

Consumer characteristics influencing milk consumption preference. The Turkey case

Rüştü YAYAR

University of Gaziosmanpaşa, 60240, Tokat, Turkey
rustu.yayar@gop.edu.tr

Abstract. *The objective of this study was to investigate packed and unpacked fluid milk consumption and preferences among Turkish households using the data from a consumer survey. Multinomial logit procedure was used to investigate the selected socioeconomic and demographic characteristics of consumers that determine households' fluid milk consumption choices among packed, unpacked and both packed-unpacked milk consumption choices. Based on the results, 30.5% of respondents consumed only unpacked fluid milk, 36.3% consumed only packed fluid milk and 33.1% of respondents consumed both unpacked and packed fluid milk. Empirical results indicate that better educated household heads, higher income and larger households, and households with children under seven years of age consumed more packed milk than others. A similar result was found for unpacked milk consumption, except for a negative effect of education, working wife and income. Milk production and manufacturing firms are increasing in Turkey; results of this study provide some relatively new information about the consumers' fluid milk consumption decision.*

Keywords: consumption; consumer preference; household survey data; multinomial logitanalysis; Turkey.

JEL Codes: D12, C35.

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1. Introduction

Milk is the most essential food to humans and contains nearly all nutrients. Milk and milk products are an important source of many nutrients as protein, calcium, phosphorus, vitamin B2 and vitamin B12. Those products should be consumed especially by adults female, children and young people and all ages each day (Unal, Besler, 2006).

Milk provides calcium necessary for strong bones, proteins needed for brain development and tissue growth, vitamin A for normal vision, and vitamin D for absorption of calcium (Black et al., 2002, Lonnerdal, 2003). People are advised to consume two glasses of milk a day. It is reported that a child who drinks a glass of milk every day meets 35 per cent of protein requirements, 52 percent of the calcium requirement, 98 percent the requirement of vitamin B12 (Setbir, 2009).

Although intake of a sufficient amount of fluid milk and milk products is recommendatory for healthy lifestyle of humans, consumers' fluid milk consumption behavior and preferences may vary among countries. There is a significant gap between developed and developing countries in terms of fluid milk consumption.

Consumption of fluid milk in Turkey is quite low compared to those of European countries. Economic reasons often limit fluid milk consumption in Turkey. Annual per capita consumption of fluid milk in Turkey is about 24 liters whereas it is above 100 liters in European Countries. In developed countries, consumption of this important food source is given a special importance. Annual per person consumption of fluid milk is 139 liters in Finland, 100 liters in England and 63 liters in Italy (Setbir, 2009).

Annual per capita consumption of dairy products, with fluid milk consumption is 255 in the US and 262 kilograms in the EU. In Turkey a total of 166 kg milk per capita is consumed annually, 26 kg of which is fluid milk and 140 kg is dairy products. Consumption of dairy products (as equivalent milk) is 85 kilograms cheese, 31 kilograms yogurt, 21 kilograms butter, 1.36 kilograms ice cream and 1.54 kilogram milk powder (TOBB, 2010).

In Turkey, dairy sector has developed, but there are various problems in the sector from production to last link of the consumption. The number of animals per farm and milk yield obtained per animal is low. Most farmers do not produce milk to sell at the market. Milk is collected from small scale businesses and this situation increases the cost of the industrialists. This is reflected in consumer prices. Under these conditions, low income groups cannot afford milk and decrease their demand (TZOB, 2008).

According to statistics, approximately 20% of raw milk produced in Turkey is consumed at the source. The milk supply to the market is processed by modern enterprises (27%) and by medium-sized enterprises or dairies (33%). 20% of milk is sold as open by hand seller. However, in developed countries, more than 90% of raw milk is sold in modern factories (TOBB, 2010).

Looking at these rates; milk consumption pattern in developing countries such as Turkey is quite different from more developed countries. As a developing country in Turkey, fluid milk is still consumed as unpacked milk, which is often unhygienic. Recent researches results showed that unpacked fluid milk contained pathogenic organisms above tolerable limits in Turkey (Altun, Besler, Unal, 2002).

There are several reasons why some consumers prefer unpacked milk whereas others prefer packed milk. Unpacked milk is preferred by some consumers because it is cheaper than packed milk and delivered at the doorstep with no additional cost. Unpacked fluid milk is mainly delivered to consumers directly by individual farmer-distributors in Turkey. The milk sellers deliver unpacked fluid milk directly from farms to residential areas, doorsteps and come to the same delivery point every day or certain days of week. This marketing structure enables farmer-distributors to avoid paying tax and sale fees. More importantly, unpacked fluid milk is delivered to consumers without having any safety controls. Furthermore, milk sellers incur no packing costs since consumers supply their own milk containers. Hence, the price of unpacked fluid milk is much lower than processed milk, and this might stimulate households, especially those with a low income, to select unpacked fluid milk as their primary fluid milk source. In addition to price concerns, processing fluid milk into yogurt and some other usages are also important factors with respect to purchasing unpacked fluid milk (Hatirli et al., 2004).

Consumers prefer packed milk because of its guarantee of quality, long shelf life, and packaging to carry and store. The desire to purchase a safe food product is also a reason to prefer packed fluid milk. In fact, not only education, age, income, and other demographic characteristics of consumers influence pasteurized and sterilized milk consumption choices but also factors such as increasing consumer awareness and concerns about health and food safety, and advertising play important roles (Akbat, Yildiz Tiryaki, 2008).

Today, in developed countries, fluid milk consumption pattern has changed. Due to health concerns, aging of the population, increased education and income level factors in developed countries, low-fat milk consumption has shown an increase but per-capita consumption of whole-fat milk has decreased (Jensen, 1995). In contrast, consumption of fluid milk in developing countries

has not peaked yet and unpacked fluid milk takes a significant share of fluid milk consumption (Hatirli et al., 2004).

The study focused on socioeconomic and demographic factors influencing consumers' different fluid milk consumption preferences. Our study includes two types of fluid milk: unpacked milk and packed fluid milk.

There is a considerable literature on the effects of socioeconomic and demographic characteristics on milk consumption patterns and preferences. Many studies have investigated consumers' attitudes toward aggregate fluid milk purchases and consumption (Ward, Dixon, 1989, Gould et al., 1990, Reynolds, 1991, Cornick et al., 1994, Gould, 1996, Watanabe et al., 1997, 1998, Green, Park, 1998a, Hsu, Kao, 2001, Celik et al., 2006, Pazarlioglu et al., 2006, Gunden et al., 2011). One finding of these studies is that socioeconomic and demographic factors can be important in determining consumer's preference and milk consumption.

There are several studies which have focused on aggregate consumption of individual milk such as whole milk, low-fat milk, and skim milk (Briz et al., 1998, Cornick et al., 1994, Gould, 1996, Gould et al., 1990, Green, Park, 1998a, Jones, Akbay, 2000, Schmit et al., 2002), on aggregate milk consumption (Capps, Schmitz, 1991, Ward, Dixon, 1989) and on private and national brands milk (Akbay, Jones, 2005, Green, Park, 1998b, Jones et al., 2003).

However, investigation of the characteristics of consumers who exhibit preference specifically toward unpacked and packed milk, such as sterilized and pasteurized milk, are more important for Turkey. Because in Turkey other functional uses of the milk is not yet widely.

A few studies focused on milk consumption decisions of consumers for a specific region, effects of socioeconomic and demographic factors on milk consumption decisions in Turkey. Hatirli et al. (2004) studied the factors affecting fluid milk purchasing sources with respect to packed and unpacked fluid milk products in Turkey, Simsek et al. (2005) investigated drinking milk consuming habits of 1,000 interviewers representing four different social and economic groups, Akbay and Yildiz Tiriyaki (2008) investigated unpacked and packed fluid milk consumption patterns and preferences among Turkish households. Another study of Yildiz Tiriyaki and Akbay (2008) related consumers' fluid milk consumption and preference in Turkey Kilic et al. (2009) analyzed unpacked and packed fluid milk preferences using consumer survey data from Samsun province of Turkey.

2. Data and method

Data used in this analysis were based on household cross-sectional data collected by the research team, conducted in September 2011 for the urban area of Tokat province in Turkey. The survey was carried out on consumers using face to face questionnaire. In this study, proportional stratified sampling method was employed. Proportional stratified sampling was based on geographical location of households for each district in the population. The major advantage of this sampling method is that it guarantees representation of defined groups in the population. Hence, it improves the precision of inferences made to the full population. For this purpose, Tokat province was divided into four geographical locations for survey data. There are significant socioeconomic differences among the households across these districts. Before collecting data, a pilot survey was carried out by a group of randomly selected households and these pre-tested surveys were not included in the final data set. There are around 137,000 households living in Tokat province.

A random sample of 347 households was surveyed. In the questionnaire form, households answered questions about their choices of purchasing fluid milk alternatives and provided socioeconomic information.

Multinomial logit model was used for analysis of households' fluid milk choices. According to the objectives of this article, multinomial logit model was used to analyze households' packed and unpacked milk consumption decisions as a function of socioeconomic and demographic factors. Multinomial logit model describes the behavior of consumers when they are faced with a variety of goods with a common consumption objective. However, the goods and choices must be highly differentiated by their individual attributes. The multinomial logit model has been used widely in some studies such as Wei et al. (2004); Pundo and Fraser (2006); Chidmi (2007); Timothy (2007); Akbay and Yildiz Tiryaki (2008); Burda et al.(2008); Antonopoulou et al. (2009); James et al. (2009); Bajari et al. (2010); Caglayan and Dayioglu (2011); Christopher et al. (2011); Moser and Raffaelli (2012); Pulina, (2010); Matin et al. (2012); Moser and Raffaelli (2012); Aprile et al. (2012).

To analyze households' fluid milk consumption behavior, we applied chi-square test of independence and multinomial logit model. Chi square test of independence was used to investigate the effects of socioeconomic and demographic characteristics on consumers' packed and packed fluid milk consumption behavior. Multinomial logit procedure was used to determine the extent to which selected socioeconomic and demographic characteristics of consumers influence these fluid milk types.

A different sort of model is necessary to deal with unordered responses. The most popular of these is the multinomial logit model, sometimes called the multiple logit models, which have been widely used in applied work (Davidson, MacKinnon, 2004).

According to the responses, dependent variables were created from the data, which indicated the consumption of unpacked fluid milk (1), packed fluid milk (2), and both unpacked and packed fluid milk (0) (Greene 2002).

The multinomial logit model for fluid milk consumption preference is

$$Prob(Y_i = j) = \frac{e^{\beta_j' x_i}}{\sum_{k=0}^j e^{\beta_k' x_i}} \quad \text{for } j = 0, 1, \dots, J. \quad (1)$$

where:

i index the observation, or individual, j and k index the choices, Y_i is the predicted probability of fluid milk consuming households selecting the J^{th} alternative, x_i is a vector of variables including education level and age of household head, household size, having working housewife, presence of children less than seven years old, and household income and β_j are vectors of unknown parameters.

The estimated equations provide a set of probabilities for the $J + 1$ choice for a decision maker with characteristic x_i . Before proceeding, we must remove indeterminacy in the Multinomial logit model which is under identified in the current form in Eq. (2). In order to identify the parameters of the model, it is required to remove indeterminacy in the model. We normalized the model assuming $\beta_0 = 0$ that is reference choice is “packed and unpacked fluid milk”. Eq. (2) can be expressed as:

$$Prob(Y_i = j | x_i) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^j e^{\beta_k' x_i}} \quad \text{for } j = 0, 1, \dots, J, \beta_0 = 0. \quad (2)$$

Multinomial logit model (2) can be estimated by the maximum likelihood method. The coefficient estimates for the β_j vectors that maximize the log likelihood function can be obtained using the Newton method using LIMDEP computer software (Greene, 2002). Estimated coefficients β do not allow direct determination of marginal effects in multinomial logit models but measure the marginal change in the logarithms of odds alternatives j over the reference alternative.

The coefficients in Eq. (2) are difficult to interpret. The marginal effects and predicted probabilities give better indications and represent changes in the dependent variable for given changes in a particular regressor whereas holding the other regressors at their sample means. These are obtained from the logit regression results by the following equation (Greene, 2002):

$$\delta_j = \frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{k=0}^j P_k \beta_k \right] = P_j [\beta_j - \bar{\beta}]. \quad (3)$$

We include several demographic variables, namely dummy variables for having working woman and the household with child less than seven years old, two dummy variables for household size, and three dummy variables for age of the household head, three dummy variables for education of the household head, two dummy variables for household income. These variables are common variables that have been used in previous papers (Cornick et al., 1994, Gould, 1996, Hatirli et al., 2004, Hsu, Kao, 2001, Watanabe et al., 1997, Bus, Worsley, 2002, Akbay, Yildiz Tiryaki, 2008, Alwis, Athauda, 2009, Kilic et al., 2009, Lefevre, 2011).

The explanatory variables, their definitions, arithmetic means, and standard deviations are presented in Table 1. All the variables used in model are discrete variables. According to the survey results, the average household size was found to be 4.19 people that are more than the average household size (3.8 people) of Turkey (TurkStat, 2009). The survey results illustrate that 21.9% of household heads were elementary school or less graduates, 18.7% were secondary school graduates, 28.0% were high school graduates and 31.4% were university graduates. Survey results revealed that 30.5% of households purchased unpacked milk, 36.3% of households purchased packed milk and, 33.1% of households purchased both of them.

The main hypothesis is that the preference for packed and unpacked fluid milk consumption is influenced by socioeconomic and demographic characteristics of the households, in particular household size and income, and the age, and education of the household head. The higher education levels of family members are often included in cross-sectional studies, but with varying results. Generally, higher education and economic status may be positively correlated with the healthy dietary patterns (Watanabe et al., 1998, Akbay, Yildiz Tiryaki, 2008). It is hypothesized that better educated consumers have higher preferences for packed milk than less educated consumers.

Table 1

Definitions and descriptive statistics of explanatory variables

Variable definitions	Variable name	Mean	Standard deviation
Education level of household head	EDU		
Elementary school or less=1; otherwise=0	EDU1*	0.219	0.414
Secondary school = 1; otherwise = 0	EDU2	0.187	0.391
High school = 1; otherwise = 0	EDU3	0.280	0.449
University degree= 1; otherwise = 0	EDU4	0.314	0.465
Age of the household head	AGE		
Less than 31 years old=1; otherwise=0	AGE1*	0.277	0.448
Between 31 and 45 years old=1; otherwise=0	AGE2	0.334	0.472
Between 46 and 55 years old=1; otherwise=0	AGE3	0.259	0.439
Older than 51 years old=1; otherwise=0	AGE4	0.130	0.336
Number of the members in the family	SIZE		
Less than 4=1; otherwise=0	SIZE1*	0.296	0.458
Between 4 and 5=1; otherwise=0	SIZE2	0.548	0.498
More than 5=1; otherwise=0	SIZE3	0.156	0.363
Child less than 7 years of age (yes=1; no=0)	CHILD	0.265	0.442
Household with working wife (yes=1; no=0)	WEMP	0.254	0.436
Household income groups	INC		
≤ 1000 TL=1; otherwise = 0	INC1*	0.386	0.488
1001 TL-1999 TL=1; otherwise = 0	INC2	0.435	0.496
≥ 2000 TL=1; otherwise = 0	INC3	0.179	0.384

* Reference category from the models to avoid multicollinearity problem.

Age of the household head is included in the analysis. Age has also been included in previous studies, again with varying results (Cornick et al., 1994, Gould, 1996, Gould et al., 1990, Hatirli et al., 2004, Akbay, Yildiz Tiryaki, 2008). We expect that younger household heads may be more informed. It is hypothesized that the younger household heads are more likely to consume packed milk, and older household heads are more likely to consume unpacked milk.

We expect that household size and the number of the children in the household influence households' milk choices. It is hypothesized that unpacked milk consumers live in larger families than packed milk consumers. Packed milk consumers are also more likely to have a child under seven years living in their families than others.

Labor participation often found to be a significant (positive) determinant of milk consumption. It is hypothesized that households with a working wife are more likely to consume packed fluid milk.

In this study, household income is included in the model as a series of dummy variables. We expect that households with higher incomes are more likely to consume packed milk. Similar to education effects, it is hypothesized that higher-income households are more likely to consume packed milk over

unpacked milk, and lower-income households are more likely to consume unpacked milk.

3. Empirical results

In this section, findings from chi-square and logistic regression analysis are discussed.

The summary statistics of socioeconomic and demographic variables used in chi-square are presented in Table 2.

Table 2 shows the cross-tabulations of unpacked fluid milk, packed fluid milk and unpacked-packed fluid milk choices considering households' socioeconomic and demographic characteristics. All of the socioeconomic and demographic variables were statistically significant at the 5% level of probability or better, with the exception of the one variable (CHILD).

Table 2

Socioeconomic and demographic characteristics of households and milk consumption

Variable definitions	Unpacked milk	Packed milk	Unpacked and packed milk	Chi-square	<i>p</i> -values
Education level of household head					
Elementary school or less	56.6	21.1	22.4	66.541	0.000
Secondary school	47.7	21.5	30.8		
High school	22.7	36.1	30.8		
University degree	9.2	56.0	34.9		
Age of the household head					
Less than 31 years old	20.8	44.8	34.4	15.647	0.016
Between 31 and 45 years old	36.2	32.8	31.0		
Between 46 and 55 years old	25.6	33.3	41.1		
Older than 55 years old	46.7	33.3	20.0		
Number of members in the family					
Less than 4 persons	21.4	43.7	35.0	13.237	0.010
Between 4 and 5 persons	31.6	37.4	31.1		
More than 5 persons	44.4	18.5	37.0		
Household with children less than seven years of age					
Households without child	31.8	33.3	34.9	3.715	0.156
Households with children	27.2	44.6	28.3		
Household with working wife					
Unemployed	38.2	31.3	30.5	28.984	0.000
Employed	8.0	51.1	40.9		
Household income groups					
Lower-income	46.3	31.3	22.4	30.451	0.000
Middle-income	23.8	35.8	40.4		
Higher-income	12.9	48.4	38.7		

Results also point out that better educated consumers had higher preferences for packed milk than less educated consumers. This finding implies that higher educated household head are more concerned about safety and hygienic conditions of milk. This result is consistent with the prior expectation that consumers with higher education were more likely to consume packed milk than those of less educated consumers.

In this study, the preference of packed milk consumption varies according to age. The choice of unpacked milk consumption was statistically meaningful.

Chi-square test of independence showed that unpacked milk consumers lived in large families, and packed milk consumers lived small families. The results suggest that larger families were more likely to consume unpacked milk, and small families packed milk.

Employment status of housewives may affect consumers' packed or unpacked milk consumption preferences. The results pointed out that non-working housewives were more inclined to choose the unpacked milk, while those working housewives were more inclined to choose packed milk.

Survey results revealed that higher-income consumers tended to consume packed milk. In contrast, lower-income consumers consumed unpacked milk.

Packed fluid milk consumers were more likely to be less than 31 years old, from households with less than four persons, had at least a high school or university degree level of education, and higher household income. Unpacked fluid milk consumers were more likely to be between 31 and 45 years old or older than 55 years old, from households with more than four persons, had at most elementary and secondary school level of education, and lower household income.

The results of the multinomial logit models for households' preference for fluid milk with respect to socioeconomic and demographic factors are presented in Table 3. The model has been estimated by the maximum likelihood method.

A likelihood ratio test that tests whether all the coefficients in the binomial logit model equal zero is highly significant at the 0.000 level as indicated by the chi-square value of 113.8. The model predicts 51.6% of the observations correctly.

In this study, the fluid milk choice of unpacked, packed, and packed-unpacked milk consumption choices can be considered as distinct categories.

Table 3 shows the results from the multinomial logit models for households' preference for the fluid milk consumption choices. Six variables, EDU3, EDU4, AGE2, AGE4 WEMP, and INC2 have statistically significant coefficients for the unpacked fluid milk category.

The marginal effects and predicted probabilities gave better indications of how changes in the regressors affected the probability of a particular event. The

marginal effects in Table 3 represent the change in the dependent variable for the given change in a particular regressor while holding the other regressors at their sample means.

Education level of the household head affects the household's packed fluid milk consumption positively. The positive and statistically significant coefficients imply that the individuals with a higher than secondary education were the most likely to consume packed fluid milk than those of less educated individuals. Households with a more educated household head are more likely to consume packed milk. The results indicate that education level of the household head, on the other hand, was related negatively to the probability of unpacked milk consumption, *ceteris paribus*. The negative and statistically significant coefficients imply that household heads with more than elementary school education were less likely to consume unpacked milk than households with less-educated heads. For example, the estimated coefficient for the university-graduated household head was -1.582, which is lower than the corresponding coefficients for high school (-1.230) education. These findings are in line with the findings of Rauniker and Huang (1984), Cornick et al. (1994) and Gunden et al. (2011). Armagan and Akbay (2008) found a negative relation between education and milk consumption as the milk consumption was aggregated in their analysis. Marginal effects of the education variables indicate that a household whose head was university graduate was about 31.3% more likely to consume packed milk. Similarly, a household headed by a high school graduate was about 12.7% more likely to consume packed milk.

Multinomial logit results indicate that household size had a negative impact on the probability of packed fluid milk consumption versus unpacked fluid milk consumption. Large household had 21.3% higher probability of consuming unpacked milk. This means that as the household size increased, the household tended to consume unpacked fluid milk instead of packed fluid milk. This result is consistent with our prior hypothesis that larger households are more likely to consume unpacked milk and smaller households are more likely to consume packed milk.

The results were consistent with previous findings obtained from analysis of household demand patterns for different milk type products (Ratnam, Spielmann, 1972, Gould et al., 1990, Cornick et al., 1994, Gould, 1996, Yen et al., 2004, Akbay et al., 2007, Armagan, Akbay, 2008, Pazarlioglu et al., 2006).

Table 3

Multinomial logit results for fluid milk consumption preferences of the households

Variables	Unpacked milk vs. both packed and unpacked milk		Packed milk vs. both packed and unpacked milk		Packed milk vs. unpacked milk	
	Coefficients (SE)	Marginal effects	Coefficients (SE)	Marginal effects	Coefficients (SE)	Marginal effects
EDU2	-0.545(0.453)	0.115	-0.468(0.520)	-0.057	0.077(0.465)	-0.058
EDU3	-1.230*** (0.443)	0.107	0.034(0.458)	-0.234	1.264*** (0.440)	0.127
EDU4	-1.582*** (0.548)	0.049	0.673(0.496)	-0.362	2.255*** (0.531)	0.313
AGE2	0.809** (0.419)	-0.064	-0.070(0.355)	0.158	-0.880** (0.416)	-0.095
AGE3	-0.388(0.468)	0.045	-0.068(0.397)	-0.066	0.320(0.475)	0.021
AGE4	1.358** (0.567)	-0.239	0.823(0.532)	0.175	-0.535(0.538)	0.064
SIZE2	0.145(0.382)	-0.014	0.009(0.314)	0.026	-0.136(0.373)	-0.012
SIZE3	-0.035(0.483)	0.131	-0.912*(0.485)	0.082	-0.877*(0.524)	-0.213
CHILD	0.099(0.385)	-0.078	0.492(0.329)	-0.029	0.393(0.376)	0.107
WEMP	-1.356*** (0.517)	0.115	0.058(0.347)	-0.260	1.415*** (0.521)	0.145
INC2	-1.023*** (0.351)	0.210	-0.831** (0.344)	-0.111	0.193(0.355)	-0.098
INC3	-0.676(0.606)	0.169	-0.768*(0.479)	-0.524	-0.092(0.611)	-0.117
Constant	1.033** (0.516)	-0.144	0.355(0.493)	0.159	-0.677(0.502)	-0.016

Note: Log likelihood: -323.462. Restricted log likelihood: -380.352. Chi-square (24): 113.7807; *P*-value: 0.0000.

Correctly prediction: 51.6%.

*, ** and *** indicate statistical significance at the 10%, 05%, and 1% levels, respectively.

WEMP was used as a dummy variable equal to 1 when a household had a working wife and zero otherwise. As expected, the results indicate that fluid milk consumption decisions were statistically influenced by the employment status of the household wife. Households with a working housewife were more likely to consume packed fluid milk than the households with an unemployed wife. As shown in Table 3, for a household with working housewife, the probability of consuming packed fluid milk increased by 14.5%. This is consistent with the finding of Dong and Kaiser (2001) who reported that employment status of the female-headed household is negatively related to fluid milk consumption. Kilicet al. (2009) found that households with a working housewife are more likely to consume packed fluid milk than the households with an unemployed wife.

As expected, the results show that income had a negative impact on unpacked fluid milk consumption. Middle income coefficient was statistically significant, indicating that the households with middle incomes were less likely to purchase unpacked fluid milk than lower-income households. As income increased, the probability of choosing the same alternative increased rather than substitution for other alternatives. Marginal effects of income variables indicate that households in the middle-income group were about 21.0% more likely to

consume unpacked milk, but 11.1% less likely to consume packed fluid milk compared to those lower-income households.

This is consistent with the findings of Bus and Worsley (2003), Watanabe et al. (1998), Dong and Kaiser (2001) and Celik et al. (2006), who reported that income influences positively the probability that household consume fluid milk. Akbay and Yildiz Tiryaki (2008) and Kilic et al. (2009) reported that household income is positively related to unpacked fluid milk consumption.

The influence of the age of the household head was examined to give some ideas of tastes among the relatively young who could have a greater bearing on consumption patterns in the future. It was also considered because consumers' life cycles affect food consumption patterns. Results of multinomial logit indicated that increasing age of household head increased the probability of consuming unpacked fluid milk, but decreased the probability of consuming packed fluid milk. This finding implies that fluid milk consumption preferences were strongly linked to cultural, psychological, and behavioral factors. The results of the marginal effects suggest that for a household head more than 55 years old, the probability of consuming unpacked fluid milk was 23.9% lower than household head younger than 31 years old. This is consistent with the finding of Akbay and Yildiz Tiryaki, (2008) and Kilic et al. (2009) who reported that increasing age of the household head is positively related to unpacked fluid milk consumption.

These results suggest that the socio-economic and demographic characteristics of the household and household head play an important role in fluid milk consumption among the Turkish households. Similar results have been reported on other study areas.

4. Conclusions

In this study, we examined the impact of various factors affecting on households' choices of packed and unpacked fluid milk consumption. Multinomial logit model was used to analyze the household data.

The findings of this study suggest that the socioeconomic and demographic characteristics of the households and their heads play an important role in fluid milk consumption choices.

Results revealed that better educated household heads, higher income and larger households, and households with children under seven years of age were associated with the use of packed milk. A similar result was found for unpacked milk consumption, except for a negative effect of education, working wife and income.

Income and education were primary reasons for purchasing unpacked milk, as it was perceived to be quite cheap compared with packed milk. When substantial increases in income and education level of consumers take place, a marked shift in preference from unpacked to packed milk could probably occur.

Empirical findings of our study have important implications and strategies for milk producers and companies. Because milk production and manufacturing firms are increasing very rapidly in Turkey, results of this study provide some relatively new information about the consumers' fluid milk consumption decision.

Research findings are quite consistent with the expected behavior of Turkish consumers and provide a clear picture of the fluid milk consumption behavior. It is hoped that the findings of this study help to both domestic and foreign companies in Turkey to design pricing and promotion strategies and other marketing strategies for fluid milk consumption. Unpacked fluid milk marketing has been prohibited by law. Despite the legal prohibition of unpacked milk market, a significant share of fluid milk in Tokat is delivered to consumers as unpacked fluid milk without having any inspection. It is suggested that the Turkish government should take necessary actions to prevent marketing of unpacked fluid milk. In order to improve fluid milk marketing system, Turkish government needs to establish some standards in the fluid milk marketing system and impose high amount of charges for unpacked fluid milk sellers.

References

- Altun, B., Besler, T. Unal, S., "Evaluation of fluid milk sold in Ankara", *STED*, 11(2), 2002, pp. 51-55
- Akbay, C., Jones, E., "Food consumption behavior of socioeconomic groups for private labels and national brands", *Food Quality and Preference*, 16, 2005, pp. 621-631
- Akbay, C., Boz, I., Chern, W.S., "Household food consumption in Turkey", *European Review of Agricultural Economics*, 24, 2007, pp. 1-23
- Akbay, C., Yildiz Tiryaki, G., "Unpacked and packed fluid milk consumption patterns and preferences in Turkey", *Agricultural Economics*, 38(1), 2008, pp. 9-20
- Alwis, A.D., Athauda, A., "Analysis of factors affecting fresh milk consumption among the mid-country consumers", *Tropical Agricultural Research and Extension*, 12(2), 2009, pp.103-109

- Antonopoulou, L., Papadas, C.T., Targoutzidis, A., "The impact of socio-demographic factors and political perceptions on consumer attitudes towards genetically modified foods: an econometric investigation", *Agricultural Economics Review*, 10(2), 2009, pp. 89-103
- Aprile, M.C., Caputo, V., Nayga Jr., R.M., "Consumers' valuation of food quality labels: the case of the European geographic indication and organic farming labels", *International Journal of Consumer Studies*, 36, 2012, pp. 158-165
- Armagan, G., Akbay, C., "An econometric analysis of urban households' animal products consumption in Turkey", *Applied Economics*, 40, 2008, pp. 2029-2036
- Bajari, P., Chan, P., Kruger, D., Miller, D., "A dynamic model of housing demand: estimation and policy implications", *Working Paper* No. 15955, 2010, National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138, USA
- Black, R.E., Williams, S.M., Jones, I.E., Goulding, A., "Children who avoid drinking cow milk have low dietary calcium intakes and poor bone health", *American Journal of Clinical Nutrition*, 76, 2002, pp. 675-80
- Briz, J., Ward, R., Felipe, I., "Habit formation and demand system estimates for fluid milk in Spain", *International Food and Agribusiness Management Review*, 1(4), 1998, pp. 477-493
- Burda, M., Harding, M., Hausman, J., "A Bayesian mixed logit-probit model for multinomial choice", *Journal of Econometrics*, 147(2), 2008, pp. 232-246
- Bus, A.E.M., Worsley, A., "Consumers' Health Perceptions of Three Types of Milk: A Survey in Australia", *Appetite*, 40(2), 2002, pp. 93-100
- Caglayan, E., Dayioglu, T., "Comparing the parametric and semi parametric logit models: household poverty in Turkey", *International Journal of Economics and Finance*, 3(5), 2011, pp. 197-207
- Capps, O.J., Schmitz, J.D., "A recognition of health and nutrition factors in food demand analysis", *Western Journal of Agricultural Economics*, 16(1), 1991, pp. 21-35
- Celik, Y., Bilgic, A., Karli, B., Celik, S., "Factors affecting milk consumption pattern in southern Anatolian region: An application of a two-stage econometric model", *Die Bodenkultur*, 57(2), 2006, pp. 57-64
- Chidmi, B., "Supermarket price competition in Dallas Fort Worth fluid milk market", *Southern Agricultural Economics Association Meeting. Selected Paper*, Mobile Alabama, February 4-7, 2007, USA
- Christopher, A.W., Glynn, T.T., Nicole, J.O., "Understanding U.S. consumer demand for milk production attributes", *Journal of Agricultural and Resource Economics*, 36(2), 2011, pp. 326-342
- Cornick, J., Cox, T.L., Gould, B.W., "Fluid milk purchases: a multivariate tobit analysis", *American Journal of Agricultural Analysis*, 76, 1994, pp. 74-82
- Davidson, R., Mackinnon, J.G. (2004). *Economic theory and method*, Oxford University Press Inc., 198 Madison Avenue, New York
- Dong, D., Kaiser, H.M., "Dissecting the advertising effects on household milk purchases", *Nicpre Quarterly*, 7(4), 2001, pp. 1-4
- El-Osta, H.S., Morehart, M.J., "Technology adoption decisions in dairy production and the role of herd expansion", *Agricultural and Research Economics*, 28(1), 1999, pp. 84-95

- Gould, B.W., "Factors affecting US demand for reduced-fat fluid milk", *Journal of Agricultural and Research Economics*, 21(1), 1996, pp. 68-81
- Gould, B.W., Cox, T.L., Perali, F., "The demand for fluid milk products in the US: a demand system approach", *Western Journal of Agricultural Economics*, 15, 1990, pp. 1-12
- Greene, W.H. (2002). *Econometric analysis*, 5th Edition. New York University, Prentice Hall, Upper Saddle River, New Jersey
- Green, G.M., Park, J.L., "New insights into supermarket promotions via scanner data analysis: the case of milk", *Journal of Food Distribution Research*, 29(3), 1998a, pp. 44-53
- Green, G.M., Park, J.L., "Retail demand for whole vs. low-fat milk: new perspectives on loss leader pricing", *American Agricultural Economics Association Annual Meeting*, 2-5 August, 1998b, Salt Lake City, UT
- Gunden, C., Bilgic, A., Miran, B. and Karli, B., "A censored system of demand analysis to unpacked and prepackaged milk consumption in Turkey", *Quality and Quantity*, 45, 2001, pp. 1273-1290
- Hatirli, S.A., Ozkan, B., Aktas, A.R., "Factors affecting fluid milk purchasing sources in Turkey", *Food Quality Preference*, 15(6), 2004, pp. 509-515
- Hsu, J.L., Kao, J.S., "Factors affecting consumers' fluid milk purchasing patterns in Taiwan: product comparisons and marketing implications", *Journal of Food Products Marketing*, 7(3), 2001, pp. 41-51
- James, J.S., Rickard, B.J., Rossman, W.J., "Product differentiation and market segmentation in applesauce: using a choice experiment to assess the value of organic", Local and Nutrition Attributes, *Working Paper* (WP 2009-01), 2009, Department of Applied Economics and Management Cornell University, Ithaca, New York, 14853-7801 USA
- Jensen, K., "Fluid milk purchase patterns in the south: effects of use of nutrition information and household characteristics", *Journal of Agricultural and Applied Economics*, 27(2), 1995, pp. 644-657
- Jones, E., Akbay, C., "An analysis of consumer' purchasing behavior for high- and low-fat milk: a focus on healthy drinking", *Journal of Food Distribution Research*, 31(1), 2000, pp. 124-131
- Jones, E., Akbay, C., Roe, B., Chern, W.S., "Analyses of consumers' dietary behavior: an application of the aids model to supermarket scanner data", *Agribusiness*, 19(2), 2003, pp. 203-221
- Kilic, O., Akbay, C., Yildiz Tiryaki, G., "Factors affecting packed and unpacked fluid milk consumption", *Agricultural Economics-Czech*, 55(11), 2009, pp. 557-563
- Lefevre, M. (2011). *Willingness-to-pay for local milk-based dairy products in Senegal*, Centre De Recherche En Economie Publique Et De La Population (CREPP WP No. 2011/08), Boulevard Du Rectorat 7 (B31), 4000 Liège, Belgium
- Lonnerdal, B., "Nutritional and physiologic significance of human milk proteins", *American Journal of Clinical Nutrition*, 77, 2003, pp. 1537-1543
- Matin, A.H. Goddard, E. Vandermoere, F. Blanchemanche, S. Bieberstein, A., Marette, S., Roosen, J., "Do environmental attitudes and food technology neophobia affect perceptions of the benefits of nanotechnology?", *International Journal of Consumer Studies*, 36(2), 2012, pp. 149-157

- Moser, R., Raffaelli, R., “Consumer preferences for sustainable production methods in apple purchasing behavior: a non-hypothetical choice experiment”, *International Journal of Consumer Studies*, 36, 2012, pp. 141-148
- Pazarlioglu, M.V., Miran, B., Ucdogruk, S., Abay, C., Using econometric modeling to predict demand for fluid and farm milk: a case study from Turkey, *Food Quality and Preference*, 18(2), 2006, pp. 416-424
- Pulina, M., “Consumer behavior in the credit card market: a banking case study”, *International Journal of Consumer Studies*, 35, 2010, pp. 86-94
- Pundo, O.M., Fraser, C.G., “Multinomial logit analysis of household cooking fuel choice in rural Kenya: a case of Kisumu district”, *Agrekon: Agricultural Economics Research, Policy and Practice in Southern Africa*, 45(1), 2006, pp. 24-36
- Ratnam, N.V., Spielmann, H., “Consumer attitudes and their impact on fluid milk demand in Hawaii: a comparison-regression analysis approach”, *American Journal of Agricultural Economics*, 54, 1972, pp. 671-678
- Rauniker, R. and Huang, C.L., “Characteristics of fluid milk expenditure patterns in the northeast region”, *Journal of Northeastern Agricultural Economics Council*, 13, 1984, pp. 54-59
- Reynolds, A., “Modeling consumer choice of fluid milk”, *Working Paper*, WP No. 9104, 1991, Department of Agricultural Economics and Business, University Of Guelph, Guelph, ON
- Schmit, T. M., Dong, D., Chung, C., Kaiser, H.M., Gould, B.W., “Identifying the effects of generic advertising on the household demand for fluid milk and cheese: a two-step panel data approach”, *Journal of Agricultural Research Economics*, 27, 2002, pp. 165-186
- Setbir, (2009). *Milk consumption in Turkey is about one quarter of Europe's dairy consumption*, [Online] Available at: <http://www.tarim.com.tr/haber/haberdetay.asp?ID=4707>. [Accessed 28 September 2011]
- Simsek, O. Cetin, C., Bilgin, B., “A research on determination of the drinking milk consuming habits and the factors affecting these habits in Istanbul province”, *Journal of Tekirdag Agricultural Faculty*, 2(1), 2005, pp. 23-35
- Timothy, J.R., “Nested logit models of strategic promotion”, *Quantitative Marketing and Economics*, 5(1), 2007, pp. 63-91
- TOBB, (2010). *Livestock industry newsletter*, The Association of Dairy Beef and Food Manufacturers and Producers in Turkey. [Online] Available at: http://www.setbir.org.tr/kaynaklar/haberler.../2010_05_27_519554.doc. [Accessed 26 May 2010]
- Turkstat, (2009). *Household Budget Survey Consumption Expenditures*, Turkish Statistical Institute, and Publication Number: 3582, ISBN: 978-975-19-5103-8. [Online] Available at: <http://www.tuik.gov.tr/>. [Accessed 28 December 2011]
- TZOB, (2008). *Evaluation of the dairy sector in Turkey in 2008 and beyond expectations*, April, Ankara. [Online] Available at: www.tzob.org.tr/tzob_web/.../sut_sek_deg_rapor_nisan_2008.pdf. [Accessed 28 January 2012]

- Unal, R.N., Besler, T. (2006). *Importance of milk in human nutrition*, T.R. Ministry of Health General Directorate of Basic Health Services Department of Food Safety, ISBN: 975-590-181-7, October, Ankara
- Ward, R.W., Dixon, B.L., “Effectiveness of fluid milk advertising since the dairy and tobacco adjustment act of 1983”, *American Journal Agricultural Economics*, 71, 1989, pp. 730-740
- Watanabe, Y., Suzuki, N., Kaiser, H.M., “Identifying consumer characteristics associated with Japanese preferences toward milk products”, *Agribusiness*, 13(4), 1997, pp. 357-363
- Watanabe, Y., Suzuki, N., Kaiser, H.M., “Factors affecting consumers’ choice of beverages in Japan”, *Agribusiness*, 14(2), 1998, pp. 147-156
- Wei, Y., Liu, B., Liu, X., “Entry modes of foreign direct investment in China: A multinomial logit approach”, *Journal of Business Research*, 58(1), 2004, pp. 1495-1505
- Yen, S.T., Fang, C., Su, S.J., “Household food demand in urban China: A censored system approach”, *Journal of Comparative Economics*, 32(3), 2004, pp. 564-585
- Yildiz Tiryaki, G., Akbay, C., “Consumers’ fluid milk consumption behaviors in Turkey: An application of multinomial logit model”, *Quality and Quantity*, 44(1), 2008, pp. 87-98