International Scholars Journals

Advanced Journal of Environmental Science and Technology ISSN 7675-1686 Vol. 4 (2), pp. 001-011, February, 2013. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Demand analysis for frozen food in Turkey: Case of Izmir

Zerrin Kenano lu Bekta[1]*, Bülent Miran[1], Özlem Karahan Uysal[1], Cihat Günden[1] and Murat Cankurt[2]

[1]Department of Agricultural Economics, Faculty of Agriculture, Ege University, Bornova-Izmir, Turkey.

[2]Department of Agricultural Economics, Agriculture Adnan Menderes University, Faculty of Agriculture, Aydın, Turkey.

Accepted 21 September, 2012

The aim of this study was to analyse the frozen food demand among consumers in Izmir, one of the three biggest provinces in Turkey. The study used a questionnaire survey of 271 randomly selected consumers; data was collected between December 2006 and February 2007. Heckman models were used for demand estimates. From demand estimates, price elasticity was found to be -0.53 for potatoes, -0.49 for peas, -0.28 for green beans, -0.80 for strawberries and -0.69 for cherries. The study calculated price premium that consumers would be willing to pay for consuming frozen food. It was found that consumers would pay an 82% price premium for frozen peas; 108% for frozen strawberries; and 130% for frozen cherries. It was found that consumers were not willing to pay a price premium for frozen potatoes or frozen green beans.

Key words: Frozen food, Heckman two stage estimation method, willingness to pay, Turkey.

INTRODUCTION

Consumption of out- of-season agricultural produce is made possible due to frozen products and also greenhouse production. However, the drawbacks connected with intensive use of pesticides make some consumers wary of greenhouse products. Frozen foods are offered to the consumption using produce that was harvested seasonally. Therefore, there is lower risk from chemicals. Frozen foods are especially appropriate for preparing meals quickly and are an important source of food for people with limited time due to work or other commitments. Increasingly busy work schedules mean that consumers typically make use of frozen foods, which are pre-prepared, washed, practical and ready to use. In addition, the desire to consume some products out-of-season gradually increased the demand for frozen food. Consumers either purchase ready frozen food or prepare their own frozen products in various forms at home, in line with their needs and the tastes of family members.

Fruit and vegetables have an important role in the frozen food production sector of Turkey. Frozen bakery products are another important product group that recently appeared in the frozen food sector. The frozen food sector in Turkey began to develop after the 1990s. While the sector initially produced for export, it increasingly serves the domestic market, in response to the food preferences of consumers and changes observed in consumption habits. The development of market strategies and promotion activities as well has increased the interest and demand for frozen food among consumers.

In 2008, the value of frozen food products exported from Turkey was $204.7 million[1]. The export market for frozen food products mainly consists of European Union countries. Frozen chicken has the highest export value within the Turkish frozen food sector, followed by frozen

*Corresponding author. E-mail: zerrin.bektas@ege.edu.tr. Tel: +90 (232) 388 18 62. Fax: +90 (232) 388 18 64.

[1] Data on the export and import values of frozen bakery products could not be obtained from the Aegean Exporters Union. Total export and import values of frozen foods do not include export and import values of bakery products. The export and import values given above are the sum of export and import values of frozen vegetables, fruit, fish, chicken and convenience foods.

vegetables, frozen fruit, frozen fish and frozen convenience foods. The countries to which Turkey exports frozen chicken include Vietnam, Iraq, Tajikistan, Azerbaijan and Bosnia and Herzegovina. The countries to which Turkey exports frozen vegetables include Germany, France, Belgium and the United Kingdom; frozen fruit markets include Germany, UK, France and Holland (Aegean Exporters' Associatıons, 2008).

In comparison to the value of export sales, Turkey does not currently have a developed import market for frozen food products. As of 2008, the value of frozen food products imported by Turkey was $ 19.1 million. Frozen vegetables, frozen fish, frozen fruit, frozen convenience food and frozen chicken are the leading product groups in terms of import value (Aegean Exporters' Associatıons, 2008).

It was found that frozen food products are widely consumed in countries with high income per capita. Studies carried out worldwide to evaluate frozen food markets, to contribute to the development of the sector and to determine customer preferences and demand for frozen food products (Montgomery, 1986; Cheng and Capps, 1988; Guenthner et al., 1991; LeGrand, 1992; Anderson and Bettencourt, 1993; Gordon and Hannesson, 1996; Park and Caps, 1997; Manrique and Jensen, 1998; Dasgupta et al., 2000; Vickner et al., 2000; Mojduszka et al., 2001; Mojduszka and Everett, 2005; AFFI, 2006) . Frozen foods are sold for higher prices in the market, due to the costs associated with processes such as cleaning, removing the husks and freezing. Today various products are sold in frozen form. It is important to know how much price difference should be applied to frozen foods when compared to fresh produce. If firms which produce frozen foods would know price premiums that the consumers can pay for frozen products compared to fresh ones, they can determine their own production and pricing policies more effectively. In recent years, along with the changes in living conditions, the demand for both frozen and fresh products has increased. As a result, the present study used a demand estimate model that included both fresh and frozen products. Leading firms in the frozen food sector in Turkey were contacted to determine the products for which demand estimates would be made. Based on the data obtained from these firms, consumer demand for various frozen products was determined. It was found that among the fruit and vegetable group, consumers preferred frozen potatoes, frozen peas, frozen green beans, frozen cherries and frozen strawberries. These products were taken as criteria in the study. Demand models for fresh and frozen products for each product analyzed in the study were developed using the Heckman two stage estimation method. In addition, for each product analyzed in the study, the price premiums that the consumers would be willing to pay for frozen compared to fresh were calculated. These models not only gave the price premiums for frozen food, but also made it possible to measure the effects of various consumer characteristics on consumption.

MATERIALS AND METHODS

The data was obtained from a survey carried out in the period of December 2006 to February 2007 in order to specify demand for some fresh and frozen food products of consumers in Izmir, one of the three biggest provinces in Turkey. At the international seaport of Izmir, an important part of total export and import of Turkey takes place. Izmir is one of the most industrialized cities in Turkey where the highest educated people with a high income level live (Pazarlıo lu et al., 2007).

The number of households within the central districts of Izmir province constituted the population of the study. Population data from the year 2000, obtained from the Turkish Statistical Institute was used. The population of the central districts of Izmir province is 2232265 (TSI, 2000). Based on the assumption that an average household consists of 4 members, it was calculated that there were a total of 558066 households in the central districts of Izmir province. The sample size was calculated using the proportional sampling method (Newbold, 1995):

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

n: Sample size; N: Number of households in central Izmir; p: The percentage of consumers who purchase frozen products (taken as 0.50 to reach maximum sample size); $_{px}^{2}$: variance.

According to the proportional sampling method, with a 90% confidence interval and 5% margin of error, the required sample size was found to be 271. The sample size (271) was distributed across the central districts of Izmir (Balçova, Bornova, Buca, Çi li, Gaziemir, Güzelbahçe, Kar ıyaka, Konak and Narlıdere), according to the ratio of the number of households in these districts to the population. Participants' addresses were selected according to the Randomized House Selection method. The questionnaires were filled through face-to-face interviews with consumers.

Theoretical framework

Heckman two stage estimation method

In the study, as some of the consumers did not buy any of the frozen products (potatoes, peas, green beans, strawberries or cherries), zero expenditure and zero consumption were observed in the data. In cases where the dependent variable observation is zero, sample selection bias can occur and the use of the least squares method can lead to biased and inconsistent parameter estimates. In such cases, the Heckman method is used. The aim of this method is to obtain non-biased, consistent parameter estimates (Harmon, 2003).

In the study, the demand for potatoes (fresh potatoes and frozen potatoes), pea (fresh peas and frozen peas), green beans (fresh green beans and frozen green beans), strawberry (fresh strawberry and frozen strawberry) and cherry (fresh cherry and frozen cherry) were estimated using the Heckman two-stage demand model considering the cases where there was zero observation. The Heckman model eliminates the bias caused by the censorship in regression coefficients. Sample selection bias occurred in a large

number of studies.

In recent years, Heckman models were used worldwide in various studies in the fields of education and its return (Fersterer et al., 1999; Caponi et al., 2000; Holmes, 2003), employment (Gray, 2000), female workforce supply (Kingdon et al., 2000; Nawata, 2003), participation of married women in the workforce (Mroz, 1987; Serumaga-Zake and Kotze, 2003), migration (LeClere and McLaughlin, 1997), Lanzona (1998), human capital (Robbins, 1999), agricultural production function (Heshmati, 1994), demand for convenience food (Park and Capps, 1997), demand for agricultural products (Tambi, 2001), demand for fresh and frozen sea products (Cheng and Capps, 1988), and demand for sea products (Manrique and Jensen, 1998). This method was used in Turkey in return of education (Tansel, 1995), wages (Tansel , 1998), human capital model (Erdo an, 1999), unemployment (Ta cı and Darıcı, 2009), demand for milk (Pazarlıo lu et al., 2007), and demand for food products (Akbay et al., 2008).

Development of a Heckman model generally consists of two stages. In the first stage, z is a dual variable which detects whether or not y was observed and y is observed only when z = 1. In the second stage, the expected values of y are modeled, on condition that it is observed. Thus, z is observed as a dummy variable. This means the realization of one unobserved or latent permanent variable z^*. For z = 1 models, y is observed, which is the observed realization of the second latent variable (has x independent variables and beta coefficients). The e and u errors, which are normally distributed in both equation systems with zero average and permanent variance, are found. These two errors are estimated to have a correlation called rho (Sweeney, 2003):

$$z_i^* = w_i'\alpha + e_i$$

$$z_i = 0 \quad If\ z_i^* \leq 0 \qquad Selection\ Equation$$

$$z_i = 1 \quad If\ z_i^* > 0$$

$$y_i^* = x_i'\beta + u_i$$

$$y_i = y_i^* \quad if\ z_i = 1 \qquad Outcome\ Equation$$

$$y_i \quad unobserved\ if\ z_i = 0$$

Dependent and independent variables used in selection and outcome models in potatoes, peas, green beans, strawberries or cherries are given in Table 1. In the first stage, selection equations were formed and were solved with a probit model. The main reason for using a probit model was to calculate the sample selection equation or, in other words, the Heckman correction coefficient. This variable is represented by λ and is calculated by making use of the error term of the solved probit model.

In the Heckman process, the error values of selection equations are used for calculating a selection bias control factor. The obtained λ value is called an Inverse Mills Ratio (Lye and Hirshberg, 2000). This ratio is a summarized measure that reflects all the properties that can not be measured.

Selection equations were used to determine the factors affecting the purchasing probability of fresh and frozen foods analyzed in the study. In selection models, the purchase/non-purchase of these products was considered as a dependent variable for different price levels. Since frozen food products are not bought frequently by consumers in Turkey. It may be diffucult to remember their prices. A kind of choice experiment was applied during the survey. The consumers were divided into two groups and two randomly chosen prices were given to each group of consumers. The randomly chosen prices were drawn from an interval of the current market prices of the frozen products. The consumer was first asked how much he/she would buy fresh product at price 1 (potatoes, peas, green beans, strawberries, cherries) and then how much he/she would buy frozen product (potatoes, peas, green beans, strawberries and cherries) at price 2, both prices are randomly distributed to the questionnaires (Table 2).

If the consumers would like to purchase these products, the dependent variable was taken as 1; if they did not want to make a purchase, the dependent variable was taken as 0. Independent variables are the factors that affect the purchase of these products. Gender, age, education, marital status, the place of longest residence, and employment status were used as independent variables in selection models. Age and education status were used as continuous variables; the other independent variables were used as dummy variables in the models.

After the Heckman models were estimated, λ was checked to determine whether it was significant, and whether Heckman correction was required for the existing data set. In the study, the outcome equation refers to demand models for potatoes, peas, green beans, strawberries and cherries. In demand models, the dependent variable is the amounts of the fresh and frozen products purchased, which are offered to the consumers from various price sets.

While some consumers agreed to purchase these products from the given price sets, some others reported that they would not buy at these prices. If consumers did not wish to purchase at a particular price, the purchase amount was recorded as zero. The dependent variables used in outcome models (the amount of the each product consumed) were taken as logarithmic.

From the independent variables used in the outcome equation, product prices and the income of the house were used logarithmically. The number of individuals in the family was used as independent variables. The models also included a dummy variable that represented whether the product in question was frozen or not and which would enable the calculation of a price threshold at which the consumers would be willing to pay for the frozen products. When the coefficient of this dummy variable was significant, willingness to pay was calculated.

Willingness to pay

To calculate willingness to pay, firstly a demand model was estimated. In this consumption of the product (y) was the dependent variable; product price (P), consumer income (I) and a dummy (D) variable, which measures whether or not the product was frozen, were the independent variables (Equation 1). In the equation, indicates parameter estimates and e indicates error term.

$$\ln y_i = \beta_0 + \beta_1 \ln P_i + \beta_2 \ln I_i + \beta_3 D_i + ... + e_i \qquad (1)$$

Based on the estimation of the parameters of the model, the price premium between the non-frozen and frozen product can be calculated. In the following equation, lnq represents estimated value for frozen food. To make calculations easier a dummy variable was defined. This dummy variable measured independent variables of the demand equation, which are price, income and whether or not the product is frozen. In this equation, P1 represents the price of the frozen product; I represent the income variable and D represents the dummy variable that measures whether or not the product was frozen. The dummy variable represents a value of 0 or 1 (frozen=1).

$$In\ q = o + {}_1 InP^1 + {}_2 I + {}_3 D \qquad (2)$$

The dummy variable (D) for non-frozen products is assigned a value of zero and, in this case, the demand equation is written as follows:

$$\ln q = \beta_0 + \beta_1 \ln P^{\upsilon} + \beta_2 \ln I \qquad (3)$$

Table 1. The Variables used in Heckman two stage estimation method.

	Variable Name
Outcome equation	
***Dependent Variable in Outcome Equation (Demand model);* Logarithm of the amount of products purchased (kg)** (Amount of fresh/frozen potatoes, Amount of fresh/frozen peas, Amount of fresh/frozen green beans, Amount of fresh/frozen strawberry, Amount of fresh/frozen cherry)	
Independent Variable used in Outcome Equation	
Ln (prices of products) (Price of fresh/frozen potatoes, Price of fresh/frozen peas, Price of fresh/frozen green beans, Price of fresh/frozen strawberry, Price of fresh/frozen cherry)	Lnprice
Number of individuals in the family	INDNO
Ln (income)	Lnincome
Dummy for frozen product (1=Frozen potatoes, 0= Fresh potatoes, 1= Frozen peas, 0= Fresh peas, 1= Frozen green beans, 0= Fresh green beans, 1= Frozen strawberry, 0= Fresh strawberry, 1= Frozen cherry, 0= Fresh cherry)	Dummyfrozen
Selection equation	
***Dependent Variable in Selection Equation;* Decision to purchase fresh/frozen potatoes, fresh/frozen peas, fresh/frozen green beans, fresh/frozen strawberry, fresh/frozen cherry** (1=Purchase 0=Does not Purchase)	
Independent Variables used in Selection Equation	
Gender (1=Female 0= Male)	Gender
Age (year)	Age
Education (year)	Education
Marital status (1=Married , 0= unmarried)	Marital
Longest residing place (1=Large city, 0=Other)	Residing place
Working status (1=Working 0=Not Working)	Working
0-6 individuals (minimum one child in the family between the ages of 0-6 =1)	Dumhouse06
7-14 individuals (minimum one child in the family between the ages of 7-14=1)	Dumhouse714
15-29 individuals (minimum one individual in the family between the ages of 15-29=1)	Dumhouse1529
30-49 individuals (minimum one individual in the family between the ages of 30-49=1)	Dumhouse3049
50+ individuals (minimum one person in the family over the age of 50=1)	Dumhouse50+
Information about frozen food (1=Has, 0=Has Not)	Frofoodinfo
Whether he/she purchases frozen food (1=Purchases, 0= Does not Purchase)	Fropurchase
Person with the highest income in the house (1=Himself/Herself, 0=Other)	Incper
The person who does food shopping (1=Himself/Herself, 0=Other)	Foodper
Do the one who cooks the dinner comes late after work? (1=Yes, 0=No)	Worklate

In calculation of willingness to pay for frozen products, the price premium which will cause a demand shift through the dummy variable (price premium paid for frozen product) can be calculated as follows:

Table 2. Price sets used in the survey (TL/kg)*.

	Consumer Group 1		Consumer Group 2	
	Price-1	**Price -2**	**Price-1**	**Price -2**
Fresh potatoes	1.25	1	1	0.65
Frozen potatoes	3.5	2.8	4	2.60
Fresh peas	2	1.6	2.5	1.63
Frozen peas	5	4	5.5	3.58
Fresh green beans	3	2.4	2	1.30
Frozen green beans	5	4	6	3.90
Fresh strawberry	3	2.4	4	2.60
Frozen strawberry	9	7.2	8	5.20
Fresh cherry	3	2.4	4	2.60
Frozen cherry	8	6.4	9	5.85

* (TL) Turkish Liras. As of February 2007: 1 $= 1.3969 TL.

$$\ln P^1 = (\beta_0 + \beta_2 \ln I + \beta_3 \ln q)$$

$$\ln P^0 = (\beta_0 + \beta_2 \frac{\ln I}{\beta_1} + \ln q)$$

$$\ln P^1 - \ln P^0 = \beta_0 + \beta_2 \ln I + \beta_3 \ln q + \beta_0 + \beta_2 \ln I + \ln q \beta_1$$

$$\ln P^1 - \ln P^0 = -\frac{\beta_3}{\beta_1}$$

$$P_1/P_0 = \exp(-\frac{\beta_3}{\beta_1}) \quad (4)$$

In the equations, P^1 represents frozen product price and P^0 represents non-frozen product price. Thus, the ratio between the price per kg of frozen and non-frozen product was represented as $e^{-\beta_3 / \beta_1}$. Using the Heckman model, willingness to pay of the consumers for frozen products was calculated with the following formula for each product analyzed in the study. Using the coefficient of the dummy variable, the price premium the consumer would pay for consuming the frozen products instead of fresh ones was calculated as follows:

$$P_{frozenproduct}/P_{freshproduct} = exp[-\ frozendummy/\ price] \quad (5)$$

RESULTS AND DISCUSSION

Demographic Characteristics of the Consumers: The demographic characteristics of the consumers included in the study are given in Table 3. The average age of the consumers was 37. Of the contacted consumers, 77% were female; 74% were married. The majority of the participants (42.7%) were primary school graduates; 11.2% were secondary school graduates; 20.6% were high school graduates who, on average, received 8 years of education. As for the age group of the families of the contacted consumers, it was found that most family members were between the ages of 30-49 and 20- 29. The average number of family members was found to be 3.63. It was found that approximately 70% of the participants did not work. The majority of these consumers were pensioners, housewives and students. It was found that more than half of the consumers (64.2%) had a monthly income between 500 and 1499 TL. Only 2.3% of participants had a monthly income of more than 3000 TL. Average monthly income of the families who were contacted was found to be 980.39 TL.

A total of 213 (78.6%) of consumers reported that they did not buy frozen food products, while 58 (21.4%) reported that they bought frozen food. The reasons for buying frozen food were the ease of preparation and timesaving characteristics of these products. The consumers reported that other factors which affected their preference for purchasing frozen food included: taste, they do not contain additives, they are high quality, they provide increased variety during every season, and they are reliable and hygienic in terms of food safety. In an earlier study carried out in Adana province by Vuru (1997), it was reported that the most important reasons for buying frozen food were ease of preparation and time-saving, seasonality and variety of products. In a study by AFFI in 2006, consumers reported that they bought frozen food items because they looked attractive when they were shopping, there were discounts on these products, these products were recommended, they were advertised, and that they read articles on frozen food.

Heckman model results: Two- stage Heckman models estimated for each product in the study are given in Table 4.

Table 3. Demographic characteristics of the consumers.

Demographic characteristics	Groups	General	
		Number	%
Age groups	14-19	14	5.2
	20-29	72	26.9
	30-39	73	27.2
	40-49	56	20.9
	50-59	41	15.3
	60+	12	4.5
Age*	N = 268; Minimum = 14; Maximum = 80; Average = 37.15; St. Deviation = 12.58		
Gender	Male	62	22.9
	Female	209	77.1
Marital status	Married	201	74.2
	Single	58	21.4
	Spouse died	6	2.2
	Divorced	6	2.2
Age groups of household	0-6	78	7.9
	7-14	148	15.0
	15-29	283	28.8
	30-49	318	32.3
	50+	158	16.0
Household size	N = 271; Minimum = 1; Maximum = 10; Average = 3.63; St. Deviation = 1.60		
Education	Illiterate	13	4.9
	Literate	10	3.7
	Primary school	114	42.7
	Secondary school	30	11.2
	High school	55	20.6
	University students and university graduate	45	16.9
Education**	N = 267; Minimum = 0; Maximum = 18; Average = 7.75; St. Deviation = 4.11		
Longest residing place	Large city	186	68.6
	City center	81	29.9
	District center	3	1.1
	Town/village	1	0.4
Person with the highest income in your house	Yes	73	26.9
	No	198	73.1
Working status	Working	82	30.3
	Not Working	189	69.7
Income groups	Below 500 TL.****	55	21.2
	500 TL.-999 TL.	115	44.2
	1000 TL.-1499 TL.	52	20.0
	1500 TL.-2999 TL.	32	12.3
	3000 TL. and above	6	2.3
Income*	N = 260; Minimum = 250.00; Maximum = 3000.00; Average = 980.39; St. Deviation = 667.07		

*Response of 3 consumers could not be taken. **Response of 4 consumers could not be taken. ***Response of 11 consumers could not be taken. ****Turkish Liras. As of February 2007: 1 $ = 1.3969 TL.

Table 4. The results obtained from Heckman two stage estimation model.

	Potatoes coefficient (standard error)	Peas coefficient (standard error)	Green beans coefficient (standard error)	Strawberry coefficient (standard error)	Cherry coefficient (standard error)
Outcome equation					
Constant	9.04529***(0.329294)	7.53199***(0.320237)	7.94114***(0.324121)	7.96205***(0.367941)	7.81103*** (0.41054)
Ln price	-0.525293***(0.113073)	-0.494182***(0.156577)	-0.284306***(0.0915063)	-0.799788***(0.139691)	-0.690685***(0.158105)
INDNO	0.124086***(0.018876)	0.0503291***(0.0185869)		0.028391(0.0194148)	0.0353149*(0.019721)
LN income	-0.102001**(0.040699)	0.0836821**(0.0422147)	0.0273246(0.0401485)	0.0970409**(0.0437075)	0.0886101*(0.0470656)
Dummyfrozen	-0.0560682(0.154395)	0.296703**(0.149187)	0.0.712811(0.10199)	0.58597***(0.144909)	0.575824***(0.159024)
Lambda (λ value)	-0.496429**(0.20435)	-0.410485***(0.100126)	-0.238968**(0.11983)	-0.214247*(0.121475)	-0.225467*(0.135043)
Selection equation					
Const	0.238187(0.267198)	-0.0279081(0.191563)	-0.316696**(0.159407)	-0.75707***(0.227269)	-0.314179(0.259714)
Gender		-0.369996***(0.107564)	-0.157316(0.115674)	-0.197854*(0.115273)	-0.349281**(0.161947)
Age	-0.00424546(0.0043852)	-0.000516967(0.00357782)		0.00604859(0.00394889)	0.00025827(0.0036275)
Education	0.0194972(0.0142205)	0.024641**(0.0104251)	0.0493759***(0.0107074)	0.0563505***(0.0113216)	0.0405928***(0.0112786)
Marital	-0.0677181(0.0994222)	-0.139241(0.0939215)		-0.0850473(0.0987688)	-0.076964(0.0962624)
Residing place	0.412799***(0.0929587)	0.557509***(0.090453)	0.465757***(0.0898757)	0.404757***(0.097375)	0.382773***(0.0981663)
Working	-0.037564(0.0963504)	0.121342(0.0964841)	-0.144065(0.0998463)	-0.0669927(0.100903)	-0.0486353(0.100325)
Dumhouse06	-0.0384892(0.0966814)				
Dumhouse714	-0.0573219(0.0894729)				
Dumhouse1529	-0.129818(0.0846692)				
Dumhuse3049	0.0680608(0.0996605)				
Dumhouse50+	-0.131096(0.0988883)	-0.217818**(0.0923225)		-0.206699**(0.100373)	
Frofoodinfo	-0.0817238(0.133363)				0.143599(0.126653)
Fropurchase	0.23377**(0.0972712)	0.286889***(0.0961584)		0.18573*(0.0971794)	0.108415(0.0977679)
Incper	0.264962**(0.107256)				-0.200646(0.148694)
Foodper	-0.0618072(0.0859112)		-0.155648*(0.0873962)		-0.320792***(0.0880359)
Worklate			0.167981(0.127881)		
Log-likelihood	-1297.790	1217.737	-1215.814	-1121.095	-1101.594
Akaike	2607.580	2447.474	2441.628	2254.189	2215.189

*** significant for <0.01; **significant for <0.05; *significant for <0.10.

Potatoes: In the Heckman model, potatoes price was found to be negative and statistically significant. As expected, as the price of potatoes increased, consumption decreased. The coefficient gives the price elasticity of potatoes (-0.53). In a study by Akbay et al. (2008), price elasticity of potatoes was estimated to be -0.49. There was a positive relationship between the size of households and potatoes consumption. As the size of households increased, potatoes consumption also increased. In a study by Akbay et al. (2008), it was found that an increase in the size of households had a positive impact on demand for potatoes. Dasgupta et al. (2000) reported that consumers from larger households tended to have a higher demand for frozen food (trout steaks).

In the equation describing the demand for potatoes, income coefficient was found to be positive and statistically significant. It was found that as the income of the consumer increased, potatoes consumption decreased. Dasgupta et al. (2000) reported that consumer income had an impact on the decision to purchase the frozen product (trout steaks). In a previous study carried out in the USA, it was found that the income of the consumer was the most important variable affecting the consumer's decision to purchase convenience food (Fanning et al., 2002).

The dummy variable represents the shift in demand for frozen potatoes. The coefficient of the dummy variable was negative and statistically insignificant. The fact that this coefficient was not statistically significant indicates that there was no demand shift towards frozen potatoes consumption. Therefore, the price premium that the consumers would be willing to pay was not calculated. λ was found to be statistically significant. This indicates sample selection bias and that Heckman correction was required. A model that considers only the consumers who purchase frozen potatoes will yield biased results. It indicates that the consumers who did not buy frozen potatoes had a potential effect on the tendency of purchasing potatoes, and both the group of consumers who purchased frozen potatoes and also those who did not, should be considered and evaluated collectively in the models.

In the selection equation, it was found that the consumers who lived in a large city for a long time and therefore expected to have the habit of purchasing frozen products had a higher probability of purchasing potatoes. The coefficients of these variables were found to be positive and statistically significant. In a study by Dasgupta et al. (2000) on frozen seafood products, it was found that living in provinces had a positive effect on the probability of purchasing seafood products. In contrast, Manrique and Jensen (1998) reported that living in large cities had a negative effect on the probability of purchasing seafood products. In Turkey, a study by Vuru (1997) reported that as families' duration of living in large cities increased, the ratio of consuming and purchasing frozen food also increased.

Peas: In accordance with the model developed for pea price demand theory, its coefficient was found to be negative and statistically significant. The increase of size of households has a positive impact on demand for peas. As the number of individuals increases, sales of peas increase. In the peas demand equation, income coefficient was positive and statistically significant. As the income of the consumers increased, purchasing amount also increased. The dummy variable, which represented the transition to purchases of frozen peas, was found to be statistically significant and positive. This result indicates that consumers may be willing to pay a price premium for peas. It was found that consumer would agree to pay a price of 82.3% for frozen peas. A demand shift can take place from fresh pea consumption to frozenpea consumption. λ was found to be statistically significant that indicates both the group of consumers who purchase frozen peas and also those, who do not should be evaluated collectively in the demand model.

According to the selection equation, families that include women and individuals over the age of 50 have a lower probability of purchasing peas. Education status was found to be statistically significant and positive.
As the educational level increased, families' probability of purchasing peas increased. Vuru (1997) reported that as the educational level of family members increased, the ratio of consuming or purchasing frozen food products increased. Dasgupta et al. (2000) reported that as the education level of consumers increased, the probability of purchasing frozen food also increased. Park and Capps (1997) reported that consumers with a higher education level had a higher probability of purchasing convenience food. Fanning et al. (2002) reported that education level was one of the most important variables affecting food expenditure. Living in a large city for a long time was found to be statistically significant and positive. There was a positive relationship between the consumers who purchase frozen food and the habit of purchasing peas. It was found that consumers who had the habit of purchasing frozen food had a higher probability of purchasing peas.

Green beans: As the price of green beans increased, purchasing amount decreased. The price elasticity of green beans is -0.28 which Akbay et al. (2008) found that the price elasticity of green beans was -0.48. The dummy variable, which represented the transition in demand for frozen green beans was found to be statistically insignificant. Therefore it was not possible, in the present study, to calculate the price premium which consumers would be willing to pay for frozen green beans. λ was found to be statistically significant that is referring the consumers who do not buy frozen green beans will have a potential effect on frozen green beans consumption.

According to the selection equation, as the educational level of the consumers increased, the probability of

purchasing green beans also increased. Consumers who had lived in a large city for a longer time had a higher probability of purchasing green beans. It was found that participants who did the shopping themselves had a reduced probability of purchasing green beans.

Strawberries: The increase in the price of strawberries had a negative impact on the level of strawberry consumption. Strawberry purchases increased with income level. A 10% increase in income was shown to increase the level of strawberry purchases by 0.97%. The dummy variable, representing the transition from fresh strawberry consumption to frozen strawberry consumption, was found to be statistically significant and positive. It can be suggested that there is a shift from fresh strawberry consumption to frozen strawberry consumption. The price premium that consumers would pay for frozen strawberries was found to be 108.1%. λ was found to be statistically significant. In the demand model calculated for consumers who would purchase and those who would not purchase strawberries at the various price levels given, a Heckman correction is required and the model is significant after the calculations.

In the selection equation, female consumers had a lower probability of purchasing strawberries at the given price levels. Education was found to be statistically significant and its coefficient was found to be positive. Increased educational level was shown to increase the probability of purchasing strawberries. Consumers living in large cities for a longer time had a higher probability of purchasing strawberries. The presence of individuals over the age of 50 in the household reduced the probability of purchasing strawberries. It was found that consumers who purchased frozen food products had a higher probability of purchasing strawberries.

Cherries: It was observed that as the price of cherries increased, purchases of cherries decreased. The price elasticity of cherries was estimated to be -0.69. It is found that as the number of individuals in a household increased, purchases of cherries also increased. There was a positive relationship between consumer income and cherry purchases. The dummy variable, representing the representing the shift in demand to frozen cherries was found to be statistically significant and positive. The fact that the dummy variable was positive and statistically significant indicates that consumers would be willing to pay a price premium for frozen cherries. The price premium that consumers would be wiling to pay for frozen cherries was found to be 130.2%. λ was found to be statistically significant, which indicates that a Heckman correction is required.

Female consumers had a lower probability of purchasing cherries at the given price levels. As educational level increased, the probability of purchasing cherries also increased. Living in a large city for a long time had a positive impact on cherry purchases. The fact that the consumer himself/herself did the food shopping was found to be statistically significant and its coefficient was found to be negative. The fact that the person himself/herself did the food shopping was linked to a reduced probability of purchasing cherries.

Conclusion

The demand analyses, in which Heckman models were used due to sample selection bias, indicated that price elasticity was - 0.53 for potatoes, -0.49 for peas, -0.28 for green beans, -0.80 for strawberries and -0.69 for cherries. The price elasticities, which were validated by the results of previous studies, fell into the category of low flexible, as expected. Accordingly, an increase in prices of these products would result in proportionally less decrease in their demand. It was found that consumers were not willing to pay a price premium for frozen potatoes and for frozen green beans. Because the price of fresh potatoes is not high in Turkey, consumers of any income level can easily afford buying fresh potatoes. The fact that the price difference between frozen and fresh potatoes is considerably high results in low levels of demand for frozen potatoes. Besides, fresh Potatoes can be found throughout the year, since they can be stored; beans can be produced throughout the year in greenhouses. It is also easy to clean green beans, so these products should be sold in the market with a low price differential between fresh and frozen varieties. For frozen peas, consumers were willing to pay a price premium of 82.3%. It was found that consumers were willing to pay price premium of 108% for frozen strawberries and a price premium of 130% for frozen cherries. This is an expected result for these products, which are particularly used within the baking sector.

This study indicated that consumers would pay a price premium for frozen foods. It was understood that when deciding which products should be produced in frozen form, it would be rational to select those products which can not be stored for a long time or which can not be produced out-of-season in greenhouses. Since almost any kind of fresh fruits and vegetables are available in Turkey all around the year, a high level of potential demand is not expected to exist for frozen fruits and vegetables. Furthermore, in Turkey the women deep freeze fresh vegetables such as peas, broad beans, green beans, okra, at home, when these products are available at lowest prices in the market. Half of the respondents (% 50.2) said that they produced their own frozen products at home. This finding points out a certain level of potential demand for frozen products. However, the fact that the consumers prepare their own frozen food at home reduces the level of demand in the market.In order to increase consumer demand for frozen products, the pricing system of frozen products should be well determined and the economic advantages of the frozen

products should be explained to consumers. For example, frozen foods have the advantage of preventing loss of product such as husks etc. when the product will be consumed. Also, other advantages of frozen foods such as their healthiness compared to out of season greenhouse products, high content of vitamins, ease of cooking and timesaving should be promoted to the consumers. Such promotion would increase the consumers willingness to pay for frozen products. Discounts in the price of frozen food will revive this sector. Promotions or advertising campaigns in supermarkets will contribute to increasing the demand for these products. While organizing activities to promote frozen food, the needs, expectations and habits of the target group should be taken into account.

ACKNOWLEDGEMENT

This article is based on a research project funded by Ege University Scientific Research Project Fund.

REFERENCES

Aegean Exporters' Associations Records, (2008), Izmir.

AFFI (2006). AFFI Research Gauges Consumers' Thoughts on 'What's New' in Frozen Foods (http:www6.lexisnexis.com).

Akbay C, Bilgiç A, Miran B (2008). "Demand Estimation for Basic Food Products in Turkey", J. Agric. Econ., 14(2): 55-65.

Anderson JL, Bettencourt SU, Sofia U (1993). "A Conjoint Approach to Model Product Preferences: The New England Market for Fresh and Frozen Salmon", Mar. Resour. Econ., 8: 31-49.

Caponi V, Plesca M (2000). The Choice For Higher Education In Canada: A Comparison Of Returns From High School, Community College And University, Department of Economics, University of Western Ontorio, Canada.

Cheng H, Capps jr (1988). "Demand Analysis of Fresh and Frozen Finfish and Shellfish in the United States", Am. J. Agric. Econ., 70(3): 533-542.

Dasgupta S, Foltz J, Jacobsen B (2000), "Trout Steaks: Consumer Perceptions of a New Food Item", J. Food Distr. Res., 31(3): 37-48.

Erdo an S (1999), "Basic Human Capital Model: An Econometric Approach in Selected Cities, J. Dokuz Eylul University, Faculty of Admin. Sci., 14: 75-95.

Fanning J, Marsh T, Stiegert K (2002), Determinants of Fast Food Consumption, WAEA Selected Paper, Long Beach, CA.

Fersterer J, Winter-Ebmer R (1999). Are Austrian Returns to Education Falling Over Time? University of Linz, Austria.

Gordon DV, Hannesson R (1996), "On Prices of Fresh and Frozen Cod Fish in European and U.S. Markets". Mar. Resour. Econ., 11(4): 223-238.

Gray M (2000), The Effects Of Unemployment on The Earnings of Young Australians, Research School of Social Sciences, Australian National University, Discussion Paper No. 419, Australia.

Guenthner JF, Lin BH, Levi AE (1991), "The Influence of Microwave Ovens on the Demand for Fresh and Frozen Potatoes", J. Food. Distr. Res., 22(3): 45-52.

Harmon C (2003), Logit, Probit, Cencored Regression Model and Heckman Two Step Estimator, Department of Economics, University College Dublin, Ireland.

Heshmati A (1994). Estimating Random Effects Production Function Models with Selectivity Bias: An Application to Swedish Crop Producers, 11: 171-189.

Holmes J (2003), "Measuring the Determinants of School Completion in Pakistan: Analysis of Censoring and Selection Bias", Econ. Educ. Rev., 22: 249-264.

Kingdon GG, Unni J, India A (2000), Education and Women's Labour Market Outcomes In India, Department of Economics, University of Oxford.

Lanzona LA (1998). "Migration, Self -Selection and Earnings in Philippine Rural Communities", J. Dev. Econ., 56: 27-50.

LeClere F, McLaughlin DK (1997), "Family Migration and Changes in Women's Earnings: A Decomposition Analysis", Population Res. Policy Rev., 16: 315-335.

LeGrand L (1992), "Fish Products: A Summary of Trends in the UK", Br. Food J., 94(9): 31-36.

Lye JN, Hirschberg J (2000), Alcohol Consumption, Smoking and Wages, Department of Economics, University of Melbourne, Australia.

Manrique J, Jensen HH (1998), "Spanish Household Demand For Seafood Products", Selected Paper, American Agricultural Economics Association, 1998 Annual Meeting, August 2-5, Salt Lake City, UT, 12p.

Mojduszka Eliza M, Caswell JA, Harris JM (2001), "Consumer Choice of Food Products and the Implications for Price Competition and Government Policy". Agribusiness, 17(1): 81-104.

Mojduszka EM, Everett RM (2005). Determinants of Consumer Choices of Prepared Frozen Meals and Salted Snacks Over Time, Selected Paper Prepared for Presentation at the 2005 Annual Meeting of the American Agricultural Economics Association, July 24-27, Providence, Rhode Island.

Montgomery NB (1986), "Economıcs of The Frozen Food Distribution System", J. Food Distr. Res., 17(1): 11-14.

Mroz T (1987). "The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumptions". Econometrica, 55(4): 765-800.

Nawata K (2003). Estimation of the Female Labor Supply Models by Heckman's Two-Step Estimator and the Maximum Likelihood Estimator, Mathematics and Computers in Simulation, (article in press). Newbold P (1995). Statistics For Business and Economics, Prentice Hall International Editions.

Park JL, Capps OJR (1997). "Demand for Prepared Meals by U.S. Households", Am. J. Agric. Econ., 79(3): 814-824.

Pazarlıo lu MV, Miran B,.Üçdo ruk , Abay C (2007). "Using Econometric Modelling Demand for Fluid and Farm Milk: A Case Study From Turkey". Food Qual. Preference, 18: 417-424.

Robbins DJ (1999), Gender, Human Capital And Growth: Evidence From Six Latin American Countries, OECD Development Centre, France.

Serumaga-Zake P, Kotze D (2003). Determinants of Labour Force Participation of married women in South Africa, University of the Western Cape, Republic of South Africa.

Sweeney K (2003). Implementing and Interpreting Sample Selection Models, Political Research Lab, Department of Political Science, The Ohio State University, USA.

Tambi NE (2001). "Analysis of Household Attitudes Toward the Purchase of Livestock Products and Fish in Cameroon". Agric. Econ., 26(2): 135-147.

Tansel A (1995). The Return of Education in Turkey and Selected Countries, Department of Economics, Middle East Technical University, Turkey.

Tansel A (1998). Earnings of Turkish Workers Before and After Dismissal Due to Privatization, Department of Economics, Middle East Technical University, Turkey.

Ta cı HM,.Darıcı B (2009). "An Examination of Unemployment by Gender in Turkey Using Individual Level Data Under Alternative Definitions of Unemployment ". Elect, J, Soc, Sci, Spring, 8(28): 139-159.

Turkish Statistical Institute (TSI) (2000). Population Statistics (http://www. tuik.gov.tr)

Vickner SS, Davies SP, Fulton JR, Vantreese VL (2000). "Estimating Market Power and Pricing Conduct for Private-Label and National Brands in a Product-Differentiated Oligopoly: The Case of a Frozen Vegetable Market", J. Food Distr. Res., July 2000, pp. 26-38.

Vuru H (1997). Socio-Economic Factor Determining Consumption of Frozen Foods: A Cross-Sectional Study in Adana Province,

Çukurova.University, Institute of Sciences, Department of Agricultural Economics (Unpublished Master's Thesis), Adana.