African Journal of Business Management Vol. 6 (7), pp.2578-2584, 22 February, 2012
Available online at http://www.academicjournals.org/AJBM
DOI: 10.5897/AJBM11.839
ISSN 1993-8233 ©2012 Academic Journals

Full Length Research Paper

Consumer characteristics influencing natural gas consumption preference in Tokat, Turkey

Rüştü Yayar[1]*, Sibel Gülse Bal[2], Osman Karkacier[3] and Yücel Erol[3]

[1]Department of Economics, Faculty of Economics and Administrative Science, University of Gaziosmanpaşa, 60240, Tokat, Turkey.
[2]Department of Agricultural Economics, Faculty of Agriculture, University of Gaziosmanpaşa, 60240, Tokat, Turkey.
[3]Department of Business, Faculty of Economics and Administrative Science, University of Gaziosmanpaşa, 60240, Tokat, Turkey.

Accepted 10 October, 2011

This study investigated the main factors affecting natural gas consumption preference of households in Tokat town of Turkey. Households' choices for natural gas and other energy alternatives were analyzed using the data collected from a household survey. Descriptive analysis was carried out to describe the socio-economic characteristics of the households. Educational level and career of household head, household size, number of children and number of elderly people in family and child care in house were among the important household characteristics that influence natural gas consumption behaviors. Binary logit model was used to determine the factors affecting natural gas consumption preference of households. These factors were air pollution, housing type, annual temperature, natural gas awareness and house ownership. According to logistic regression model, there were positive and significant correlations between natural gas use preference and air pollution, total annual heating expenses, natural gas awareness of household head and house ownership. On the other hand, natural gas use was significantly lower in apartments.

Key words: Binary logit analysis, natural gas consumption, Turkey.

INTRODUCTION

Although known for thousands of years, natural gas has been extensively used only since 1960s in Europe (Çikiş, 1991). In Turkey, it was first used in 1985 as a new energy source (Koyuncu and Bakirtaş, 2004). There has been a sharp demand increase for energy in Turkey as a result of fast population increase, industrialization and urbanization starting from the 1980s (Sarak and Satman, 2003). Turkey signed the first natural gas import deal with the former USSR in 1984. Turkish people approved of this new energy source, which has many advantages over conventional fuels. Thus, demand for the natural gas has increased in Turkey and the country is one of the fastest growing natural gas markets in Europe (Oğan, 2003).

*Corresponding author. E-mail: rustu.yayar@gop.edu.tr. Tel: 0903562521671. Fax: 0903562521673.

Natural gas has the advantage of improving environmental health and reducing air pollution over other fuels. This advantage has been an important factor in the expansion of natural gas use by households. Some investigations about natural gas are being conducted as its use become widespread in Turkey. Sarak and Satman (2003) tried to estimate the demand for natural gas Turkey will require for heating of buildings. Yazici and Demirbaş (2001) examined Turkey's natural gas demand and consumption. Özçomak et al. (2008), using logit models, investigated effective factors (demographic, social, cultural and economic) that influenced chosing natural gas system in housing in the city of Erzurum. Study of Durmayaz et al. (2000) consider the city of Istanbul in Turkey and presents a detailed account for practical energy requirements and fuel consumption calculations.

There is a considerable literature that deals with natural gas consumption decisions of consumer, effective factors

in preferred source of energy, heating systems, economic and environmental costs heating systems for different regions.

Karlsson and Gustavsson (2003) compared heating systems in homes in terms of their pay for heating cost and taxes. Torekov et al. (2007) examined effective factors in the selection of heating systems of new buildings in Denmark. Poortinga et al. (2004) have researched the effective factors in preferred source of energy in the Netherlands. Bos and Weegink (1995) have investigated the amount of natural gas consumed in the Netherlands. Bowitz and Trong (2001) have analyzed the economic and environmental costs central heating systems in some European countries. Wei (2009) examined energy consumption in China. Siemek et al. (2003) describe the possible scenario of the development of the gas sector in Poland.

In the present study, cross sectional data from a household survey were subjected to logistic regression analysis, and factors affecting the natural gas use were determined. The aim of the present study was to determine the socioeconomic and demographic factors affecting the demand for natural gas as a new utility and to determine how much and in what directions these factors affect the natural gas demand possibility in the town of Tokat.

MATERIALS AND METHODS

A survey was conducted over 316 urban households, sampled from 23,251 households in the town of Tokat in the period of August and September 2008, using face-to-face discussion technique. Data from this survey have been used as the main material of the study. Respondents were selected randomly. Sample number was determined using probability sampling method based on the equation given thus (Yamane, 2001):

$$n = \frac{Nt^2 pq}{d^2 N + t^2 pq}$$

N = number of households in Tokat (23,251); *t* = *t* value for confidence interval (for 95% confidence interval, t = 1.96); *p* = existed probability (preference for natural gas) (0.5); *q* = non-existed probability (non-preference for natural gas) (0.5); *d* = error rate (0.055).

In the study, information about natural gas preference and non-preference, general attitudes towards preference of natural gas as well as socioeconomic and demographic characteristics of the people in the survey were gathered. As the aim of the research was to investigate the factors affecting natural gas preference, factors affecting the decision of preference and non-preference for natural gas were studied.

In order to establish the variables determining the natural gas demand tendencies of households, logistic regression analysis, a multivariable statistical analysis method, was used.

Cross sectional data obtained from the questionnaire conducted on 316 households in Tokat were analyzed using SPSS software (Version 10.0) (Kinnear and Gray, 2000). Dependent variable in logistic regression model was natural gas preference, while independent variables were presence of air pollution in the area (APOLL), housing type (HTYPE), yearly heating expense (HEATING), natural gas awareness (AWARE) and house ownership (HOWN).

Regression analysis involves the studying of the dependability of a variable (dependent variable) on other variable(s) (independent variables) (Gujarati, 2003). Binary logit regression is a non-linear regression model specifically designed for two-dependent variable systems. It is a non-linear model that can be linearized using appropriate transformations. Logit regression is also called “logistic regression model” (Stock and Watson, 2007). It is called “binary logistic regression model” when the dependent variable is expressed in two categories and called “multiple logistic regression model” when in more than two categories (Leech et al., 2004).

Logistic regression model is an alternative to discriminant analysis and cross tables when certain assumptions (such as the presence of normality and a common co-variance) cannot be obtained. When the dependent variable is a discrete one consisting of two, 0 and 1, or more levels, logistic regression model can be properly used. In addition, mathematical elasticity and simplicity of inter-pretation increase the popularity of the method (Tatlıdil, 2002).

The logistic regression model employed in the present study is a binary logistic regression model, where dependent variable is Y and independent one is X. In order to explain the model, the following logistic distribution function is used (Maddala, 1986; Greene, 1993; Gujarati, 1995; Ramanathan, 1995):

$$P_i = E(Y = 1 | X_i) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}} \quad (1)$$

In the logistic distribution equation, *Pi* is the independent variable, *X*i is the data, *i.* is the possibility of a preference by an individual (possibility of having 1 and 0 values by i^{th} individual). It is seen that the aforementioned model (Equation 1) is not linear. However, it can be linearized using proper transformations. When $\beta_1 + \beta_2 X_i$ in Equation 1 is replaced by Z_i, Equation 2 is obtained:

$$P_i = \frac{1}{1 + e^{-Z_i}} \quad (2)$$

Z_i is between - ∞ and + ∞, and P_i is between 1 and 0. When P_i shows the possibility of an event’s occurrence, the possibility of this event’s non-occurrence is $1 - P_i$ (Harrel, 2001). Then, the possibility of this event’s non-occurrence can be explained as in Equation 3 as follows:

$$1 - P_i = \frac{1}{1 + e^{Z_i}} \quad (3)$$

Equation 4 is obtained by dividing the occurrence by non-occurrence:

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \quad (4)$$

When the natural logarithm of both sides of the equation is written, Equation 1 is obtained:

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = Z_i = \beta_1 + \beta_2 X_i \quad (5)$$

$$L_i = \ln(\frac{P_i}{1-P_i}) = Z_i = \beta_1 + \beta_2 X_i \quad (5)$$

Thus, non-linear logistic regression model is linearized based on both its parameters and variables. "*L*" is called "logit" and models such as this called "logit models" (Gujarati, 1995, 2003). When there are more than one independent variable, $(X_1, X_2, ..., X_K)$, binary and multiple logit regression models apply. In these situations, Equation 1 is used for proper transformations:

$$P_i = E(Y=1|X_i = \frac{1}{1+e^{-(\beta_1+\beta_2 X_1+\beta_3 X_2+....+\beta_K X_K)}} \quad (6)$$

In logistic regression models involving a binary mode, categorical dependent variable has the following assumptions (Agresti, 1996; Tüzüntürk, 2007):

i) Conditional mean of logistic regression model has a value between 0 and 1.
ii) Error terms in logistic regression model have a Binomial distribution.
iii) If the data is *X,* the possibility of *Y's* being 1 is P_i. That is, $E(Y=1|X_i....X_K) = P_i$
iv) n number of observations about dependent variable are statistically independent.
v) Defining variables are independent of each other.

Odds and odds ratio are significant terms in logit model. Odds is a ratio of possibility. Odds are defined as the ratio of the number of events that occurred to number of events that did not occur (Morgan and Teachman, 1988). "Odds ratio" on the other hand, is the ratio of two odds, in other words, the ratio of likelihood to another. In Equation 4, two probabilities, occurrence and non-occurrence probability of an event, are proportioned and this is the odds of proportion.

It is important to understand that possibility, odds, and logit concepts, are three different ways of explaining the same thing (Menard, 2002).

There is a clear interpretation of odds ratio (Morgan and Teachman, 1988). An odds ratio of greater than 1 means that likelihood of an event's occurrence has increased while that of lower than 1 indicates that likelihood of that event's occurrence has decreased.

There are various methods to test the significance of meaningfulness of a logit regression model. Wald Test can be conducted using Wald statistics in order to test the meaningfulness of individual coefficients. For example, when maximum likelihood estimates of slope parameter of a simple two-mode logit regression model ($\hat{\beta}_1$) is proportioned to its own standard error $\hat{Sh}(\hat{\beta}_1)$:

$$W = \frac{\hat{\beta}_1}{\hat{Sh}(\hat{\beta}_1)} \quad (7)$$

Obtained *W* statistics show a standard normal distribution (Z) (Hosmer and Lemeshow, 2000). Here, hypotheses used to test the significance of slope parameter are as follows:

$$H_0 : \hat{\beta}_2 = 0$$
$$H_1 : \hat{\beta}_2 \neq 0 \quad (8)$$

If *W* statistics is greater than the *Z* table value, then the null hypothesis is rejected, and slope parameter is concluded to be statistically meaningful.

In the logit regression analysis, Pearson's chi-square and deviation statistics is used to test the general meaningfulness of the model (Leech et al., 2004).

Another statistics to test the fitness conferred by all variables of the model is Hosmer and Lemeshow test statistics which shows a Chi-square distribution. Good fitness, in a sense, shows the efficiency of the best model established in order to explain the dependent variable (Hosmer and Lemeshow, 2000). When Hosmer and Lemeshow test statistics is smaller than the table value, it is concluded that the model has a good fitness.

Another way of testing the fitness conferred by all variables of the model is to check the rating percentages in the rating table. Higher rating percentages in the table mean that rating is correctly made and that fitness is good.

Finally, R^2 values of Cox and Snell, and Nagelkerke, which are statistics that roughly estimate the variance (variation) resulted by the variables in the model, are statistics similar to R^2 in standard procedures.

RESULTS

After an explanation of sampling procedure and some descriptive information, findings from logistic regression analysis are discussed. Of the 316 households interviewed, 251 indicated that they would use natural gas while 65 would not. Demographic features of households in the survey are given in Table 1.

As seen in Table 1, household heads were predominantly high school or college graduates (29.4 and 23.7%, respectively) and had government employment (33.5%). In terms of family size, 34.2% of the households had four people, and about 40% had two children. About 75% of the households did not have grandparents. Percentage of households with children younger than seven was 33.9. Table 1 shows that 26.3% of these households took care of their children at home. Socioeconomic and some other features of household in the survey are given in Table 2. Two-hundred and fifty one of the 316 households (79.42%) in the survey stated that they would prefer natural gas, while 65 (20.60%) replied that they would not. Turkey is an import-dependent country for natural gas. Recent increases in natural gas prices and negative developments in Turkey's political and economic relations with Russia can be considered as factors that lowers the natural gas preference by Turkish public.

Considering the statistically significant air pollution variable in the logistic regression model, 68.7% of the households indicated that the air was polluted in their environment. It was determined that 63.6% of the households lived in their own houses, which were mostly apartments. In terms of heating system, 51.9% of households used wood- or coal-based domestic heaters

Table 1. Some demographic information about households.

Variable	Count	%	Variable	Count	%
Education level of household head			**Job of household head**		
Illiterate	3	0.9	Civil servant	106	33.5
Literate	6	1.9	Worker	64	20.3
Primary school	67	21.2	Trader	63	19.9
Middle school	61	19.3	Businessman	37	11.7
High school	93	29.4	Farmer	11	3.5
College	75	23.7	Retired	30	9.5
Graduate	11	3.5	Unemployed	5	1.6
Total	316	100.0	Total	316	100.0
Number of people in the household			**Number of children in the household**		
1	3	0.9	0	32	10.1
2	28	8.9	1	61	19.3
3	51	16.1	2	126	39.9
4	108	34.2	3	65	20.6
5	79	25.0	4	21	6.6
6	37	11.7	5	9	2.8
7	10	3.2	6	2	0.6
Total	316	100.0	Total	316	100.0
Grandparents			**Childcare**		
Yes	81	25.6	At home	83	26.3
No	235	74.4	Outside	24	7.6
Total	316	100.0	Total	107	33.9

while 40.5% used coal-based central heating systems. When it comes to the awareness of household head for natural gas, it was determined that 47.5% of the respondents had some awareness, though limited. Yearly heating expense was from 401 to 800 TL for 46% and 801 to 1200 TL for 31% of the households.

The relationships between household demand for natural gas and statistically significant variables in the logistic regression model were organized as a contingency table (Table 3). Natural gas was preferred by 86.2% of the households that reported to have air pollution in their environments and by 82.8% of the households that lived in detached houses. When yearly total heating expenses were studied, 61.7% of the households with the lowest heating expenses preferred natural gas, while 100.0% of house-holds with the highest yearly heating expense preferred natural gas. As the yearly heating expense increased, so did the preference for natural gas.

Considering the natural gas awareness of household heads, 73.2% of the household heads who were not informed about natural gas preferred natural gas; as the awareness for the natural gas increased, preference by the household heads similarly increased.

After some information about sampling, a logistic regression model using five variables were formed using SPSS statistical software (Version 10.0), and the results are given in Table 4. As can be seen from Table 4, coefficients of air pollution, natural gas awareness and house ownership variables were statistically significant at 1% level of probability while those of housing type and yearly heating expenses were significant at 10% level of probability.

Here, $exp(\beta)$ values of each parameters are treated as probability ratios. Thus, $exp(\beta p)$ means how many times, or how much, more probably Y would be observed due to the effect of Xp variable. As known, parameters in a linear regression model show the effect of a one-unit change in independent variable on dependent variable provided that other variables are fixed. Parameters in a logistic regression model on the other hand, show the effect of a one-unit change of independent variable on the probability ratio provided that other variables remain fixed (Işığıçok, 2003).

General meaningfulness of the model was tested using Pearson's chi-square test, and at least one coefficient was found to be different from zero at 1% level of probability. It was determined that all defining variables were significant for the dependent variable.

Fitness conferred by all variables was revealed by Hosmer and Lemeshow test statistics, which has a Chi-square distribution. Significance level of Hosmer and

Table 2. Information about socioeconomic characteristics and some other features of households.

Variable	Count	%	Variable	Count	%
Natural gas preference			**Air pollution**		
No	65	20.6	Yes	99	31.3
Yes	251	79.4	No	217	68.7
Total	316	100.0	Total	316	100.0
Housing type			**House ownership**		
Apartment	215	68.0	No	115	36.4
Detached	101	32.0	Yes	201	63.6
Total	316	100.0	Total	316	100.0
Heating system			**Natural gas awareness**		
Central heating (Coal)	128	40.5	Not aware	71	22.5
Central heating (Fuel oil)	22	7.0	Some	150	47.5
Wood-Coal heater	164	51.9	Enough	78	24.7
Electric-gas heater	2	0.6	Very much	17	5.4
Total	316	100.0	Total	316	100.0
LPG expense			**Yearly heating expenses**		
0-23 TL	13	4.1	0-400 TL	47	14.9
24-46 TL	144	45.6	401-800 TL	146	46.2
47-69 TL	109	34.5	801-1200 TL	98	31.0
70-92 TL	40	12.7	1201-1600 TL	20	6.3
93- + TL	10	3.2	1601- + TL	5	1.6
Total	**316**	**100.0**	**Total**	**316**	**100.0**

Lemeshow test statistics was calculated to be 0.593. Since this value was higher than 0.05, the fitness was considered good.

Based on these definitions, probability ratios of each variable given in Table 4 can be interpreted. Accordingly, presence of air pollution in the environment increased natural gas demand probability 3.340 folds whereas yearly heating expenses increased 1.372 folds, awareness of household heads 1.700 folds, and house ownership 2.265 folds. When the house was an apartment, natural gas demand probability diminished 1.876 folds.

It was found that there was a positive and significant relationship between air pollution and natural gas demand possibility. Air pollution in the environment had a positive effect on households' natural gas preference. It can be stated that advantage of natural gas over other fuels for environmental health and air pollution had a significant effect on the spreading of natural gas use in households. The percentage of households thinking that they had air pollution in their environments was 68.7, and 86.2% of them said they would prefer natural gas. Air pollution variable in the logistic model was significant at 1% level of probability. According to the calculated probability ratios, the presence of air pollution in the environment could increase natural gas demand probability 3.340 folds.

There was a positive and significant relationship between natural gas demand tendency and yearly total heating expenses in the logistic regression model. It was found that as the yearly total heating expenses increased, demand for the natural gas would increase.

Yearly total heating expenses of 46.2% of the households were between 401 to 800 TL while those of 31.0% between 801 to 1200 TL. This variable was significant at 10% level of probability in the model. Higher yearly heating expenses increased the natural gas preference probability 1.372 folds.

There was a positive and significant relationship between household head's awareness for natural gas and probability of natural gas demand. It was determined that 47.5% of the responding household heads were familiar with the natural gas, though to a limited extent. As the awareness of household heads for natural gas increased, so did the natural gas use preference. Natural gas awareness variable in logistic regression model was significant at 1% level of probability. It was determined that as the awareness of household heads for natural gas increased, the probability of their preference for natural gas increased 1.700 folds.

Effect of housing type (detached housing or apartment) on natural gas demand was included in the logistic regression model as an independent variable. There was a negative and significant relationship between living in an apartment and natural gas demand tendency. It can be stated that natural gas preference over central heating

Table 3. Natural gas demand tendency.

Variable	Natural gas non-preferred		Natural gas preferred		Total	
	Count	Percentage	Count	Percentage	Count	Percentage
Air pollution						
No (0)	35	35.4	64	64.6	99	100.0
Yes (1)	30	13.8	187	86.2	217	100.0
Total	65	20.6	251	79.4	316	100.0
Housing type						
Detached (0)	37	17.2	178	82.8	215	100.0
Apartment (1)	28	27.7	73	72.3	101	100.0
Total	65	20.6	251	79.4	316	100.0
House ownership						
No (0)	30	26.1	85	73.9	115	100.0
Yes (1)	35	17.4	166	82.6	201	100.0
Total	65	20.6	251	79.4	316	100.0
Yearly heating expenses						
0-400 TL	18	38.3	29	61.7	47	100.0
401-800 TL	24	16.4	122	83.6	146	100.0
801-1200 TL	20	20.4	78	79.6	98	100.0
1201-1600 TL	3	15.0	17	85.0	20	100.0
1601- + TL	-	-	5	100.0	5	100.0
Total	65	20.6	251	79.4	316	100.0
Natural gas awareness						
Not aware (1)	19	26.8	52	73.2	71	100.0
Some (2)	37	24.7	113	75.3	150	100.0
Enough (3)	8	10.3	70	89.7	78	100.0
Very much (4)	1	5.9	16	94.1	17	100.0
Total	65	20.6	251	79.4	316	100.0

Table 4. Variables in the equation.

Variable	β	S.E.	Wald	df	Sig.	Exp (β)	95% confidence interval for EXP (β)	
							Lower	Upper
Air pollution	1.206	0.302	15.940	1	0.000	3.340	1.848	6.037
Housing type	-0.629	0.328	3.681	1	0.055	0.533	0.281	1.014
Yearly heating expense	0.316	0.182	3.019	1	0.082	1.372	1.199	4.277
Natural gas awareness	0.531	0.205	6.716	1	0.010	1.700	1.138	2.540
House ownership	0.817	0.324	6.349	1	0.012	2.265	0.960	1.959
Constant	-1.436	0.673	4.552	1	0.033	0.238		
-2 Log likelihood	:	282.426						
Cox and Snell R^2	:	0.115						
Nagelkerke R^2	:	0.181						
Chi-square	:	38.755			Significance : 0.000			
Hosmer and Lemeshow test	:	6.489			Significance : 0.593			

in detached houses is a rational behavior since establishment and use expenses of central heating units for detached houses are high.

Housing type variable in logistic regression model was significant at 10% level of probability. Percentages of households living in detached housing and apartments were 32 and 68.0, respectively. Preference of households living in apartments for natural gas was 72.3%. There was a negative relationship between living in apartments and natural gas preference. Based on the probability ratio, living in an apartment decreases natural gas use preference by 1.876 folds. Households that lived in their own houses were 63.6%, and 82.6% of them said they would prefer natural gas use.

In the logistic regression model, there was a positive and significant ($P<0.01$) correlation between house ownership and natural gas preference. It was determined that house ownership increased the natural gas demand possibility 2.265 folds. Of 316 households in the survey, 79.4% stated that they would prefer natural gas while the remaining 20.6% expressed that they would not.

DISCUSSION

Before introducing a new product, it is important to determine the factors affecting the potential demand for that product. The aims of the present study were to determine the effects of socioeconomic and demographic factors on the demand for natural gas as a new product for the town of Tokat, and to determine to what extent and in what direction these factors affect the natural gas demand possibility.

In the logistic regression model estimated using cross sectional data obtained from a survey conducted on 316 households in the town of Tokat, preference for natural gas was dependent variable whereas air pollution (APOLL), housing type (HTYPE), yearly total heating expenses (HEATING), natural gas awareness (AWARE) and house ownership (HOWN) were independent ones.

Conclusion

In conclusion, the important factors on demand for natural gas as a new utility for the town of Tokat were air pollution, housing type (detached house or apartment), total yearly heating expenses, natural gas awareness of household, and house ownership. Of these factors, housing type variable had a negative effect on potential natural gas demand while the others had positive effects.

REFERENCES

Agresti A (1996). An Introduction To Categorical Data Analysis. John Wiley. New York.

Bos R, Weegink R (1996). The 1994 Basic Study into Domestic Natural Gas Consumption. Fuel and Energy Abstracts. 37(2): 95.

Bowitz E, Trong MD (2001). The Social Cost Of District Heating İn A Sparsely Populated Country. Energy Pol., 29: 1163–1173.

Çikiş Y (1991). Industrial Conversion To Natural Gas And Industrial Natural Gas Consumption Potential Of Istanbul. Istanbul Technical University Applied Science Institute. M.Sc. Thesis (Unpublished). Istanbul. (In Turkish).

Durmayaz A, Kadioğlu M, Şen Z (2000). An Application Of The Degree-Hours Method To Estimate The Residential Heating Energy Requirement And Fuel Consumption in Istanbul. Energy. 25: 1245–1256.

Greene WH (1993). Econometric Analysis. Second edition. Macmillan Publishing Company. USA, p. 775.

Gujarati DN (1995). Basic Econometrics. Third edition. McGraw-Hill Inc. New York.

Gujarati DN (2003). Basic Econometrics. McGraw-Hill Companies. New York.

Harrel FE (2001). Regression Modeling Strategies. Springer. New York.

Hosmer DW, Lemeshow S (2000). Applied Logistic Regression. John Wiley and Sons. New York.

Işığıçok E (2003). Investigation Of Factors Affecting Length And Weight Of Newborns Using Logistic Regression Analysis. VI. National Econometrics and Statistics Symposium. Gazi University. Ankara. (In Turkish).

Karlsson A, Gustavsson L (2003). External Costs And Taxes İn Heat Supply System. Energy Pol..31: 1541–1560.

Kinnear PR, Gray CD (2000). SPSS for Windows Made Simple: Release 10. Psychology Press Ltd. ISBN: 1-84169-118-6. UK.

Koyuncu C, Bakirtaş İ (2004). Factors Affecting Potential Natural Gas Demand (Kütahya province case). EKEV Acad. J., 21: 339–351.

Leech NL, Barrett KC, Morgan GA (2004). SPSS for Intermediate Statistics: Use and Interpretation. Lawrence Erlbaum Associates Publishers. Manwah. New Jersey.

Maddala GS (1986). Limited-Dependent and Qualitative Variables In Econometrics. Cambridge University Press. New York.

Menard S (2002). Applied Logistic Regression Analysis. Second edition. Sage Publications. California.

Morgan SP, Teachman JD (1988). Logistic Regression: Description, Examples And Comparisons. J. Marriage Family. (50)4: 929–936.

Oğan S (2003). Blue Stream Project: An Example Of Energy Strategy And Lack Of Strategy. Stradigma J., 7: 1-20.

Oktay E, Naralan A, Özçomak HS (2008) .Investigation Of Effecting Factors İn Preference Of Natural Gas Systems At Houses: A case study of Erzurum. Social Sciences Institute Review. 11(1):341-353.

Poortinga W, Steg L, Vlek C (2004). Values, Environmental Concern And Environmental Behaviour: A Study İnto Household Energy Use. Environment And Behaviour. 36(1): 70–93.

Ramanathan R (1995). Introductory Econometrics. Third edition. The Dryden Press. Harcourt Brace College Publishers. USA. p. 718.

Sarak H, Satman A (2003). The Degree-Day Method To Estimate The Residential Heating Natural Gas Consumption In Turkey: A Case Study. Energy. 28: 929-939.

Siemek J, Nagy S, Rychlicki S (2003). Estimation Of Natural-Gas Consumption İn Poland Based On The Logistic-Curve İnterpretation. Appl. Energy, 75: 1–7.

Stock JH, Watson MW (2007). Introduction To Econometrics. Pearson Addison Wesley. Boston.

Tüzüntürk S (2007). Introduction Of Graduates Of Econometrics Department Into Working life: An experimental field study. 8th Turkish Econometrics And Statistics Congress. 24-25 May. Inönü University. Malatya. (In Turkish).

Tatlıdil H (2002). Applied Multi-variate Statistical Analysis. Agricultural Press. Ankara. (In Turkish).

Torekov MS, Bahnsen N, Qvale B (2007). The Relative Competitive Positions Of The Alternative Means For Domestic Heating. Energy. 32: 627–633.

Wei L (2009). Comparative study on Chinese and foreign natural gas consumption. Int. J. Mark. Stud., 1(2).

Yamane T (1967). Elementary Sampling Theory. Prentice-Hall, Englewood Cliffs, N.J, USA.

Yazici N, Demirbaş A (2001). Turkey's Natural Gas Necessity And Consumption. Energy Sources, 23: 801–808.