

Analysis of factors affecting households' fish consumption in Erzurum, Turkey

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Abstract

This paper focused on the socio-demographic factors influencing fish consumption in Erzurum, Turkey. The data were collected from 271 households by using face to face survey technique. The Logit model has been used to analyze the socio-economic factors affecting fish consumption of households. The prices of meat, chicken and fish, and income have been used as the variables affecting the probability of fish consumption. According to the results from logit regression analysis, red meat price, chicken meat price and income are significant and positively correlated with fish consumption. An increase in red meat price resulted in a 1.82 % increase in the likelihood to purchase fish. As in the price of meat, the estimated 0.02 change in probability for income indicated that a unit rise in chicken meat price caused a 2.25 % increase in the likelihood to purchase fish. In the light of the findings, it can be recommended that fish marketers and processors should consider income, the prices of red meat, chicken meat and fish among socioeconomic factors in their formulation of marketing strategies aimed at promoting fish consumption in Turkey. Furthermore, stocking and marketing conditions should be rearranged, and household and marketing standards should be formed.

Keywords: Fish consumption, logit model, households' preferences, Turkey

1. Introduction

It is known that animal and plant protein intakes should be at certain levels for adequate nourishment. In Turkey, the share of animal protein intake in per capita protein consumption is very low and protein intake is plant based. One of its reasons is low level animal production, 42% within total agricultural production. Due to constant population growth and the necessity to make up for the gap in animal protein intake, existing resources of animal protein should be utilized efficiently (Sayin et al., 2010).

Due to the fact that fish products are vital food source for animal protein, they are accepted as a noteworthy alternative for animal protein consumption (Hatirli et al., 2004). Although equivalent and/or superior to meat, increasing fish consumption, which is not very common in Turkey, is considered as fundamental in terms of a balanced diet (Sen et al., 2008).

The amount of fishery production in Turkey in 2010 is 653.080 tones in total. 55.109 tones of this production are exported, 80.726 tones are imported, 505.059 tones are domestic consumption, 168.073 tones are processed and 5.565 tones are unutilized parts. Deep sea fishing constitutes 61.15 % (generally anchovy), other seafood constitutes 7.07%, fresh water products (generally carp and grey mullet) constitutes 6.18% and culture fish (specially trout, perch and gilt head bream) constitutes 25.60% of fishery production in Turkey (TURKSTAT, 2011).

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According to 2010 values, annual tuna fish consumption per capita is 6.9 kg in Turkey (TURK-STAT, 2011). Annual fish consumption per capita around the world is 17 kg; it is 24-25 kg in the USA and 75 kg in Japan (FAO, 2011). According to these numbers, it can be seen that Turkey is far behind the developed countries and the world although it has a very significant potential in terms of fish production. The primary reason for the low consumption in Turkey is stated as the failure to introduce fish in landlocked cities and transportation of fish at higher costs. Moreover, decrease in the income level of people can be considered as another reason for low consumption of fish (Colakoglu et al., 2006). Increase in the purchasing power in Turkey, tendency for healthy diet and demand for package food due to the reason that more women work influence the demand for fishery products in a positive way. Owing to the increase in fish production lately and improvements in cold chain, fish consumption has risen; however, it is stated that the rate of fish consuming habits in households is still very low (SPO, 2007).

2. Literature review

Many researchers have analyzed the factors affecting consumer preferences on fish consumption. Nayga and Capps (1995) used discrete logit models to study the probability of consuming fish at home or out, without analyzing the quantity consumed. Bose and Brown (2000) studied the logit modeling procedure and found that there exist noticeable regional differences in seafood consumption behavior. In the study, it is emphasized that the variables price, distance, taste, quality and season are significant at the conventional level. Tambi (2001) analyzed cultural and socio-economic factors affecting fish consumption in Cameroon. Jung and Koo (2002) analyzed meat and fish consumption behaviors in Korea, by estimating the Linear Approximate Almost Ideal Demand System (LA/AIDS). Palas and Sabur (2004) investigated fish consumption level, income flexibilities and buying behavior in Dhaka city. Hatirli et al. (2007) aimed to estimate Linearized Almost Ideal Demand System (LA/AIDS) for red meat, fish and chicken using cross-sectional data collected from central district of Isparta province. Sayin et al. (2010) and Verbeke et al. (2007) focused on consumer evaluation of fish quality and its association with fish consumption, risk and benefit beliefs and information processing variables. Erdal and Esengün (2008) used logit model in their study to analyze the factors effecting the level of fish consumption of families. According to the logit model results, seasonal conditions and social status were found to affect the fish consumption level of the families. Sayin et al., (2010) aimed to determine the socio-economic factors that are effective on fish consumption. The fish purchasing decision of the households is generated by using the two step probit model. Aydin et al. (2011) used chi-square and a one way ANOVA statistical techniques to explore how socio-economic and demographic factors affected fish consumption pattern in Turkey. Erdogan et al. (2011) focused on consumption habits and preferences of Turkish people for seafood in Istanbul city. They found that seafood was more preferable for older people. Education, income and being family were the other important factors. Mugaonkar et al. (2011) studied consumer behavior at organized fish retail outlets in Mumbai. Musaba and Namukwambi (2011) used the logit model to analyze the influence household characteristics have on consumers' decision to purchase horse mackerel, hake and snoek.

3. Material and method

The main data were collected through questionnaires given to 271 houses in the urban areas of Erzurum Province.

In order for the houses to represent urban areas of Erzurum Province best, districts involved in the survey were divided into three groups as low, medium and high according to their socio-economic status. 20 % of the districts were selected randomly to represent each group. The aim was to cover the whole population in this way. In order to determine the number of the households to be included in the survey, their rates in the total households were taken into consideration

(Pazarlioglu et al., 2007; Armagan and Akbay 2007; Kiziloglu and Kizilaslan, 2013) and consumers participating were identified randomly.

In order to determine the sample size representing the main mass, proportional sampling method was used (Newbold, 1995).

$$n = \frac{Np(1-p)}{(N-1)\sigma_p^2 + p(1-p)}$$

In the equation above, n represents sample size, N represents population size (361.250) (TURKSTAT, 2011), p represents estimation rate (sample size 0.5 maximum), σ_p^2 represents rate variances (in order to reach maximum sample size, table value should have confidence interval of 90%, with 1.65 and 10% margin of error). As the characteristics of the enterprises which formed the main mass were not identified in the beginning, p was determined as 0.5 to maximize the sample size and it was determined as 271 households.

Logit model was used to analyze the socio-economic factors affecting fish consumption of households in the urban areas of Erzurum Province. Binary choice models were used for econometrics applications in which dependent variables are qualitative and bivalent, and the most common of them are probit and logit models. The main difference between probit and logit models results from the distribution of error term. While the distribution of error term in the logit model is accepted logistically, it is assumed that error term is normally distributed in the probit model (Greene, 2011; Gujarati, 2001). The logistic regression procedure is the most frequently used method to study household perceptions and behaviors (Gempesaw et al., 1995). A choice model is specified with a dichotomous dependent variable representing the households' final choice to be explained by a set of variables such as demographic factors, socio-economic factors, perception, experience, and preferences. Dependent variable is a dummy and estimated likelihood values change between 0 and 1. The estimation method utilizes the Maximum Likelihood Estimation (MLE) procedure as they provide consistent parameter estimates that are asymptotically efficient (Gujarati, 2001; Greene, 2011).

The logit model for a representative household i can be expressed as follows (Gujarati, 2001);

$$P_i = F(Z_i) = F(\beta_0 + \beta_1 X_i) \quad E(Y=1 | X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \quad (1)$$

P_i = the probability of i .th household to select a specific choice

F = Probability function

$Z_i = \beta_0 + \beta_1 X_i$

β_0 = Fixed coefficient

β = estimation of parameters for each explanatory variable

The equation below has been found by rearranging the Equation 1 and finding the natural logarithm of both sides of the equation;

$$L_i = \text{Ln} \left[\frac{P_i}{(1-P_i)} \right] = Z_i = \alpha + \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon_i \quad (2)$$

The parameters estimated in the Model might be better interpreted within the marginal probability concept. Marginal probability calculates the variation in the probability of fish consumption in accordance with the change in each explanatory variable (Greene, 2011).

The estimated β -coefficients of equation (2) do not directly represent the marginal effects of the independent variables on the probability P_i . In the case of a continuous explanatory variable, the marginal effect of X_j on the probability P_i is given by:

$$\frac{\partial P_i}{\partial x_{ij}} = \frac{[\beta_j \exp(-\beta X_i)]}{[1 + \exp(-\beta X_i)]^2} \quad (3)$$

However, if the explanatory variable is qualitative or discrete in nature $\partial P_i / \partial X_{ij}$ do not exist. In such a case, the marginal effect is obtained by evaluating P_i at alternative values of x_{ij} . For example, in the case of a binary explanatory variable x_{ij} that takes values of 1 and 0, the marginal effect is determined as:

$$\frac{\partial P_i}{\partial x_{ij}} = P(X_{ij}) - 1 - P(X_{ij}) = 0 \quad (4)$$

In the study, the households consuming fish were converted to 1 and those not consuming fish were converted to 0. The descriptions of dependent and explanatory variables are shown in Table 1. Sayin et al. (2010) reported that the determining factors on fish consumption by households were fish price, price of substitutes and complementariness and socio-economic features (especially education and income) of households. In addition to this, income, the number of people and children in the households, educational background, age, avoiding red meat due to health reasons, education of the woman in the household and ethnicity were considered as independent variables in the previous studies. (Herrmann et al., 1994; Nayga and Capps, 1995; Manrique and Jensen, 1998; Sengul and Emeksiz, 1999; Ho-Shui Li et al., 2000; Tambi, 2001; Hatirli et al., 2004; Erdal and Esengun, 2008; Puduri et al., 2011; Erdogan et al., 2011)

The price of meat, chicken and fish, the number of people in the households, marital status, age of the household head, educational background of the person included in the survey and monthly income of the household were taken into consideration among the socio-economic factors affecting fish consumption of households. LIMDEP package program was used to estimate the empirical model results.

The following model was developed to predict factors affecting the probability of fish consumption. The model was formulated as:

$$\text{FISHCONS} = \alpha + \beta_0 + \beta_1 \text{RMEATPRI} + \beta_2 \text{CMEATPRI} + \beta_3 \text{FMEATPRI} + \beta_4 \text{HS} + \beta_5 \text{MS} + \beta_6 \text{AGE} + \beta_7 \text{EDU} + \beta_8 \text{INC} + \varepsilon_i$$

Table 1. Description of the variables specified in the model

<i>Variables</i>	<i>Description</i>
Dependent Variable FISHCONS	(Fish consumption): 1 for fish consumption, 0 otherwise
Explanatory Variables RMEATPRI CMEATPRI FMEATPRI HS MS AGE EDU INC	Red Meat Price (TL/kg)* Chicken Meat Price (TL/kg)* Fish Price (TL/kg)* Household Size (number of family members) Marital Status (married 1, others 0) Age (If householder age <30, it gets 1, 31-45 it gets 2 and >46 it gets 3) Education (If householder graduated from primary school 1, secondary school 2, high school 3, university 4 and otherwise 0) Income (If household income < 1000 gets 1, 1001-2000 gets 2 and >2000 gets 3)

1 \$ equals to 1,594 TL in June (CBRT, 2013)

4. Results

According to the results of the survey, the number of people in the households was calculated as 4.21 in the urban areas of Erzurum Province, which is more than the average number (3.92) of household in the urban areas of Turkey in general (TURKSTAT, 2010). The households participating in the survey were divided into three groups according to their monthly income by using frequency distribution. The first group included the households whose monthly income was 1000 TL and less, the second group consisted of households with a monthly income of 1001-2000 TL and the third group consisted of households with a monthly income of 2001 TL and more.

Table 2. Distribution of households according to monthly income

Income groups	Income Levels (TL)	Total Household Number	Percentage of Total (%)	Monthly Income (TL/household)	Average Household Size
1. Income Group	< 1000	71	26.20	728.00	3.98
2. Income Group	1001-2000	115	42.44	1,673.00	4.50
3. Income Group	2001 <	85	31.36	3,636.00	4.00
		271	100.00	2,288.06	4.20

The monthly income of households was found to be 2,288.06, and the average number of people in the households was 4.20. While the percentage of the household with the lowest income was 26.20%, the percentage of the household with the highest income was found 31.36 % (Table 2).

Monthly fish consumption per capita varied from 34% to 90% among income groups. It was 74% kg on average. It was reported in a study conducted in Isparta Province that monthly fish consumption was 1.03 kg (Hatirli et al., 2004). Another study conducted in Tokat Province reported it as 1.08 kg (Erdal and Esengun, 2008). Taken into consideration that fish consumption per capita in Turkey is 6.92 kilograms (TURKSTAT, 2011), it can be realized that it is above average number in the province that the study has been conducted.

Income level of the household was the main factor affecting the fish consumption. This variable was included in the model considering the hypothesis that the households with low income might consume more fish when the prices of fish are lower. Variables of household size, marital status, age and education were excluded from the model as they were not found statistically significant at the level of 10 %. According to the studies by Myrland (1998), Nayga and Capps (1995), Erdogan et al. (2011), gender does not affect fish consumption levels. Thus, the prices of meat, chicken, fish and income were used as the variables affecting the probability of fish consumption. In conclusion, the below-mentioned equation was formed as the final model.

$$\text{FISHCONS} = \beta_0 + \beta_1 \text{RMEATPRI} + \beta_2 \text{CMEATPRI} + \beta_3 \text{FMEATPRI} + \beta_8 \text{INC} + \varepsilon_i$$

The maximum likelihood estimates of the model are exhibited in Table 3. It is statistically significant at the level of 1% according to probability statistics, which is the equivalent for Model F test statistics in logit model. McFadden R-square which represents explanatory variable was identified as 0.1709. This value shows that the variables included in this model are adequate for explaining the households' preference probabilities for fish consumption.

The results of the analysis revealed that all variables included in the model were as estimated. The price of meat and fish and income variables were found statistically significant at the level of 10% and the price of chicken had a statistical significance at 10% level. The results showed

that there was a positive relationship between probability of fish consumption and household income, which is one of the variables included in the model. In general, the literature indicates that income is positively correlated with fish consumption (Bose and Brown, 2000; Cheng and Capps, 1988; Dellenbarger et al., 1992). Trondsen et al. (2004) reported that higher fish consumption was associated with a higher level of income. It might be concluded according to the results of logit analysis that probability of fish consumption rises as the monthly income of households increases. The implication of these results is that high-income households are more likely to purchase fish than low-income households.

Table 3. Estimates of the binary logit model

Variable	Coefficient	Std. Error	z-Statistic	Probability	Marginal effects on Prob [Y= 1]
Constant	-3.51	0.92	3.81	0.0001	-0.86
RMEATPRICE	0.07	0.02	3.43	0.0006	0.02
CMEATPRICE	0.09	0.05	1.80	0.0713	0.02
FMEATPRICE	-0.08	0.03	-2.46	0.0138	-0.02
INCOME	1.01	0.23	4.48	0.0000	0.23
Log-likelihood	-154.6212				
Restricted Log-L	-186.4956				
McFadden Pseudo-R ²	0.1709				
X ² (df=8)	63.7489				
Significance level	0.000				

It was observed that there was also a positive relationship between fish consumption of households and the price of meat (Table 3). This meant that the increase in red meat price positively affected the households' fish purchasing decision. An increase in red meat price resulted in a 1.82 % increase in the likelihood to purchase fish.

The results indicated that there was a positive relationship between fish consumption of households and the price of chicken, which is one of the variables included in the model (Table 3). As in the price of meat, the estimated 0.02 change in probability for income indicated that a unit rise in chicken meat price caused a 2.25 % increase in the likelihood to purchase fish.

A similar study was conducted to investigate factors affecting fish consumption. It indicated that there was a negative relationship between fish consumption and the price of fish and the number of people in households, whereas there was a positive relationship between the consumption and age and income (Nayga and Capps, 1995). Another study analyzed the factors affecting fish consumption with probit model. The results indicated that there was a positive relationship between the price of meat, chicken and income, while there was a negative relationship between consumption and household size (Sayin et al., 2010). In another study using logit model to identify the factors influencing fish consumption, it was found that there was also a positive relationship between the number of people in households and fish consumption (Musaba and Namukwambi, 2011).

According to the results, while increase in the price of fish decreases the fish consumption of households, the rise in chicken prices increases the fish consumption probabilities of households. This means that households give up to consume chicken and tend to consume fish sold at a lower price in the market. It can be stated that price is an important factor in the substitution of fish for meat and chicken. In other words, this suggests a highly elastic household for fish in the markets

at the current market prices. However, Sayin et al. (2010) emphasizes that meat, which is subject to traditional consumption attitudes, and chicken, which is consumed more recently, are preferred more than fish in Turkey. As cultural attitudes are effective on consumption of chicken and fish, their consumption rises with a decline in their prices.

The rationale for lower fish consumption in Turkey compared to other countries results undoubtedly from the difference in eating habits. In Turkey, fish is regarded as luxury food. When the price of fish is compared to meat and chicken, it can be seen that it is relatively lower, which leads to the assumption that the reason for low fish consumption is not related to eating habits but affordability. The eating habits in Turkey are predominantly based on grains and vegetables (Aydin et al., 2011).

5. Conclusion

This paper aimed to determine the socio-demographic factors influencing fish consumption in Erzurum City, Turkey. For estimation technique, binomial logit model was specified and analyzed using collected data from households. The analysis considered factors such as household size, marital status, age, education, red meat price, chicken meat price and fish price. However, variables of household size, marital status, age and education were excluded from the model as they were not found statistically significant at 10% level.

According to the results from logit regression analysis, red meat price, chicken meat price and income were significant and positively associated with fish consumption. This suggests that an increase in red meat price, chicken meat price and income caused a decline in the probability to consume fish. In other words, the likelihood to consume fish was higher among households with high income level than those with lower income level. Moreover, the probability of fish consumption increased as the price of meat and chicken rose.

In the light of the findings, it can be recommended that fish marketers and processors should consider income, red meat price, chicken meat price and fish meat price among socioeconomic factors in their formulation of marketing strategies aimed at promoting fish consumption in Turkey. It is suggested that fish can be promoted for sale in supermarkets and specialized shops for high-income households group in urban area.

It is of vital importance to increase the variety of fish processed in an appealing way and sell them at rational prices in order to raise fish consumption, which is a fundamental part of a healthy diet. It can be concluded from the results of the study that the probability of fish consumption decreases as the price of fish increases.

Households should be made conscious of fishery products regarding a healthy diet, and fish consumption should be encouraged in the landlocked cities by introducing all kinds of fishery products. It is of significant importance for a healthy generation. Fishing industry should be revived for breeders, households and manufacturers in all seasons and sea food and culture fishing should be supported. Furthermore, stocking and marketing conditions should be rearranged, and household and marketing standards should be formed.

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