FACTORS AFFECTING MEAT AND MEAT PRODUCTS CONSUMPTION QUANTITIES IN SANLIURFA PROVINCE

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Abstract

In this paper, a two-stage decision choice modeling was used to estimate red and white meat consumption demand patterns in Sanliurfa city. The conducted tests reveal that a two-stage Cragg model is deemed appropriate than a single Tobit model which assumes the decision to purchase meat to be the same as the decision for the quantity consumed. Most of household demographic variables play important role in determining meat consumption pattern as economic factors play. The demand for red meat is elastic with respect to total food expenditure, the age of household head and household size, while the demand for white meat was not elastic with any of variables used in the model.

Keywords: Tobit, Cragg, red and white meats, demand analysis

Şanlıurfa İlinde Et ve Et Ürünleri Tüketimini Etkileyen Faktörlerin Standart Devamlı Talep Modellerine Göre Belirlenmesi Üzerine Bir Araştırma

Özet

Bu çalışmada, standart devamlı talep modelleri kullanılarak, Şanlıurfa ilinde hanelerin kırmızı ve beyaz et tüketim desenine etki eden faktörler analiz edilmiştir. Yapılan testler sonucunda, iki basamaklı Cragg devamlı talep modelinin, tek basamaklı Tobit devamlı talep modeline üstün olduğu görülmüştür. Bilindiği gibi, tek basamaklı Tobit devamlı talep modeli, malı satın alma kararı ile satın alınan mal miktarına etki eden faktörlerin aynı olduğunu varsaymaktadır. Hanelerin ekonomik faktörlerinin yanında sosyo-demografik faktörlerinin çoğunun da, et tüketimini önemli derecede etkilediği görülmüştür. Kırmızı et talebi; toplam gıda harcamalarına, hanehalkı reisine ve hanehalkı sayısına karşı elastik iken, beyaz et talebi modelde kullanılan hiç bir değişkene karşı elastik bulunmamıştır.

Anahtar Kelimeler: Tobit, Cragg, Kırmızı ve Beyaz Etler, Talep Analizleri.

1. Introduction

In the past few decades, consumers' perceptions about meat quantity demanded were observed to be changed in the United States and many countries in Europe due to meat-health issues. These issues are growth hormone abuse, mad caw disease, and saturated fat. Factors other than price and income of consumers are increasingly becoming important in explaining changes in meat demand (Newman, Henchion, and Matthews, 2001).

Southern Anatolian Region (SAR) of Turkey has received immigrants at a high rate from all rural and other surrounding urban cities since 1996. This brings a new mix lifestyle in the region and therefore a food consumption pattern differs substantially. These differences might be due to cultural and educational attainments, differences in food providing vendors, income, and lifestyle habit and age structure. We expect that these differences become insignificant or perhaps disappeared over years as people live together creating a homogenous lifestyle in the region. Moreover, some cities, for instance Sanliurfa, have its unique food consumption pattern, specially attributed to red and white meat consumption. No one has so far identified factors responsible for food demand patterns in the region.

This study is aimed to identify determinants responsible for red and white meat demand consumption patterns using censored regression analysis. In addition, the current study presents elasticities for price,

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income and social-demographic characteristics of households. These elasticities serve for possible policy implication for policy makers to assess the impact of urbanization and changing income and individual socio demographic profiles for future consumption pattern.

The censored regression analysis for cross sectional data is deemed appropriate when zero consumption of meat is present. The zero consumptions in micro economic analysis of household survey are common due in large part to either persistent corner solution in which income and prices are such that no affordable quantity are purchased or some other sociological constraints, such as being vegetarian or to a lesser extent measurement error: people do not want to reveal their red and white consumption patterns. The later issue is perhaps even people consume positive amount of meat but the consumption is really insignificant (e.g., small amount) and thus people are shamed to reveal that true value and report zero amount.

The paper is organized as fallows. The following section deals with methods and describing data are presented subsequently. Section 4 shows results and conclusions with implications are drawn in the final section.

2. Materials and Methods

2.1 Data

Primary data were collected during late 2003 through a survey of household food consumption behavior. Because Sanliurfa Province gets immigrants from all over of the Southern Anatolian Region it has been chosen as a representative sample for the region. Questionnaires were thus distributed to 300 households across the Sanliurfa Province yielding 199 completed questionnaires. Questionnaires were delivered in person by enumerators to households and collected one weak later. Questions in the survey elicited monthly consumption of red and white meat products and socio-economic characteristics of respondents. Complete set of all variables are given in Table 1.

2.2. Model

The zero consumption in micro economic meat demand analysis of households calls for censored regression models. Tobit model is well known in this area in which zero consumption is result of strict corner solutions: economic barriers are such that make it impossible to purchase the positive amount of meat (Deaton and Irish, 1984; Yen and Roe, 1989; Heien and Wessells, 1990; Gould, 1992; Gould, 1996; Yen and Jones, 1997; Dong, Shonkwiller, and Capps, 1998; Yen, 1999; Su and Yen, 2000).

The assumption under the Tobit model is that the zero expenditure is result of a true corner solution. The Tobit model lacks information about households' consumption patterns in terms of the probability of consuming a good and its level of quantity demanded. In other words, the model assumes that the decision to consume a good is the same as the decision about the level of quantity demanded. Thus the variables and parameter estimates that determine the probability of observing a positive consumption of a good also determine the quantity of the good demanded in the same fashion (Yen and Su, 1995). In addition, some available information may not be used when the Tobit model is present. For example, some important information persistent to only those who actually consume a positive amount of good and information might not be observed for those households who do not engage in the meat market. Meat cooking styles are attributed to those households who participate in the market and report positive consumption of the good. To overcome such problems, the double-hurdle censored regression analysis is formulated by Cragg (1971) and extensively used in many economic applications (Haines, Guilkey, and Popkin, 1988; Blisard and Blaylock, 1993; and Yen and Su, 1995).

The double-hurdle model calls for the probability decision to consume the product

Table1. Descriptive Statistics

Variables	Definition	Name	Unit	Mean	S.Dev.
Red Meat	Average red meat consumption per household per month	QRMEAT	Kg	5.86	4.24
White meat	Average white meat consumption per household per month	QWMEAT	Kg	6.09	21.55
Total Food Expenditure	Average food expenditure per household per month	FEXPEND	YTL	282.44	130.85
Total Meat Expenditure	Average meat expenditure per household per month	MEXPEND	YTL	78.16	56.48
Red meat price	Average red meat market price per household per month	NPBEEF	YTL	10.43	6.67
White meat price	Average white meat market price per household per month	NPWMEAT	YTL	3.93	1.18
Red meat consum. ratio	Percentage of red meat consumed per household	DUMMY1	%	.92	..26
Red meat consum. ratio	Percentage of red meat consumed per household	DUMMY2	%	.94	.22
Age of household head	If the household head is male	AGE	Year	36.53	12.67
Education	Years in education	EDUCN	Years	10.94	4.29
Income1	Average monthly income per household if is 1-250 YTL	INCOME1	0/1	.05	.20
Income2	Average monthly income per household if is 251-500 YTL	INCOME2	0/1	.21	.41
Income3	Average monthly income per household if is 501-750 YTL	INCOME3	0/1	.12	.32
Income4	Average monthly income per household if is 751-1000 YTL	INCOME4	0/1	.24	.43
Income5	Average monthly income per household if is 1-1500 YTL	INCOME5	0/1	.22	.41
Income6	Average monthly income per household if is above 1500 YTL	INCOME6	0/1	.16	.37
Household size	Total number of persons in household	HSIZE	#	4.43	1.85
Number of Kids	Total number of kids under 20 years	NKIDS	#	2.43	1.88
Working	If an additional working person other than household head is present	WORKING	0/1	.15	.36
Personnel	If the household head's job is in government	PERSONEL	0/1	.33	.47
Meat purchase place1	If the person purchases meats from supermarket	MAREKT	0/1	.34	.48
Meat purchase place2	If the person purchases red meats from butchery shop	BUTCHER	0/1	.64	.48
Meat with bones	If the person prefers red meat with bones	QBONES	0/1	.07	.26
Meat quality 2	If the person prefers red fatty meat	QFAT	0/1	.05	.08
Advertisement	If the person is affected by any media advertisement on meat product	ADVERT	0/1	..34	.47

Note: To be consistent with present new Turkish Liras we omit six zeros from prices of goods and expenditures. Therefore, the impact of prices and total food expenditures and total meat expenditures on the quantity consumed of each meat product in the subsequent Tables is measured in terms of New Turkish Liras (YTL).

and determines the amount of quantity consumed. When the first hurdle is crossed, people reveal the positive records on the quantity demanded of the product. The first hurdle determines the factors responsible for the probability to participate in the meat market using a binary decision model (e.g., either logit or probit) using all observations. Once the first hurdle is crossed, the second hurdle analyzes the determinants responsible for the quantity consumed of the product using a truncated regression model for only households reporting positive values for quantity consumed of the particular product.

Let d_{ij} be the switching dummy indicator for the meat market participation and d_{ij}^{*} be its corresponding latent variable for i^{th} household in the j[th] meat market. Also let y_{ij} be the meat quantity demanded for the i^{th} household in the j[th] meat market and y_{ij}^{*} be the corresponding latent variable for y_{ij} [2]. The model is then:

$$
\begin{aligned}
d_{ij}^{*} &= Z_{ij}\alpha_j + u_{ij} \\
w_{ij}^{*} &= X_{ij}\beta_j + v_{ij} \\
\ln\left(y_{ij}^{*}\right) &= w_{ij} \qquad if\ y_{ij}^{*} > 0\ and\ d_{ij}^{*} > 0 \\
&= -\infty \qquad if\ d_{ij}^{*} \le 0
\end{aligned}
\tag{1}
$$

where $\mathbf{Z}_{ij}$ and $\mathbf{X}_{ij}$ are a vector of exogenous variables responsible for the decision to participate in meat market and level of quantity consumed, respectively, $\boldsymbol{\alpha}_j$ and $\boldsymbol{\beta}_j$ are conformable parameter vectors, and u_{ij} and v_{ij} are independent random errors with distribution $N(0,1)$ and $N\left(0,\sigma_j^2\right)$, respectively.

[2] We use the log transformation for positive observation of y_{ij} to avoid negative latent quantity of demanded for each meat product. Thus y_{ij} is the natural log of the observed quantity demanded by i^{th} respondent for j[th] meat type.

The corresponding likelihood function for double-hurdle model for each meat product is:

$$\log L=\sum_i\left[\left(1-d_{ij}\right)\log\left(1-\Phi\left(Z_{ij}\alpha_j\right)\right)+d_{ij}\log\Phi\left(Z_{ij}\alpha_j\right)\right]$$
$$+\sum_i d_{ij}\left[-\log\sigma_j+\log\phi\left(\frac{\ln(y_{ij})-X_{ij}\beta_j}{\sigma_j}\right)-\log\Phi\left(\frac{X_{ij}\beta_j}{\sigma_j}\right)\right] \quad (2)$$

where d_{ij} is an indicator and takes value 1 when y_{ij}^* is positive, 0 otherwise, ϕ and Φ are the standard normal density function and the cumulative normal distribution function, respectively. The probit model stands for the estimation for the first summation part and truncated regression model is used for the estimation of the second summation.

The double-hurdle model reduces to the Tobit model when $\mathbf{Z}_{ij} = \mathbf{X}_{ij}$ and $\boldsymbol{\alpha}_j = \boldsymbol{\beta}_j$. However, there is no economic guidelines what variables should be used in each hurdle (Su and Yen, 2000). In addition, some variables as noted above might be directly assigned to the second hurdle. We, therefore, choose a different set of determinants responsible for the probability decision participation and the level of quantity consumed of the particular product. To test whether the splitting model into two decisions is appropriate or not, we use Vuong's standardized normal test[3]. The Vuong test is used when the Tobit model is not nested within Cragg's double-hurdle model due to different sets of variables used in each decision. In addition, since the presence of heteroscedasticity (unequal variances) is common in cross sectional micro economic studies, we use a multiplicative form for the variance, σ_{ij}, as $\sigma_{ij}=\sigma\exp\left(W_{ij}'\gamma_j\right)$, where $\mathbf{W}_{ij}$ are sets of exogenous determinants suspected to cause unequal variances, and γ_j are parameter sets to be estimated[4].

3. Results and Discussion

Before proceeding on the discussion of parameter estimates, we conducted Vuong standardized normal test for each meat product. The tests significantly reject the single hurdle process (e.g., Tobit model) in favor of the alternative model which indicates that the effect of the probability decision is significantly different from the effect of the level of quantity demanded.

We will, therefore, discuss the parameter estimates from the double-hurdle model only. Parameter estimates obtained from double-hurdle models are presented in Table 2.

3.1. Red Meat Market Participation Decision

Total food expenditure has a significant effect at the 5% level on the probability to purchase red meat. The probability decision increases as the respondent advances in age but the effect of age on the probability is insignificant. Presence of an additional person would significantly decrease the probability decision to participate in the red meat market. Working in government places by the household head would increase the red meat consumption probability but its effect is insignificant. A higher educational attainment will diminish the red meat consumption probability. This is an expected result because a higher human capital endowment provides more information to a consumer about the red meat to be a source of cholesterol and some other chronic diseases. People on a special cholesterol diet would probably avoid the participation in red market and substitute red meat for white

[3] The Vuong standardized normal test is V=Sqrt(N)*(Xbr(M)/Sdv(M)), where N is total number of observations, Xbr and Sdv are mean and standard deviation of M respectively. M is the difference between the individual log-likelihood (Log-L) values for models compared. For example let the first Log-L values be for the double-hurdle Cragg model (Loglikelihood from probit+loglikelihood from truncated regression) and the second Log-L values be for Tobit model. The critical value greater than +1.96 suggests the choice of the hurdle model, while less than -1.96 suggests the Tobit model is preferred and the value in-between -1.96 and +1.96 suggests that two models are equally likely (Greene, 2002; 2003).

[4] Likelihood Ratio test (LR) is applied whether all $\gamma_j = 0$ under the null hypothesis. The LR test will signify the presence of heteroscedasticity.

meat.

Larger households are more likely and significantly to participate in the red meat market than smaller size households. Interestingly, households having many kids are more likely to consume red meat than households having fewer kids.

This is to some extent that kids presumably prefer fast food and cereal type meal than red meat meal because fixing a red meat meal may take a few hours. Wealthier families are more likely to participate in red meat market than poor families.

Table 2. Parameter Estimates of Double-hurdle Censored Models for Meat Consumption

Variables	Red Meat			White Meat		
	Probit	Truncation		Probit	Truncation	
	Parameters	Parameters	Heteroscedasticity	Parameters	Parameters	Heteroscedasticity
Constant	.931	.029		1.692 [b]	1.137 [a]	
	(.937)	(.037)		(1.704)	(3.841)	
FEXPEND	.005 [a]	.006 [a]		.004 [a]	.001 [a]	
	(2.943)	(6.362)		(2.205)	(2.426)	
MEXPEND			.021 [a]			-.0002
			(9.623)			(.079)
AGE	.011	.031 [a]	.011	-.017	-.001	-.001
	(.713)	(2.335)	(1.291)	(-1.109)	(-.173)	(.239)
WORKING	-.986 [a]	-.223		-.009	-020	
	(-2.139)	(-.524)		(-.019)	(-.151)	
PERSONEL	.044	-.062		.650	.032	
	(.105)	(-.182)		(1.243)	(.321)	
EDUCN	-.114 [b]	-.050 [b]	.039	-.013	.019	-.006
	(-1.790)	(-1.716)	(1.613)	(-.264)	(1.476)	(-.290)
HSIZE	.167	.247 [a]	-.064	-.124	.076 [b]	-.024
	(1.173)	(2.488)	(-.532)	(-.789)	(1.819)	(-.360)
NKIDS	-.183	-.233 [a]	.001	.082	.018	.067
	(-1.176)	(-1.948)	(.005)	(.505)	(.436)	(.977)
INCOME5	.561	1.268 [a]	-.452 [a]		-.345 [a]	.086
	(1.195)	(4.186)	(-1.964)		(-2.764)	(.409)
INCOME6	.547	.332	-.292	-.131	-.052	-.178
	(.925)	(.843)	(-.942)	(-.243)	(.463)	(-.787)
NPBEEF		-.020	-.257 [a]		.005	-.148 [a]
		(-.936)	(-5.727)		(.389)	(-4.493)
NPWMEAT		.201 [a]	-.212 [a]		-.110 [a]	-.036
		(2.459)	(-2.669)		(3.270)	(-.473)
LAHMACUN		.117				
		(.525)				
QFAT		1.566 [a]				
		(2.143)				
QBONES		-.057				
		(-.002)				
MARKET					-.221	
					(-2.292)	
BUTCHER		.507 [b]	-.143			
		(1.896)	(-.782)			
ADVERT		-.693 [a]	-.120		.236	.339 [b]
		(-2.730)	(-.638)		(2.366)	(1.877)
SIGMA	-39.592	8.909			2.492	
		(1.198)			(2.178)	
L-LOG		-350.830			-117.606	

Note: Values in parentheses are t- statistic values. We chose all individual and household characteristics to present the probability decision; while individual, household and quantity-related characteristics were chosen to estimating the demand for each product. We chose two meat prices, meat expenditure, and some individual characteristic to capture the variations in variances. The LR test rejects the restricted model of equal variances in favor of the alternative multiplicative variance form for each meat product. The significances on variables for heteroscedasticity justify the use of the form as well.

[a] significant at the 5% level, [b] significant at the 10% level

3.2. Red Meat Quantity Demanded

As the price of a red meat increases, its quantity of demanded significantly decreased, as expected, holding all other factors constant, *ceteris paribus*. The price of white meat has a significant impact on the quantity demanded of the red meat, indicating that as the price of the white meat increases, people tend to substitute white meat for red meat. On the other hand, as the price of the white meat goes down, its quantity consumption increases and people tend to consume less red meat holding all other factors constant, *ceteris paribus*. A steeper reduction in the white meat price gives both substitution and income effects to a consumer tending to consume more of white meat relative to where he/she stands before. Holding the red meat price constant, the substitution effect stands for when people compare the new white meat price, which is quite bit lower than original price, with a higher red meat price and cuts the quantity demanded of the red meat with substituting more of the quantity demanded of white meat. The income effect gives a purchasing power due to a steeper reduction in white meat price.

Food expenditure has a significantly positive effect on the quantity consumed of the red meat product indicating that as the food expenditures increase, the proportion of the quantity demanded of the red meat product increases. This is a plausible result indicating the direction of the Engel curve for a normal good. As the proportion of the food expenditures in income rises, the quantity demanded of the red meat product increases due to being a normal good. The quantity demanded of the red meat product increases as the household head age advances, suggesting that the older the head of the household, the increase in the red meat consumption.

Additional working people in the family, being a government employer and educational attainment all have a negative effect on the quantity demanded of the red meat product but their effect on the quantity demanded are not significant. This suggests that cooking red meat at home is preferred less by households with additional worker than households without additional worker. A relatively high human capital endowment obtained by individuals in Turkey does not necessarily imply a premise leading to a higher income and thus lower educated people are wealthier than higher educated counterparts. The size of household is an important determinant of its red meat consumption level. The effect of an additional person in the family is to increase the likelihood of purchasing more red meat, while the effect of an additional kid is more likely to reduce the quantity level of that product. Higher income households tend to demand more red meat than lower income household. This is in agreement with an increase in food expenditures leading to a high consumption of that product.

One of unique cooking types so called lahmacun attributed to the city has a positive effect on the quantity demanded of the red meat, as expected. Lahmacun is made of ground beef with inclusions of different spices spread over to a tortilla and bake in a bakery. The preparation for lahmacun at bakery takes a few minutes and is less costly than other cooking types. Interestingly people prefer fatty and boney red meat than non-fat and boneless red meat. This is presumably because lahmacun requires fat grand beef and people tend to purchase red meat as a limb or rump which is cheaper than minced meat.

Purchasing red meat from butchery shop has a significantly positive effect on the quantity demanded of the red meat. Butchery shop may have lower price for the red meat than supermarket and household may easily access them than supermarket due to close neighborhood to shop. Mass media advertisement has a significantly positive effect on the quantity demanded of the red meat.

3.3. White Meat Market Participation Decision

All variables except food expenditures are statistically insignificant indicating that individual characteristics are not pole factors determining the participation decision. Age, additional worker in the family, education attainment, household size and higher

income households tend to participate less in white meat market, while being a government personnel and an additional number of kids in the family have a positive effect on the decision to purchase the white meat.

3.4. White Meat Quantity Demanded

Cross price of red meat has a positive effect on the quantity demanded of white meat indicating that as the price of the red meat goes up, households tend to demand more white meat and cuts red meat quantity. The effect of own price of white meat has a significantly negative effect, as expected, indicating as the price of the white meat goes up or goes down, the quantity demanded of the white meat goes down or goes up holding all other factors constant, *ceteris paribus*. Food expenditure variable has a significant effect on the quantity demanded of that product indicating that as the household tend to increase the food expenditures, the proportion of white meat expenditures in food expenditure will ultimately increase. This indicates that the white meat is a normal good.

Younger head of households without an additional worker are more likely to consume the white meat than their older head of households. Being government personnel with a higher education tend to consume more white meat than any other job classifications with less educational attainment. The sizes of households and kids have positive effect on the consumption of the white meat. The size of households is statistically significant, indicating that larger scale families with sheltering many kids are more likely to consume more white meat than smaller scale families with few kids present. Wealthier families tend to consume less white meat than low income groups, as expected. This result is plausible because wealthier families find red meat product as a source of daily protein intake in spite of a risk associated with cholesterol and many other diseases. Purchasing white meat from supermarkets and mass media advertisements have a negative effect on the quantity demanded of that particular product. People may presumably find cheaper white meat in other than supermarket places, even though the product may not be clean and fresh in those places.

To assess the elasticity of meat products with respect a particular exogenous variable, we need first:

$$\begin{aligned} E\left(y_{ij}\right) &= \Phi\left(\bar{Z}_{ij}'\alpha_j\right) * E\left(y_{ij} \mid y_{ij} > 0\right) \\ &= \Phi\left(\bar{Z}_{ij}'\alpha_j\right) * \exp\left(\bar{X}_{ij}'\beta_j + \frac{1}{2}\sigma_j^2\right) \end{aligned} \tag{3}$$

where the unconditional expected mean, $E(y_{ij})$, evaluated at the sample mean of exogenous variables is a product of the probability of participation and conditional mean given that the first hurdle is crossed. After a little bit mathematical manipulation, the elasticity of the quantity demanded of meat products associated with a particular X_m variable is then:

$$\varepsilon_{mj} = \left(\frac{\phi\left(\bar{Z}_{ij}'\hat{\alpha}_j\right)}{\Phi\left(\bar{Z}_{ij}'\hat{\alpha}_j\right)} \bar{X}_{mj} \right) \hat{\alpha}_{mj} + \bar{X}_{mj}\hat{\beta}_{mj} \tag{4}$$

where the first part on the right hand side is a percentage change due to the probability decision in the first hurdle and the second part on the right hand side is a percentage change observed in the meat quantity demanded due to a change in X_m for a semi-log functional form. If the X_m variable used in both first and second hurdles then the resulting elasticity is given in equation 4. However, if the X_m variable used only in the second hurdle then the resulting elasticity would be only the second part on the right hand side of the equation 4. The delta method is used to obtain the standard errors of the each corresponding elasticity variables (Greene, 2002; 2003; Spanos, 1999).

The elasticities with their corresponding t-values are presented in Table 3. We will discuss only economically sound variables due to page space limitation[5].

The quantity demanded of red meat is

[5] We would be happy to provide all derivatives of elasticities and their corresponding standard errors using the delta method technique in detail to interested readers upon request.

own price inelastic, indicating that a percent change in the quantity demanded would not be induced as much as a percentage change incurred in the red meat price. The same argument is valid for white meat own price elasticity. A ten percent increase in red meat price reduces its quantity demanded by 2.04%, while a ten percent increase in white meat price reduces its quantity demanded by 0.75%. The magnitude of own price elasticity for red meat is larger than the magnitude for white meat own price elasticity, indicating that a decrease (or an increase) in red meat price would have a high impact on its quantity demanded.

Cross price elasticities indicate that both products are substitute to each other. A ten percent increase in white meat price increases the demand for red meat by 7.90%, while a ten percent increase in red meat price pikes the demand for white meat by only 0.49%. In terms of the substitution effect, a decrease (or an increase) in white meat price would have a high impact on the quantity demanded of the red meat holding all other factors constant, *ceteris paribus*, while a decrease (or an increase) in the red meat price would have a less pronounced effect on the quantity consumed of white meat. This is perhaps because the red meat is perceived as a source of protein than that of the white meat.

Total food expenditures for both products are all positive and significant suggesting that the red and white meat products are considered normal goods. The food expenditure elasticities are considerably high, at 1.8, for red beef and considerably low, at 0.3, for white meat. The higher expenditure elasticity for red meat implies that as the household incomes continue to grow, expenditures for that product is expected to increase and the demand for the red meat product will grow. The inelastic own price and elastic expenditure for red meat has a potential interest. The red meat is perceived as a luxury good by common people residing in the city and the product is less price-responsive, suggesting that the negative mass media about cholesterol and chronically diseases resulting from red meat consumption can be effective in shifting the demand to white meat or possibly to fish consumption.

The red meat quantity demanded are elastic with respect to the age and size of households, while the white meat quantity demanded are all inelastic with respect to social individual and product characteristic variables. Relative to other households, households by an older individual consume more red meat and less white meat, while as household size continues to grow the

Table 3. Elasticity Estimates of Double-hurdle Censored Models for Meat Consumption

Variables	Red Meat		White Meat	
	Parameters	t-value	Parameters	t-value
FEXPEND	1.755[a]	6.674	.285[a]	3.059
AGE	1.156[a]	2.381	-.061	-.485
WORKING	-.043	-.671	-.003	-.152
PERSONEL	-.020	-.173	.025	.697
EDUCN	-.628[b]	-1.947	.203	1.374
HSIZE	1.144[a]	2.585	.301	1.582
NKIDS	-.595[a]	-2.309	.056	.547
INCOME5	.282[a]	4.284	-.075[a]	-2.764
INCOME6	.059	.928	-.010	-.514
NPBEEF	-.204	-.936	0.049	.389
NPWMEAT	.790[a]	2.459	-.075[a]	-3.270
LAHMACUN	.061	.525	-	-
QFAT	.110[a]	2.143	-	-
QBONES	-.0003	-.002	-	-
MARKET	-	-	-.077[a]	-2.292
BUTCHER	.326[b]	1.896	-	-
ADVERT	-.237[a]	-2.730	.081[a]	2.366

[a] significant at the 5% level,
[b] significant at the 10% level

consumption of both meat types will increase. However, the effect of household size on the red meat relative to the white meat is large because a 1% increase in household size resulting in a 1.15% increase in the consumption of red meat.

4. Conclusions

In this analysis we investigated factors affecting the probability decision to purchase meat products and their levels of quantity demanded. Censored demand system model accommodates zeros in meat quantities produces different effects on the decision to participate in the meat market and the level of each quantity product. The Vuong test reveals that two generating data processes are in effect: factors affecting the probability decision to purchase meat types are substantially different than factors affecting the quantity demanded levels.

Most of individual social demographic factors play a key in determining both the probability participation and the quantity consumed level of the red meat, while they do not generally show such effects on the probability decision for white meat consumption. Our findings suggest that better educated household head with sheltering fewer kids in the family having medium income prefer white meat to red meat consumption. Media advertisement induces positive consumption of white meat and diminishes red meat consumption. Price and food expenditure elasticities vary across two products and both meats are normal goods. The positive food expenditure elasticity suggest that income is still a driving force of changing meat consumption pattern, but its strong effect forces households to consume more red meat than white meat. Both meat products are price inelastic meaning that the proportionate change in both meat types is less than that of prices. Red and white meat products are substitute to each other. However, the effect of a price change in white meat on the red meat is greater than the effect of the red meat price change on the white meat product. This shows that the substitution effect is higher than the income effect. It is worth considering that government and private health sectors may disseminate white meat consumption among households relative to red meat consumption.

Our results have important implications for the supermarket, butchery shop and other food supplier industries in the region. Since the demand for meats are less price- response, an increase in revenue would occur if prices of both meat increase. Further research should focus on a bivariate relationship between red and whit meats possibly using a bivariate Tobit type analyses.

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