such feed at subsidized prices to feed lot farms on per head basis. The policy gives a first priority to such operations. However, the other feed component of the ordinary ration, i.e. the straw is mainly wheat straw.

As mentioned earlier the availability and price of wheat

straw is determined by the economic power in the market. Accordingly, some previous normative approach production models showed that the cost of straw in feedlot operations is very important in determining fed animals slaughter. Even its insignificance reflects additional issues in this market. First, the supply and the price of straw as a by product of the wheat crop are of high seasonal variability which may affect the seasonal supply of fed animals rather than annual supply. Second, the feedlot farm operators enjoy a comparative advantage because their farms are usually on the urban cities belt. Therefore, they receive the highest possible price for their supply of fed animals. Accordingly, they can use straw up to requirements, even under the high price, low supply conditions of such feed, because the high price of meat can cover the additional costs of feeds. Also, they may have enough funds to avoid price variability of straw by storage of the requirements over a long period in advance.

RPFB (L) and RPCB (L) represent price of fed beef and calf and culled cattle and buffalo as a major substitute, respectively. On the average, the estimated price elasticity of supply of fed cattle and buffalo is 1.6545. It means that an increase of 1 percent in retail price of fed cattle and buffalo meat expands the quantity supplied of fed cattle and buffalo slaughter by 1.65 percent. It shows in general that the supply is highly elastic, though the response estimated coefficient is not significant at 0.05 level of significance. These results should be viewed with caution due to this insignificance. The cross elasticity shows that an increase of 1 percent in culled

cattle and buffalo meat retail price decrease the supply of fed cattle and buffalo slaughter by 1.08 percent. However, the regression coefficient is not significant at 0.05 significance level. Thus, these results should be viewed with caution because of this insignificance. Generalization can not be made at this stage. Figure 2 and Table 2 represent actual and estimated values of SLCBF for the sample period 1964-1977.

Baby Buffalo Veal Slaughter (SLBV). Out of all alternative fits, the presented equation was selected as the best. This is because it has a priori expected signs for all regression coefficients estimated, and it has the minimum relative standard error and the highest R^2 value. However, only the berseem area, (BRA) (L1), response was significant at the 0.05 significance level, and the retail price of buffalo veal meat, (RPVM) (L), response was significant at only 0.2 level of significance.

$$SLBV\ (L) = 763.6804 - \underset{(2.577)}{0.5144}\ BRA\ (L-1)$$

$$+\underset{(1.484)}{0.6803}\ RPVM\ (L) - \underset{(0.408)}{0.2393}\ SLCBC\ (L)$$

$R^2 = 0.418$, SE = 1863.192, F = 2.398, D.W. =1.11, Y = 228.857

In general, the equation does not fit well. This result by itself may support some evidence. First, the buffalo veal slaughter is a direct derivative from the buffalo female inventory change. As mentioned earlier, it is a function of social and structural variables on traditional farms rather than other economic and market variables.

The negative significant sign of berseem area response in the previous year may show that it is a major limiting variable

for buffalo veal slaughter response. The larger the last year's berseem area, the smaller is the number of buffalo veal slaughter supply. This is because the farmers are expected to keep the baby buffalo to be raised on farm, either because of the greater availability of berseem on farm for feeding or because the expected milk production would be enough for the complete sucking period and for sale at the same time. On the other hand, since 1967 fed buffalo slaughter started to appear at slaughter house records. That was a result of establishement of the general meat organization (state company). The main objective of that company was to fatten baby buffalo to beef grade age (2 years old). However the veal fattening policy has been unstable over the last decade due to many reasons (4). Therefore, the supply of veal slaughter fluctuated drastically in the seventies, not only because of market variables but also because of changes in government policy attitudes.

The estimated low price response for baby buffalo veal from the estimated equation, may show that the high increase in beef retail price encouraged the private sector to involve itself heavily in baby buffalo fattening to supply fed buffalo at the expense of buffalo veal supply, in spite of the high purchase costs of buffalo veal to be fed and feeding costs. That is because the beef meat price would cover such high expenses. Although the equation has poor fit, the errors between actual and estimated values seem to decrease in the 1970-1977 period.

Sheep and Goats Slaughter (SLSG). While fed cattle and buffalo represented about 65 percent of total animals slaughter

during the 1970-1979 period, sheep and goats slaughter number represented about 30 percent of total animals slaughter during the same period. However mutton and goat meat production represented about 6 percent of total red meat production in Egypt (6). Because the difference in the nature of the supply of the sheep and goats from that of cattles and buffalo, a separate behavioural equation is specified to explain variations in the sheep and goat slaughter number under government inspection.

As mentioned earlier, the bulk of sheep and goats population are kept either as nomadic or semi-nomadic herds out of the delta valley. Their off-take is not affected strongly by feed availability. Generally, the major factors affecting mutton and goat meat production reflected in slaughter numbers seem to be their prices relative to other major meat items.

The following equation is estimated for sheep and goats slaughter (4).

$$SLSG\ (L) = 528.4624 + \underset{(0.02)}{0.0380}\ RPSG\ (L) - \underset{(.71)}{2.2861}\ RPPUD\ (L)$$

$$+ \underset{(1.774)}{3.9598}\ TFMI\ (L-1)$$

$$R^2 = 0.390,\ S.E. = 59.98,\ F = 2.176,\ D.W. = .92$$

The equation does not fit well, but the errors seem to decrease in the 1970-1977 period (Figure 4). All included variables are associated with a priori expected signs and with statistically insignificant coefficients. However, the equation seems to provide reasonable forecasts, given data and other limitations (Figure 3 and Table 2).

Total Red Meat Production (RMQ). The red meat production is estimated through an identity equation which includes estimation from previous behavioral supply functions. Also, assumptions concerning on-farm slaughter and average carcass weights are based on the previously mentioned coefficients. The slaughter number of culled animals are used as exogenous variable in the following equation (5).

$$RMQ\ (L) = 0.45\ SLCBC\ (L) + 0.35\ SLCBF\ (L) + 0.133\ SLCBV\ (L) + 0.045\ SLSG\ (L)$$

The stated coefficients represents the average carcass weight for each type divided by the percentage of on-farm slaughter from total slaughter. This equation is used to obtain estimated total red-meat production to be compared with actual values. However, the use of the estimated slaughter from the previous behaviorial equations was not attempted at this stage. Table 3 reflects the actual figures for red meat production as estimated from the previous equation.

IMPORTS RELATIONS:

In this equation the current total red meat consumption index, (TMCI) (L), is included in the equation to represent demand forces. Also, urban population, (UP) (L), is introduced as an explanatory variable to express the market volume growth, because most of imported meat is distributed through government stores in urban areas as mentioned above. Current domestic production supply of red meat, RMQ (L), is specified as an explanatory variable for red meat imports supply, and the

average value per unit of the frozen meat imports in the last year, AVFMI (L-1), are used to reflect the government planning attitude with respect to imports toward expected international prices and expantion in domestic production supply. The following equation is the best fitted among several alternatives (5).

$$RMI\ (L) = -38.93 + \underset{(1.75)}{0.14\ RMQ\ (L)} + \underset{(4.24)}{2.46\ TMCI\ (L)}$$

$$\underset{(4.44)}{-17.82\ UP\ (L)} + \underset{(1.23)}{0.58\ AVFMI\ (L-1)}$$

$$R^2 = 0.740,\ F = 6.48,\ S.E. = 7.96,\ Y = 16.93,\ D.W. = 2.106$$

In spite of the high standard error, the equation fits reasonably well. Figure 4 and Table 6 present actual and estimated total red meat imports.

In general, this behavioural equation shows that the demand indicators for meat (total meat consumption index and urban population) have the most significant effect on red-meat imports increase over time. In other words, the importation decision is derived mainly from demand side, rather than from the "importation inhibiting factors," i.e., expansion in domestic production or inflation in international prices.

DEMAND RELATIONS:

For simulation purposes to test the different impacts of policy changes, particularly price changes, a demand equation for red meat is required to be specified and estimated. However, for demand estimation, time series data should be viewed with caution because of the Egyptian conditions. Therefore, pooled time

series and cross-section estimates for red meat demand were used in this study. Cross section data from the 1974-1975 family budget survey (5) was used to adjust for income demand response.

The double log model was the best alternative form for such pooling estimation. In this case both the prices and income elasticities for demand are the estimated regression coefficient. The following equation represnts the estimated demand equation for red-meat in Egypt (9).

$$(RMCC)\ (L) = 0.32 - 0.3146\ RPFBD\ (L) - 0.372\ RPPUD\ (L) - 0.299\ RPFD\ (L) + 0.96\ RCED\ (L)$$

$$R^2 = 0.73,\ S.E. = 0.063,\ D.W. = 1.529$$

The equation presents annual red meat per capita consumption, RMCC (L), as a function of retail price of fed beef deflated by consumer price index, RPFBD (L), deflated retail price of poultry, RPPUD (L), deflated retail price of fish, RPFD (L), and deflated annual per capita private consumption expenditure, PCED (L).

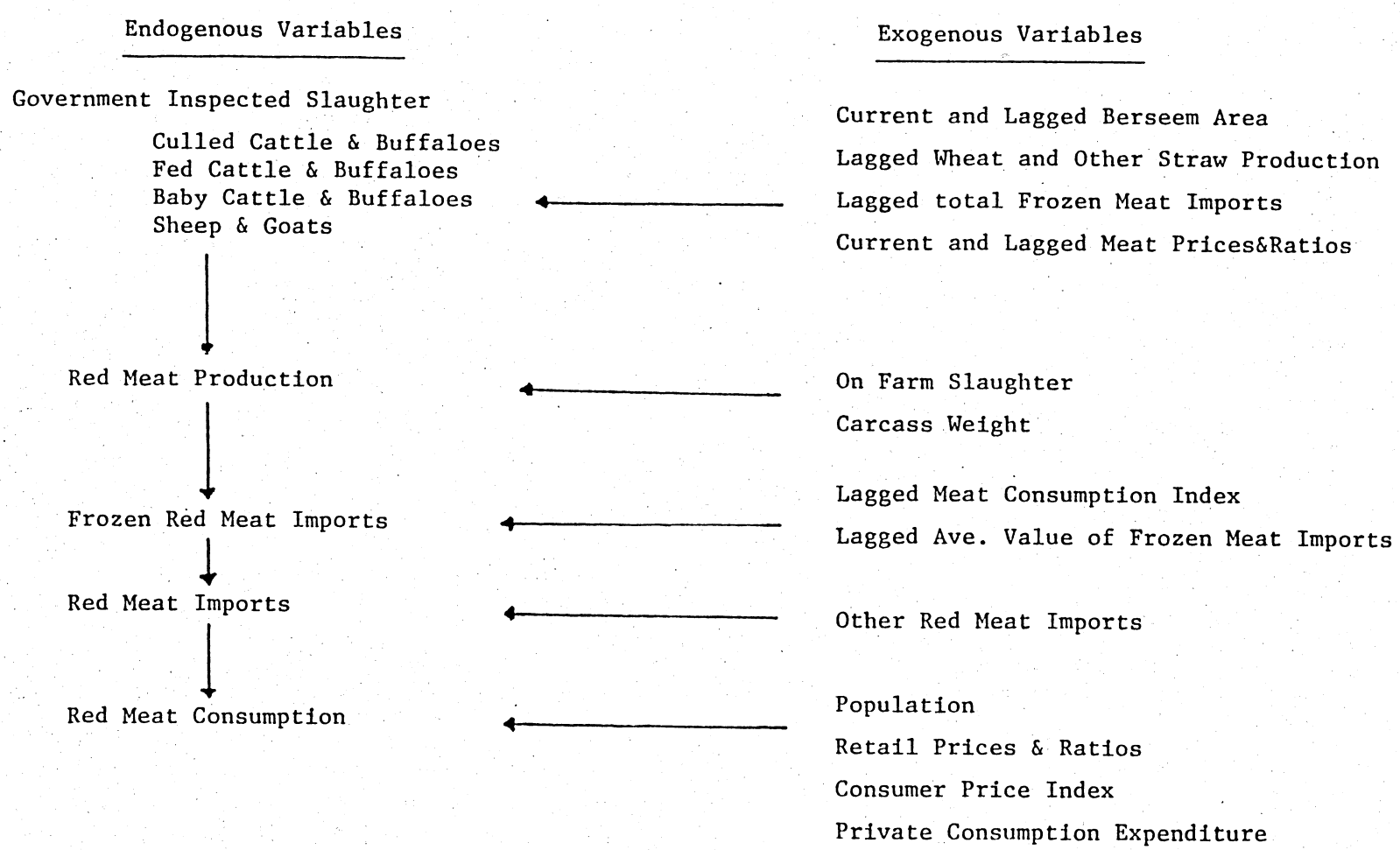
The equation fits reasonably well. The equation has economic logic. The estimated coefficients (elasticities) have a priori expected signs.

In general, the estimated aggregate red meat demand function in Egypt shows that the demand price elastisity of red meat is about 0.315, and both white meat and fish are substitutes for red meat, with cross elasticities of 0.372 and 0.299, respectively. Also, it shows that red meat is elastic with respect to income changes. The expenditure-red meat consumption elasticity is almost equal unity.

The relatively low price elasticity of red meat does not seem reasonable with such a superior good (of high income elasticity). However, away from data complexity, the estimate is an aggregate one that hints the effect of different red meat quality. Actually, the retail price used is that of the common type, i.e., fed beef, while per capita consumption used is an aggregate one, including domestic produced meat of low and high quality, in addition to imported meat of lower quality than domestically produced meat. Low quality red meat is a superior commodity for the low income class, a necessary good for the medium class, and an inferior one for the high income class (11). This evidence indicates an income distribution effect, which is not reflected in the present estimate. On the other hand, the estimated price elasticity is for a real increase in price (deflated price). Therefore, it does not reflect the other component in price increase impacts, i.e., the income effect. It reflects only price effects. That the real income elasticity is higher than the real price elasticity may show that the income effect on aggregate red meat demand in Egypt is much greater than price effect. Even, the real increase in the substitutes' real price (white meat and fish) has much higher effects than the own-price effect of red meat. However, multicollinearity could be the reason for some of these estimates. Thus, these preliminary results should also be considered with caution.

Figure 1

Preliminary Red Meat Recursive Model



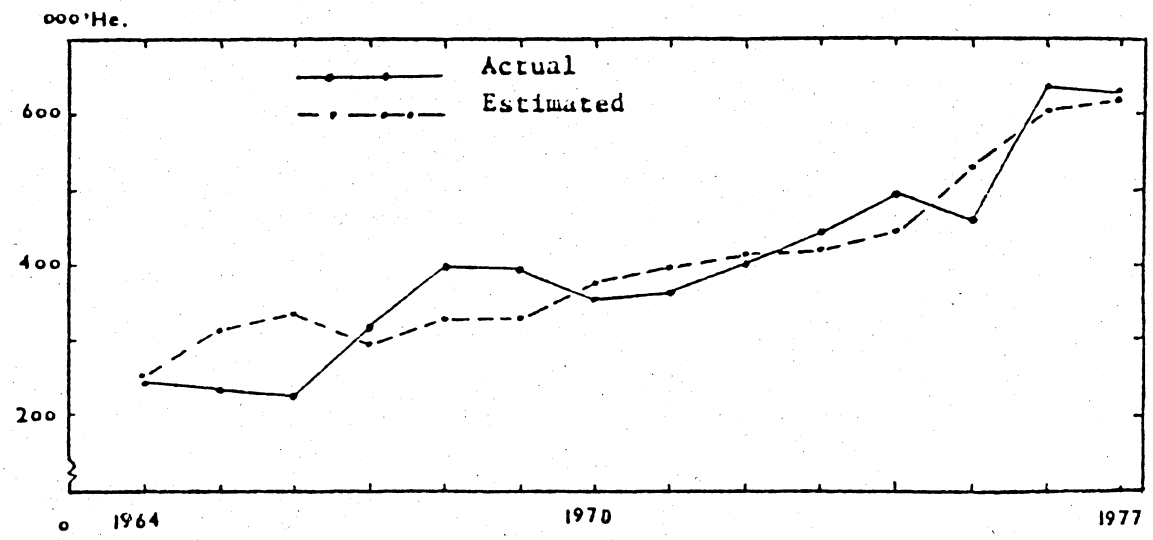


Figure 2. : Actual and Estimated Fed Cattles and Buffaloes Slaughter Numbers (1964 - 1977)

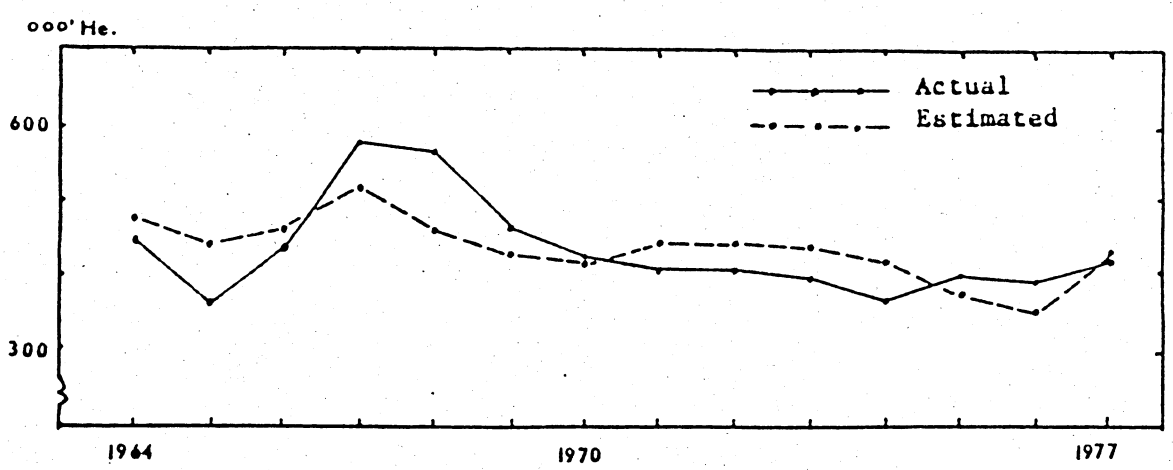


Figure 3. : Actual and Estimated Sheep and Goats Slaughter Numbers (1964-1977)

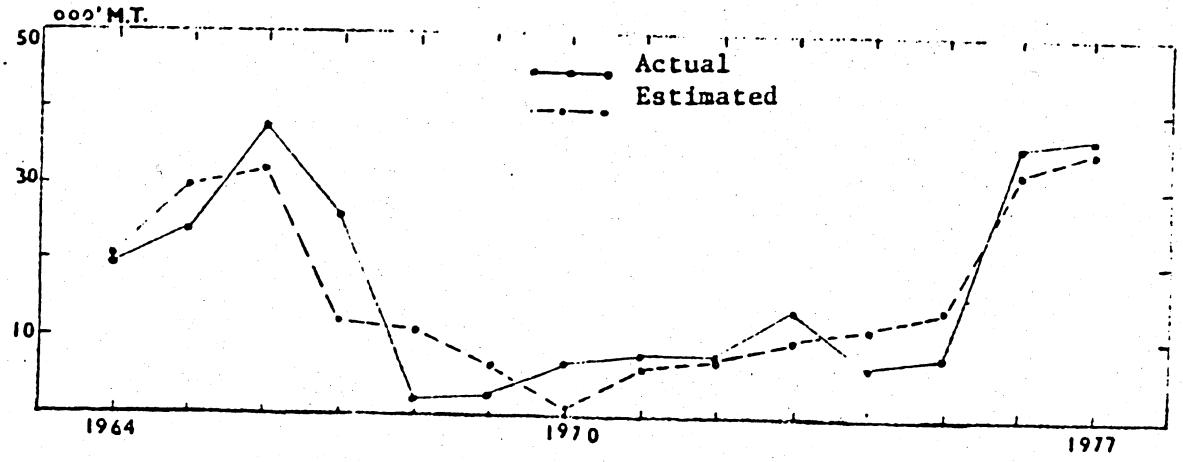


Figure 4. Actual, and Estimated Total Red Meat Imports, 1964-1977

Table 1

Government Inspected Slaughter of Domestic Animals

(000 heads)

	Culled Cattles & Buffalos (SLCBC)	Fed Cattles & Buffalos (SLCBF)	Buffalo Calves (SLCBV)	Sheeps & Goats (SLSG)
1964	107	246	203	451
1965	57	239	225	366
1966	117	275	291	442
1967	125	318	348	579
1968	140	402	265	567
1969	134	396	244	465
1970	106	356	198	425
1971	96	364	181	421
1972	95	403	177	409
1973	102	444	185	400
1974	122	497	197	369
1975	111	460	187	402
1976	100	636	259	393
1977	101	629	244	422
1978	140	623	229	461

Source: Ministry of Agriculture

Table 2

Actual, Estimated, and Percentage Error Index for Fed Cattles Slaughter, Sheep and Goat Slaughter.

(1964 - 1977)

Year	Fed Slaughter(1)			Sheep & Goat Slaughter (1)		
	SLCBF	ESLCBF	% EI	SLSG	ESLSG	% EI
1964	246.00	250.44	100.80	451.00	482.40	106.96
1965	239.00	314.84	131.73	366.00	445.51	121.72
1966	275.00	335.31	121.93	442.00	462.42	104.61
1967	318.00	295.07	92.78	579.00	517.01	89.29
1968	402.00	328.47	81.70	567.00	459.77	81.08
1969	396.00	328.54	82.96	465.00	428.69	92.19
1970	356.00	375.33	105.42	425.00	421.15	99.09
1971	364.00	399.13	109.65	409.00	445.45	108.91
1972	403.00	410.74	101.92	409.00	445.45	108.91
1973	444.00	421.24	94.87	400.00	441.28	110.32
1974	497.00	446.03	89.74	369.00	420.93	114.07
1975	460.00	531.29	115.49	402.00	375.65	93.44
1976	636.00	604.98	95.12	393.00	353.89	90.04
1977	629.00	623.57	99.13	422.00	425.71	100.87

(1) 000 heads

Table 3

Total Red Meat Production
(1964 - 1977)

(000 M.T.)

Year	Utility beef	Fed beef	Veal	Mutton & Goat meat	RMQ
1964	48.2	86.1	27.1	20.3	181.7
1965	25.7	83.7	30.0	16.5	155.9
1966	52.7	96.3	38.8	19.9	207.7
1967	56.3	111.3	46.4	26.1	240.1
1968	63.0	140.7	35.3	25.5	264.5
1969	60.3	138.6	32.5	20.9	252.3
1970	47.7	124.6	26.4	19.1	217.8
1971	43.2	127.4	24.1	18.9	213.6
1972	42.8	141.1	23.6	18.4	225.9
1973	45.9	155.4	24.7	18.0	244.0
1974	54.9	173.9	26.3	16.6	271.7
1975	49.9	161.0	24.9	18.1	253.9
1976	45.0	222.6	34.5	17.7	319.8
1977	45.5	220.2	32.5	19.0	317.2
1978	63.0	218.1	30.5	20.7	332.3
1979	76.1	243.9	29.9	20.5	370.4

Table 4

Retail Prices of Meat in Egypt

(P.S./kg)

	Utility beef (RPCB)	Fed beef (RPFB)	Buffalo veal (RPVM)	Mutton & goat-meat (RPSG)
1964	18.1	22.1	27.4	57.9
1965	41.6	50.4	58.3	60.6
1966	45.3	54.9	53.72	62.6
1967	38.3	45.3	53.7	47.3
1968	36.3	46.5	50.7	61.3
1969	41.9	51.9	56.3	56.9
1970	50.9	64.1	68.5	67.2
1971	54.2	70.1	74.8	72.0
1972	60.9	76.0	81.6	78.0
1973	62.8	80.2	86.2	83.0
1974	68.5	87.2	94.6	91.3
1975	83.1	108.0	118.5	113.3
1976	106.4	134.7	146.4	138.3
1977	121.0	150.2	165.7	153.3
1978	122.1	152.4	168.7	157.3

Source: Central Agency for Public Mobilization and Statistics

Table 5

Available Concentrates for Livestock Feeding

(000 M.T.)

	Straws[1] (STRCL)	Corn (CCL)	Sorgum	Cotton seed cake	Bran
1964	3177	57	37	654	238
1965	2653	58	41	566	239
1966	2958	62	43	733	192
1967	2666	60	44	503	179
1968	3020	58	45	491	87
1969	2771	57	39	490	121
1970	3007	57	42	541	202
1971	2862	56	41	599	176
1972	3170	58	39	581	161
1973	2733	58	39	609	159
1974	2930	68	41	536	86
1975	3345	72	41	472	205
1976	3719	76	37	356	264
1977	3310	85	36	438	240
1978	3522	81	31	431	266

(1) Wheat and other straws

Source: Ministry of Agriculture

Table 6.

Actual Estimated, and Percentage Error Index for Red Meat Imports
1964 - 1977

	Red.Meat		
	RMI	ERMI	%EI
1964	19.41	20.2	104.07
1965	23.69	29.82	125.87
1966	37.63	32.17	85.49
1967	26.40	12.53	47.46
1968	1.78	11.91	669.10
1969	2.61	6.72	257.47
1970	6.78	1.19	17.32
1971	8.09	5.97	73.79
1972	8.33	7.99	95.92
1973	13.79	10.04	72.81
1974	6.83	11.71	171.45
1975	8.53	13.65	160.02
1976	35.92	32.33	90.01
1977	37.20	35.59	95.67

Table 7. Variables Description

Variable Code Name	Unit of Measure	Description
AVFMI	L.E./M.T.	Average imports value for meat
BRA	000 hec.	Berseem Area
CCL	000 M.T.	Corn for livestock feeding
CI	000 M.T.	Corn imports
CPI	----	Consumer price index
PCED	L.E.	Private consumption expend. deflated
RMCC	kg	Red meat per capita consumption
RMI	000 M.T.	Red meat imports
RMQ	000 M.T.	Red meat production
RPCB	P.S. 1 kg	Retail price of culled beef
RPFB	P.S. 1 kg	Retail price of fed beef
RPFD	P.S. 1 kg	Retail price of fish deflated
RPPUD	P.S. 1 kg	Retail price of poultry meat deflated
RPSG	P.S. 1 kg	Retail price for mutton and goat meat
RPVM	P.S. 1 kg	Retail price for veal
SLBV	000 head	Baby cattle and buffalo slaughter
SLCBC	000 head	Culled animals slaughter
SLCBF	000 head	Fed cattle and buffalo slaughter
SLSG	000 head	Sheep and goat slaughter
STRCL	000 M.T.	Straws for livestock feeding
SUFOD	000 hec.	Area for summer fodder
T	----	Time trend variable
TFMI	000 M.T.	Total frozen meat imports
TMCI	----	Total meat consumption index
UP	mill. head	Urban population

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