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# MEAT AND FISH DEMAND IN TUNISIA : ECONOMIC AND SOCIO-DEMOGRAPHIC FACTORS EFFECTS

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# Meat and Fish Demand in Tunisia: Economic and Socio-demographic Factors Effects



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## 1. INTRODUCTION AND RESEARCH QUESTIONS

Since 1990's, food demand has had significant changes related particularly to urbanization process; new lifestyles; industrialization of food sectors; woman work; the emergence of modern retail and increasing health and nutrition concerns.

- The structure of the consumption of meat and fish has undergone a significant evolution over the past two decades. Between 1990 and 2005, consumption of poultry and fish grew remarkably respectively by 80% and 32%. Sheep meat consumption increased by 24% and beef has decreased by 21% over the same period. Concerning the expenditures, they have more than doubled for mutton (102%) and poultry (143%) and especially fish (206%).

-The remarkable increase in fish expenditure reflects the new consumption patterns of the Tunisian consumer.

### Why assessing the households economic and socio demographic factors on Tunisian meat and fish consumption?

-First, food habits are changing rapidly with the new sociodemographic characteristics of the Tunisian population. Age, income level and education level are thus important factors in purchasing decisions in a country where 55% of the population has an age lower than 30 years in 2005 and whose education and income is improving day by day.

-Second, most of the studies carried out in Tunisia aimed to find future projections for demand, for planning objectives, considering only two variables: population and income. This study seeks to improve knowledge and understanding of meat and fish expenditure patterns in Tunisia, taking into account differences in demand behavior across regions as well as across income groups.

-Last, Tunisian decision makers are concerned by food and nutrition and are interested in studying the structure of meat and fish consumption and the means to predict and adjust its future evolution.

The objectives of this research are threefold:

- to analyze the structure of meat and fish demand and to identify the principal characteristics of Tunisian meat and fish consumption trend.
- to estimate the demand parameters using a complete demand system.
- to compare and choose among different functional forms.

## 2. MODELING FRAMEWORK

### Theoretical Model

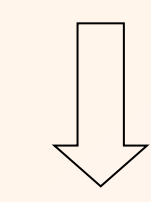
Maximise utility function, subject to a budget constraint

$$\text{Max. } u(q) = u(q_1, q_2, \dots, q_n)$$

$$\text{S.a. } \sum_{i=1}^n p_i q_i = m \quad \text{Where } u \text{ is utility; } q_i, p_i, \text{ are quantity and price for food } i \text{ respectively; and } m \text{ is the total expenditure or income.}$$

Demand equation  $q_i = f(m, p_1, \dots, p_n)$

$$d \ln q_i = \eta_i d \ln m + \sum_{j=1}^n \mu_{ij} d \ln p_j \quad \text{Where } \eta_i \text{ is the income elasticity of demand for good } i, \text{ and } \mu_{ij} \text{ is the uncompensated, own-price elasticity, while the } \mu_{ij} (i \neq j) \text{ are the cross-price elasticities.}$$



Rotterdam System - ROT

$$w_i d \ln q_i = b d \ln Q + \sum_{j=1}^n s_{ij} d \ln p_j$$

Almost Ideal Demand System - AIDS

$$w_i (d \ln q_i - d \ln Q) = \gamma_i + c d \ln Q + \sum_{j=1}^n s_{ij} d \ln p_j$$

CBS System

$$w_i (d \ln q_i - d \ln Q) = \gamma_i + c d \ln Q + \sum_{j=1}^n s_{ij} d \ln p_j$$

NBR System

$$d w_i + w_i d \ln Q = \gamma_i + b d \ln Q + \sum_{j=1}^n r_{ij} d \ln p_j$$

### SYNTHETIC MODEL

$$w_i d \ln q_i = (\delta_i w_i + d_i) d \ln Q + \sum_{j=1}^n (e_{ij} - \delta_i w_j (\delta_i - w_j)) d \ln p_j$$

Where:  $d_i = \delta_i b + (1 - \delta_i) e_i$ ,  $e_i = \delta_i \delta_i + (1 - \delta_i) s_i$ ,  $\delta_i$  and  $\delta_2$  are additional parameters.

$$\text{Adding-up} : \sum_{i=1}^n d_i = 0, \quad \sum_{i=1}^n e_i = 0$$

$$\text{Homogeneity} : \sum_{i=1}^n e_i = 0$$

$$\text{Symmetry} : e_{ij} = e_{ji}$$

Tests results for the competing demand models and the synthetic system: likelihood ratio test statistics and Goodness of fit

Demand Systems	Maximised Log Likelihood	Likelihood Ratio Test: named demand system v. the 'synthetic' system. <sup>a</sup>	Goodness of Fit R <sup>2</sup>
Synthetic System <sup>b</sup>	800.82	-	0.298
ROT	703.76	194.12	0.247
<b>CBS</b>	799.80	<b>2.04</b>	0.289
AIDS	782.75	36.15	0.298
NBR	686.05	229.54	0.237

Notes: <sup>a</sup>. With two degrees of freedom, the critical value at the 5 percent significance level is 5.99. The 1 percent critical value is 9.21.

<sup>b</sup>. The estimates for  $\delta_1$  and  $\delta_2$  in (23) are 1.06 and 0.16 with standard errors 0.0686 and 0.136, respectively.

The expenditure elasticity of each commodity group ( $\eta_i$ ), the uncompensated price elasticities ( $E_{ij}$ ) and the compensated price elasticities ( $e_{ij}$ ) for the CBS model are:

$$\text{Total expenditure: } \eta_i = \frac{c_i}{w_i} + 1$$

$$\text{Uncompensated price elasticities: } E_{ij} = \frac{s_{ij}}{w_i} - \eta_i w_j$$

$$\text{Compensated price elasticities: } e_{ij} = \frac{s_{ij}}{w_i}$$

### Data

	%	
Age (years)	<30	5.16
	30-40	23.21
	40-50	42.06
	50-60	22.62
	>60	6.95
Education Level	Illiterate	3.77
	Coranic school	4.56
	Primary school	15.87
	Secondary school	41.67
	Higher school	34.13
Income (per month)	< 143 \$	3.17
	143-286 \$	19.25
	286-429 \$	24.8
	429-714 \$	24.8
	714-1072 \$	15.87
	> 1072 \$	12.1

Source: Authors' elaboration from survey data (2008).

This study is based on data from a survey conducted during the year 2008 among a sample of 504 persons (head of household) distributed equally among all governorates in Tunisia.

## 3. RESULTS AND DISCUSSION

### Own price and expenditure elasticities

Beef and mutton are luxury goods while poultry and fish are necessary products

### Cross price elasticities

- Mutton substitutes any type of meat. Beef substitutes mutton, chicken and fish.
- Chicken substitutes beef and mutton. Fish substitutes also mutton and chicken.
- Turkey does not substitute any type of meat because it was recently introduced into the culinary practices of the Tunisian consumer.
- Beef and Mutton are net substitutes because they are considered for a long time as essential in the traditional kitchen.

### Own price and expenditure elasticities by the education level of the head of the household

Beef and mutton are considered as "luxury products" except for beef for consumers with a high level of education.

Poultry and fish are considered as "necessary products" except turkey bought by illiterate consumers or those having coranic or primary education.

Products	Illiterate, coranic and primary studies		Secondary studies		higher studies	
	Expenditures	Prices	Expenditures	Prices	Expenditures	Prices
Beef	1,09**	-0,84**	1,01**	-0,39	0,98**	-0,85**
Mutton	1,33**	-0,85**	1,38**	-0,91**	1,38**	-0,97**
Chicken	0,76**	-0,18*	0,78**	-0,55**	<b>0,68**</b>	-0,44**
Turkey	1,10**	-0,23	0,18	-0,07	<b>0,51*</b>	-0,0083
Fish	0,65**	-0,12*	0,61**	-0,17**	<b>0,52**</b>	-0,11**

Notes : \*\* significance at 5% level. \* significance at 10% level.

Consumers with a high level of education are more concerned by health than those with a low level of education. This result explains the high quantity of fish purchased and poultry with a low level of greases.

The less expenditure elasticities of chicken, turkey and especially fish for consumers highly educated confirm this reality.

### Own price and expenditure elasticities by age

Beef and mutton are luxury goods except beef for young consumers (age lower than 40 years)

Poultry and fish are necessary goods for all types of consumers.

Products	AGE1 < 40 years		AGE2 Between 40 and 50 years		AGE3 > 50 years	
	Expenditures	Prices	Expenditures	Prices	Expenditures	Prices
Beef	0,96**	-0,07	1,04**	<b>-1,27**</b>	1,11**	-0,53*
Mutton	1,29**	-0,64**	1,35**	<b>-1,12**</b>	1,45**	-0,80**
Chicken	0,86**	-0,58**	0,73**	-0,57**	0,65**	-0,04
Turkey	0,51**	-0,28	0,39	-0,32	0,30	-0,28
Fish	0,69**	-0,19**	0,60**	-0,34**	<b>0,45**</b>	-0,05**

Notes : \*\* significance at 5% level. \* significance at 10% level.

The demand for beef and mutton is elastic to any change in its price for the category of age between 40 and 50 years.

For the other persons, this demand is relatively elastic. This variability in demand elasticity confirms the effect of age in beef and mutton consumption. The demand for fish is inelastic for people aged more than 50 years. This confirms that fish consumption is not dependent on its price but on health aspects.

### Own price and expenditure elasticities by level of income

Beef and mutton are luxury goods except beef for consumers with a monthly income between 286 and 714 \$

Poultry and fish are necessary goods

Products	RVN1		RVN2		RVN3	
	Expenditures	Prices	Expenditures	Prices	Expenditures	Prices
Beef	1,23**	-0,76**	0,91**	-0,38	1,15**	<b>-1,31**</b>
Mutton	1,21**	-0,61**	1,48**	-1,17**	<b>1,31**</b>	-0,85**
Chicken	0,81**	<b>-0,29*</b>	0,78**	<b>-0,40**</b>	0,52**	<b>-0,52**</b>
Turkey	0,67*	1,48*	0,15	-0,42**	0,31	-0,16
Fish	0,71**	-0,13**	0,45**	-0,00	0,71**	0,09**

Notes : \*\* significance at 5% level. \* significance at 10% level.

RVN1: Monthly income <286 \$, RVN2: Monthly income between 286 and 714 \$, RVN3: Monthly income > 714 \$.

The demand for beef and mutton for the consumers with an income higher than 714 \$ and the demand for mutton meat for the consumers with an income between 286 and 714 \$ are elastic to any changes of the price. Demand elasticity for chicken meat increases with the income.

## 4. CONCLUSION AND POLICY IMPLICATIONS

Empirical Results from this research:

- Stimulate the necessity for decision makers to set up adequate pricing and marketing policies in the future. The specification of a segmentation among households provided not only a complete panorama of meat and fish consumption in Tunisia but also provides useful information on economic and socio demographic factors affecting the demand of these particular foods.
- Suggests the assessment of other factors such as diet quality and information about diet-health regarding their influence on the demand of meat and fish products.
- Encourage further analysis on the estimation and comparison of multi-equation systems using panel data. This is a field where the subject of theoretical research, especially in regard to the development of specification tests in multivariate version is lacking.