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Consumer's behaviour in terms of paper's recycling. Case Study: The Municipality of Aigaleo in Greece

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ABSTRACT

In the present essay the objective is to investigate consumer's attitude towards the recycling of printed paper. As a case of study the Municipality of Aigaleo in Greece was chosen. For the purposes of this research both bibliographic, as well as primary empirical research was conducted.

The primary research was based on the use cross layer data, which came from a questionnaire that was distributed to 355 residents of the municipality of Aigaleo. The research revealed that certain factors do influence the behavior of the citizens of the municipality of Aigaleo regarding recycling. More specifically, the net monthly income, the level of awareness among citizens on environmental issues, their knowledge of the use of blue garbage bins, their motivation towards their family and friendly environment to participate in recycling and the economic incentives are statistically significant defining factors of recycling.

Regarding the factors that affect the frequency of recycling by the citizens, the results showed that the net monthly family income and the participation in voluntary programs so as to improve recycling are statistically significant defining factors of the frequency of recycling. Also, the attitude of the citizens to recycle aluminium positively affects the frequency of recycling.

Keywords: Recycling, municipal solid waste, Consumer and Recycled Paper, Consumer's Behavior and Recycling, Determining factors, Recycling Enterprises.

1. INTRODUCTION

Human for decades acted unreasonable burdening the planet. The consuming society which was formed mainly in the 20th century, led to overconsumption of energy and raw materials as well as to the production of excessive amounts of waste. The municipal solid waste is one of the most important problems of the modern society. The rapid growth of urban centers caused a large concentration of municipal solid waste in small spaces, as well as the development of the living standards of the citizens has resulted in an increased consumption of goods and waste disposal. [Panagiotakopoulos (2002), Karvounis & Georgakellos, (2003)]

Without any doubt, recycling can be seen as the answer of science and modern technology to the problem of waste, which is a particularly important problem for modern societies. Applying recycling notable benefits can occur, such as reducing the volume of waste led towards landfill and conserving of raw materials and energy. Nowadays, recycling is an essential component of waste management. Furthermore, recycling is one of the policies to protect the environment and can dynamically contribute so as to achieve the goals of green and sustainable development. [Terzis (2009), Karvounis & Georgakellos (2003)]

Despite its advantages, recycling can not by itself be the solution to the problem of waste management. Necessary requirement for the success of any recycling program should be the application of basic principles that govern the entire circuit and positively or negatively affect it. (Simeonidis, 2005)

Realizing the current situation, the present investigation was selected to be conducted, and has as its main objective to investigate the factors that influence the attitude and behavior of consumers towards recycling, and particularly towards the recycling of paper.

The purpose of this study is to examine the determining factors of recycling and particularly paper recycling. In order to achieve this objective the degree of knowledge, attitude and behavior of citizens and entrepreneurs of the Municipality of Aigaleo in Greece regarding recycling in general and towards the recycling of paper was investigated.

In order to achieve this purpose we collected and evaluated primary data which was gathered through a survey with questionnaires and completed by a random sample of citizens of the municipality. The required presentation of the theoretical concepts involved, which are required as a background for the understanding by the reader of the narrative of the present essay was preceded. In addition, previous empirical studies of other researchers intending to study the determining factors towards recycling were reviewed.

2. MUNICIPAL WASTE - WASTE MANAGEMENT SYSTEMS - RECYCLING

The complete absence of basic principles and guidelines for spatial planning in Greece, as well as the inability to implement key urban settings over the past decades was probably the main reason for an unprecedented expansion of population and production activities of the Greek cities. Beyond the obvious and indisputable advantages such a situation in major urban centers confer with the emergence of economies of scale resulting in mainly financial multiplier benefits, gradually serious problems within the cities and their wider regions of influence started to emerge. One of these problems was and still remains to be, the deterioration of the natural and structured environment and the descent of living standards. [Simeonidis (2005), Leventis (2007)]

The realization, therefore, of the degradation of the environmental quality and therefore the quality of life has made more urgent the need to adopt the steps needed, initially aiming to preserve the richness of the natural the environment and also in long-terms its safe management, under the protection of the principles of sustainable development, or else the need for ecologization of the economy, a rather ecological term that emphasizes the social dimension of the issue. One of the main and most crucial tools that move in this direction is the design, the concept of which involves some processes to appropriately determine the actions through a series of options to be prospectively applied, having as an ultimate goal to substantially deal with the problem. [Moussiopoulos (1998), Simeonidis (2005)]

The intensification of the environmental problems has led to their integration in the planning within the implementation of relevant development and spatial policies of any scale (International - European - national - regional - local). Under this designed context, modern human societies seize the opportunity to place and express their concerns around the environmental issues that directly concern them.

The so far existing Greek legislation on waste management constitutes in the strongest possible manner the prevention of their simple rejection, due to the significant and diverse drawbacks that it has as a method. However, an integrated planning for solid waste is absent. At the same time, efforts to harmonize with EU directives still evolve. In our country unfortunately still only marginally have the conditions ripen, for the state to carry the financial cost, but also the political and legal responsibility to implement the laws that very clearly and rigorously enforce the management of solid waste. At the municipal level until today, in many cases the simple - uncontrolled waste disposal at random points landing waste on the ground or in natural cavities do dominate, without any prior precede measures so as to prevent current or potential future environmental impacts to be taken. [Arvanitis (2011), Andreadakis (2000)]

In a central and nodal point is recycling therefore located within an integrated political thought for the management of solid waste, playing a catalytic role. Recycling comes to justify in the most indicative manner the views of many scholars and researchers on the endorsement of the traditional economic model, which ignored the environmental parameters in the economic production process. The concerns of the above people led to the overturning of the data with the final integration of environmental considerations as a productive factor. It is perhaps the most accessible side of this environmental revolution. The main expresser of this reflection was recycling. As a method and practice, always in comparison with other methods of waste management is the only one that involves simultaneously all three dimensions, educational, technical and financial as well. In no case, however, should be the recycling be taken as a cure, since on the one hand savings in raw materials and energy may be achieved, on the other hand, however, it cannot operate in perpetuity, for the reason that every element of the waste has a limited life cycle, beyond which it ceases to be suitable for reuse or recycling. Moreover, in an advanced estimation it is considered that recycling does not remove waste, but merely pushes further their disposal. (Andreadakis, 2000)

Recycling is defined the process that involves the systematic collection and technical processing of the materials of the total of wastes and their reintroduction in the economic cycle, in contrast to reuse, in which there is some processing and simply commonly used with different use. It regards those materials for which there is some economic value, and for that it partially solves the problem of management [Simeonidis (2005), Leventis (2007)].

The reintroduction in the production process of materials considered as wastes, namely recycling as mentioned above, is an important component of sustainable management of wastes. Without any doubt, recycling may be regarded as the proper response of science and modern technology to the problem of wastes, which constitutes a particularly important hoarsely for modern societies. In order to achieve recycling, problems resulting from traditional practices of the public that are difficult to change should be overcome while the successful recovery of useful materials (e.g. paper, glass, metal, plastic) depends on various factors, such as the quantitative and qualitative characteristics of wastes etc. (Vasiloglou, 2005). Out of recycling, notable benefits can occur, such as reducing the volume of wastes led towards landfill while at the same time we conserve raw

materials and energy. Due to the latter mainly results the spread of the implementation of recycling, despite the considerable financial resources it usually requires. Given their significant percentage in the total of waste, packaging materials are particularly popular targets of the recycling programs (Moussiopoulos, 1998).

3. RESEARCH - REGRESSIONS FOR CONSUMERS OF THE MUNICIPALITY OF AIGALEO

The primary analysis of this research studies the factors that affect the behavior of the citizens of the municipality of Aigaleo for recycling wastes emphasizing on recycling paper. In order to conduct this research the primary method of sample survey using a questionnaire was selected. The questionnaire created aimed at the citizens of the Municipality of Aigaleo. The questionnaires were distributed to a randomly selected sample.

The process of distribution and collection of the questionnaires took place during the period 1/3/2013-20/3/2013. The total number of questionnaires distributed to the citizens of the Municipality of Aigaleo was 355. The acceptance rate was 100%.

The questionnaire includes twenty-two (22) closed questions with predefined answers from which the respondents could choose one. The first section of the questionnaire including questions 1-6 examines the demographics of the participants (gender, age, marital status, family members, educational level and monthly income). The second section of the questionnaire for the citizens includes questions 7-13 and examines the environmental consciousness of the citizens. The third section includes questions 20-22 examines the willingness of citizens for recycling paper.

The questionnaires collected were tested and numbered for their validity. Then we entered the data in the statistical data analysis program IBM SPSS STATISTICS 20.0, in two different files (sav) from which emerged the frequency distributions and correlations among the variables.

Then a logistic regression between the dependent variable (recycling implementation) and independent variables derived from the literature that correlate with the trend towards recycling as well as multiple linear regression between the dependent variable were performed (recycling rate).

As we have earlier mentioned, empirical studies have determined several factors that influence the attitude of consumers to recycle. Whether consumers tend to recycle is affected by various factors such as demographic and economic data (gender, age, education level, income) [Smallbone (2005), Jenkins et al., (2003), Martin et al., (2006), Afroz et al., (2009), McDonald and Ball (1998), Kishino et al., (1998), Sidique et al., (2010), Straughan and Roberts (1999)], factors that are directly related to recycling, such as the knowledge about which materials are recycled, the distance from the recycling bins, factors related to consumer attitudes towards recycling [Smallbone (2005), do Valle et al., (2004), McDonald and Ball (1998), Vicente and Reis (2007)] and factors affecting the ecological behavior of the consumer and includes their concern for the environment, attitudes, opinions and behaviors, etc. [Straughan and Roberts (1999), do Valle et al., (2004)].

I. Estimated logistic regression model to investigate factors that influence the behavior of citizens for the recycling in the municipality of Aigaleo

The investigation of the factors affecting the attitudes of the citizens to recycle or not was assessed using the method of maximum likelihood and the following logistic regression equation applies

$$\text{Question9} = b_0 + b_1 \text{ gender} + b_2 \text{ age} + b_3 \text{ education_dummy} + b_4 \text{ marital_dummy} + b_5 \text{ family members} + b_6 \text{ income} + b_7 \text{ q7} + b_8 \text{ q8} + b_9 \text{ q14} + b_{10} \text{ q15} + b_{11} \text{ q16} + b_{12} \text{ q17} + b_{13} \text{ q19} + b_{14} \text{ q20} + b_{15} \text{ q21} + b_{16} \text{ q22} + \varepsilon_i$$

The variables shown in the above equation are:

Question9: it is the qualitative dependent variable which expresses the attitude of the citizens regarding recycling and takes the value 1 when the residents recycle and 0 when the residents do not recycle.

Gender: it is the independent qualitative variable that reflects the gender of the respondents and takes on the values 1 for male and 0 for female.

Age: it is a quantitative independent variable, which expresses the age of the citizens and it takes the value 0 when it is 18-24 the value of 1 when it is 25 to 29, the value of 2 when it is 30-44, the value of 3 when it is 45-59 and the value 4 when it is 60 +.

Marital dummy: is a dummy variable that represents the marital status of the citizens and takes the value 0 when they are married, the value of 1 for all other cases.

Family members: this is an independent quantitative variable, which expresses the number of family members.

Education dummy: it is a dummy variable which reflects the educational level of the citizens and takes the value 0 when the education level is up to high school and the value of 1 when the level is higher / highest.

Income: it is an independent quantitative variable, which expresses the net monthly income of the family and takes the value of 0 when it is below 1,200, the value of 1 when it is 1201 to 2000, a value of 2 when it is from 2001 to 3000, the value of 3 when it is from 3001 to 4000 and the value of 4 when it is over 4,001.

Q7: this is an independent quantitative variable that expresses the level of information of the citizens over environmental issues and takes the value of 0 when it is none, the value of 1 when it is little, the value of 2 when it is good, the value of 3 when it is too good and the value of 4 when it is excellent.

Q8: this is an independent qualitative variable that expresses the knowledge of the citizens on the use of blue garbage bins and takes the value of 1 when it is yes and 0 when it is not.

Q14: this is an independent quantitative variable expressing whether the citizen urges their family and friendly environment to participate in recycling and takes the value of 0 when the answer is never, the value of 1 when the answer is sometimes and the value of 3 when the answer is all the time.

Q15: this is an independent quantitative variable that represents the knowledge of the citizen whether the municipality to which he belongs make organized efforts for recycling and takes the value of 0 when the answer is yes, the value of 1 if the answer is no and the value of 3 when the answer is I do not know.

Q16: this is an independent quantitative variable that expresses the voluntary participation of the citizen in some effort of the municipality to improve recycling implementation and takes the value of 0 when it the answer is definitely yes, the value of 1 when the answer is maybe, if I had spare time and a value of 2 when it the answer is no, because I do not care.

Q17: this is an independent quantitative variable that expresses the agreement of the citizen in the proposal that if awarded citizens were rewarded, with financial relief from municipal taxes, people would participate more actively in the recycling and takes the value of 0 when the answer is very much, the value of 1 when it the answer is a lot, the value of 2 when the response when it is moderate, the value of 3 when the answer is a little and the value of 4 when the answer is not at all.

Q19: this is an independent qualitative variable that expresses the preference of citizen to be charged based on the amount of waste produced instead of square meters of the house and takes the value of 1 if the answer is yes and 0 when the answer is no.

Q20: this is an independent qualitative variable that expresses the agreement of the municipal in the proposal to install a special bin for recycling exclusively paper in your neighbourhood and takes the value of 1 if the answer is yes and 0 when the answer is no.

Q21: this is an independent qualitative variable that expresses the mood of the citizen to recycle paper separately for the specific paper bin and takes the value of 1 if the answer is yes and 0 when the answer is no.

Q22: this is an independent qualitative variable that expresses the view of the citizen as to who is the best way to inform the public about recycling paper and it takes the value of 0 when the answer is advertising or informational inserts in newspapers and magazines, the value of 1 when the answer is advertising on TV, the value of 2 when the answer is advertising leaflets to homes and the value of 3 when the answer is lectures by specialists in schools, clubs, organizations, etc.

Ei: errors of regression

In the second column of the table below the estimating results of the above equation for all explanatory variables are presented. The statistically non-significant variables were removed from the original model and the results of the final model are presented in the third column of the table.

Table 1: Estimated logistic regression for the implementation or not of recycling by the citizens

Variables (1)	Initial model (2)		Final model (3)	
	B	Wald	B	Wald
Stable (make recycling) (q9)	-4,877***	18.591	-4,3344***	22.326
sex	.237	.752		
Age (age)	.103	.456		
Educational level (education dummy)	.082	.082		
Marital status (marital dummy)	-0,097	.070		
Family members (family members)	-.014	.012		
Income (income)	-0,351***	3.870	-0,349**	4.044
Updating your environmental matters? (q7)	0,487***	8.056	0,495***	8.896
Know the use of blue garbage bins? (q8)	3,260***	20.429	3,069***	19.957
I urge your family and friendly environment to participate in recycling (q14)	0,987***	12.863	1,005***	14.441
The Municipality of Aigaleo makes organized efforts for recycling? (q15)	.304	2.116		
Would you volunteer in some effort on your municipality to improve recycling implementation? (q16)	-0,481*	3.510	-.377	2.365
Do you agree that if the aware citizens were rewarded, with financial relief from the municipal taxes, people would participate more actively in recycle? (q17)	0,400***	8.335	0,373***	7.886
The municipal cleaning fees are paid based on the square meters of your home. Would you prefer to be charged based on the amount of wastes you produce? (q19)	0,661*	3.305	.575	2.603
Would you agree with the installation of a special bin for recycling exclusively paper in your neighborhood? (q20)	-.593	1.432	.367	1.372
Are you willing to recycled paper separately for the specific paper bin? (q21)	0,697*	3.167		
How do you think should the information the public be done about recycling paper bins paper? (q22)	.037	.097		
(chi square)	10,314		11,921	
Cox & Shell R2	0.300		0.300	
2 Log likelihood ratio	342,665		342,568	

*** 1% significance level

** 5% significance level

* 10% significance level

From the table above it is observed that gender, age, marital status, educational level and the number of family members of citizens are not statistically significant explanatory variables in terms of recycling. The result above is in agreement with the results of the research of do Valle et al., (2004), who indicate that gender, age, and educational level are not statistically significant determinants of behaviour towards recycling. It also comes in agreement with the findings of Vicente and Reis (2007) where the demographic characteristics did not show any significant influence on their research.

On the contrary this result is at odds with most of the researches which were above reviewed [McDonald and Ball (1998), Jenkins et al., (2003), Martin et al., (2006), Smallbone (2005), Hansmann et al., (2006), Sidique et al., (2010), Afroz et al., (2009), Straughan and Roberts (1999)], which suggest that age, education and household size are statistically significant explanatory variables and are positively correlated with recycling.

Furthermore, it is observed that the charge based on the amount of waste produced instead of square meters of the house and the organized efforts that might be carried out by the municipality for recycling are not statistically significant explanatory variables in terms of recycling. In corresponding results also concludes research of Jenkins et al., (2003), which states that the program of charging the families depending on the amount of waste is not a statistically significant factor in the percentage of recycling.

Non-statistically significant interpretative factors of recycling are also the volunteer programs for improvement of recycling, the willingness of the citizen to recycle paper separately in the special paper bin and the installation of a special bin for recycling paper only in his neighbourhood.

According to the final model, the estimated equation of the determinants as far as recycling is concerned is as follows:

$$\text{Question9} = b_0 - 0,349 \text{ income} + 0,495 q_7 + 3,069 q_8 + 1,005 q_{14} + 0,373 q_{17} + \epsilon_i$$

The net monthly income of the family is a statistically significant determinant of recycling at the level of 5% . The negative sign of the estimated coefficient suggests that citizens with lower monthly household income are more likely to recycle compared to citizens with higher monthly family income. This result is partly consistent with the results of other researches concerning the emergence of income as a determinant factor of recycling. However the majority of the researches which were reviewed [Smallbone (2005), Jenkins et al., (2003), Martin et al., (2006), Afroz et al., (2009), Ojeda-Bentitez et al., (2003)], show that income is positively correlated with recycling, namely consumers with higher income are more likely to recycle than those who have less income, which is in contrast with the result of logistic regression in this essay which showed that the citizens of the municipality of Aigaleo with less income are more likely to recycle compared to citizens with higher income.

The level of awareness among citizens on environmental issues is a statistically significant determinant of recycling at the level of 1% . The positive sign of the estimated coefficient indicates that citizens who are most likely to recycle are those who have a higher level of awareness on environmental issues in relation to the citizens who have a lower level of awareness on environmental issues. This result is in contrast with the results of the researches of do Valle et al., (2004) and Smallbone (2005), who indicate that the perceptual ability to contribute in solving environmental issues and the concern for environmental issues is not an important determinant factor of behavior as far as recycling is concerned.

The knowledge of the citizens for the use of blue garbage bins do positively affect the percentages of recycling and the estimated coefficient is statistically significant at the level of 1% . The positive result in column 3 in the table above indicates that citizens who are trained to use the blue recycling bins are more likely to recycle than those who do not know. This result is in agreement with the research of Jenkins et al., (2003) who indicate that the existence of a recycling program with bins is statistically significant factor that increases the intensity of recycling. Also, the searches of [do Valle et al., (2004), Aljaradin et al., (2011), Hansmann et al., (2006) come to a similar conclusion] stating that information positively affects recycling practices.

The motivation of the citizens towards their family and friendly environment to participate in recycling is a statistically significant determinant of recycling at the level of 1% . The positive sign of the estimated coefficient of motivation shows that citizens who recycle are more likely to positively encourage their family and friendly environment for the participation in recycling compared to citizens who do not recycle. The research of Vicente and Reis (2007) also came in a similar conclusion.

Moreover, the agreement of the citizens with the suggestion that if aware citizens were rewarded, with financial relief from municipal taxes, they would be more actively involved in recycling is statistically significant explanatory factor in increasing recycling at 1% and the sign of the estimated coefficient is positive. The positive sign indicates that consumers who agree with the above proposal are more likely to recycle than those who disagree. The research of Yau (2010) comes to a similar conclusion.

Taking into consideration the table above, according to the coefficient of determination of Coxx & Shell R2 independent variables which are examined in the original model explain 30% of the dependent variable. Furthermore, the independent variables are statistically significant in the original model, are examined in the final model and interpret the 30% of the dependent variable (again according to the coefficient of determination of Coxx & Shell R2).

In conclusion, from all the foregoing it is stated that the citizens who are more involved in the recycling process are consumers with lower monthly family income. Also, it is observed that citizens who recycle more are those who have a higher level of awareness on environmental issues and have knowledge about the use of the blue garbage bins. Finally, it is observed that the motivation of consumers who already recycle, towards their family and friendly environment and also the financial incentives do increase percentages of recycling.

II. Valuation of multiple linear regression models for the investigation of the factors that affect the frequency of application of recycling by the citizens

In order to investigate the factors that affect negatively or positively the frequency of application of recycling by the citizens of the municipality of Aigaleo, was estimated with the method of least squares, the following multiple linear regression equation.

$$\text{Frequency (Q11)} = b_0 + b_1 \text{ gender} + b_2 \text{ age} + b_3 \text{ education_dummy} + b_4 \text{ marital_dummy} + b_5 \text{ income} + b_6 q_7 + b_7 q_8 + b_8 q_{10.1} + b_9 q_{10.2} + b_{10} q_{10.3} + b_{11} q_{10.4} + b_{12} q_{10.5} + b_{13} q_{14} + b_{14} q_{15} + b_{15} q_{16} + b_{16} q_{17} + b_{17} q_{19} + b_{18} q_{20} + b_{19} q_{21} + \epsilon_i$$

Therefore analytically we observe:

Frequency (Q11): it is a quantitative dependent variable, which expresses the rate of material recycling of citizens in of the blue recycling bins and the takes the values from 0 to 4, where 0 = never, 1 = rarely, 2 = sometimes, 3 = many times, 4 = always.

Gender: is independent qualitative variable that reflects the gender of the respondents and takes the values 1 for male and 0 for female.

Age: it is a quantitative independent variable, which expresses the age of the citizens and is takes the value of 0 when it is 18-24 the value of 1 when 25 to 29, the value of 2 when it is 30-44, the value 3 when 45-59 and 4 when the price is 60 +.

Education dummy: it is a dummy variable which reflects the educational level of the citizens and takes the value of 0 when the education level is up to high school and the value of 1 when the level is higher / highest.

Marital dummy: is a dummy variable that represents the marital status of its citizens and takes the value 1 when they are married, the value 0 for all other cases (unmarried, widowed divorced).

Income: is an independent quantitative variable, which expresses the net monthly income of the family and takes the value of 0 when it is below 1,200, the value of 1 when it is 1201 to 2000, the value 2 when from 2001 to 3000, the value 3 when from 3001 to 4000 and the value of 4 when over 4,001.

Q7: it is an independent quantitative variable that expresses what is the level of information of the citizens on environmental issues and takes the value of 0 when it is none, the value of 1 when it is little, 2 when the level is good, the value 3 when it is very good and the value of 4 when it is excellent.

Q8: this is an independent qualitative variable that expresses the knowledge of the citizens on the use of the blue garbage bins and takes the value of 1 when it is yes and 0 when it is no.

Q10.1: this is an independent qualitative variable that expresses the attitude of the citizens whether they recycle paper and takes the value of 1 when they say yes and 0 when they say no.

Q10.2: this is an independent qualitative variable that expresses the attitude of the citizens on whether they recycle glass or not and takes the value of 1 when they say yes and 0 when they say no.

Q10.3: this is an independent qualitative variable that expresses the attitude of the citizens whether they recycle plastic and takes the value of 1 when they say yes and 0 when no.

Q10.4: this is an independent qualitative variable that expresses the attitude of the citizens whether they recycle aluminum and takes the value of 1 when they say yes and 0 when they say no.

Q10.5: this is an independent qualitative variable that expresses the attitude of the citizens whether they recycle tinplate packaging and takes the value of 1 when they say yes and 0 when they say no.

Q14: this is an independent quantitative variable that expresses whether the citizen urges their family and friendly environment to participate in recycling or not and takes the value of 0 when the answer is never, the value of 1 when the answer is sometimes the value of 3 when the answer is always.

Q15: this is an independent qualitative variable that expresses the knowledge of the citizen whether the municipality to which he belongs makes organized efforts for recycling and takes the value of 0 when the answer is yes, the value of 1 when the answer is no and the value of 2 when the answer is I do not know.

Q16: this is an independent qualitative variable that expresses the voluntary participation of the citizen in some effort of the municipality of Aigaleo for the improvement of recycling and takes the value of 0 when the answer is definitely yes, the value of 1 when the answer is maybe, if I had spare time and the value of 2 if the answer is no, because I do not care.

Q17: it is an independent quantitative variable that expresses the agreement of the citizen in the proposal that if aware citizens, were to be financial alleviated of the municipal taxes, people would be more actively involved in recycling and takes the value of 0 when the answer is very much, the value of 1 when the answer is a lot, the value of 2 when the answer is mediocre, the value 3 when the answer is a little and the value of 4 when the answer is no.

Q19: it is an independent qualitative variable that expresses the preference of citizen to be charged based on the amount of waste produced instead of square meters of the house and takes the value of 1 when the answer is yes and 0 when the answer is no .

Q20: it is an independent qualitative variable that expresses the agreement of the citizen in the proposal to install bins exclusively for paper recycling in your neighborhood and takes the value of 1 when the answer is yes and 0 when the answer is no.

Q21: it is an independent qualitative variable that expresses the mood of the citizen to recycle paper separately in the special paper bin and takes the value of 1 when the answer is yes and 0 when the answer is no.

Ei: errors of regression

In the second column of the table below the results of the estimation of the above equation for all explanatory variables are presented. The non-significant variables were removed from the original model and the results of the final model are presented in the third column of the table.

Table 2: Estimation of multiple linear regression for the frequency of recycling by the citizens

Variables	Initial model		Final model	
	B	t	B	t
Stable (If YES to question 9 how often do you apply material recycling for the blue bin) q11 (frequency)	1.1812**	1.994	2.255***	14.373
Sex (gender)	.058	.495		
Age (age)	.005	.071		
Educational level (education_dummy)	-.070	-.607		
Marital Status (marital_dummy)	.010	.069		
Income (income)	-0.223***	-2.948	-0.201***	-3.014
Your information over environmental issues is?	.099	1.465		
Do you know the use of of the blue garbage bins?	.354	.723		
If YES to question 9 what materials do you put in the blue bin (paper)	.069	.336		
If YES to question 9 what materials do you put in the blue bin (Glass)	-.004	-.036		
If YES to question 9 what materials do you put in the blue bin (Plastic)	.193	1.540		
If YES to question 9 what materials do you put in the blue bin (Aluminum)	0.382**	2.373	0.559***	4.699
If YES to question 9 what materials do you put in the blue bin (Tin)	.173	.900		
Do you urge your family and friendly environment to participate in recycling	.037	.342		
Does the municipality of Aigaleo make organized efforts for recycling?	.083	.925		
Do you volunteered in some effort of your municipality for the improvement of recycling?	-0.366***	-3.562	-0.408***	-4.769
Do you agree that if aware citizens were to be financially alleviated from the municipal taxes, _ they would be more actively involved in _ recycle?	-.006	-.101		
The municipal cleaning fees are paid baised to the square meters of your home. Would you prefer to be charged based on the amount of waste you produce?	-.103	-.616		
Would you agree with the installation of special bin for recycling exclusively of paper in your neighborhood?	.265	1.305		
Are you willing to recycled paper separately in the special paper bin?	.094	.544		
f statistic	3,920		15,028	
R square	.291		.223	
R square (adj)	.217		.208	

*** 1% significance level

** 5% significance level

* 10% significance level

From the above table of multiple linear regressions it is shown that gender, age, marital status and educational level of the citizens are not statistically significant explanatory variables on the frequency of recycling. The result

above confirms the searches of do Valle et al., (2004) and Vicente and Reis (2007) who also came in a similar conclusion.

Non statistically significant interpretation factors for the frequency of recycling are the level of awareness among the citizens on environmental issues and their knowledge over the use of the blue garbage bins. The researches of do Valle et al., (2004) and Smallbone (2005) conclude on similar results, which indicate that the perceptual ability to contribute in solving of environmental issues and the concern for environmental issues is not a significant determinant factor of behavior for recycling.

Furthermore, it is observed that the charge based on the amount of waste produced instead of square meters of the house and the organized efforts that might be carried out by the municipality for recycling are not statistically significant explanatory variables on the frequency of recycling. In corresponding results concludes also research of Jenkins et al., (2003), which states that the program of charging the families depending on the amount of waste is not a statistically significant factor in the percentage of recycling.

The mood of the citizens to recycle paper separately in the special paper bin and their agreement for the installment of special bins exclusively for recycling paper in their neighborhood does not interpret the frequency of recycling for any level of statistical significance.

The agreement of the citizens with the suggestion that if aware citizens, were to be financially alleviated from the municipal taxes, they would be more actively involved in recycling is not statistically significant explanatory factor in the frequency of application of recycling by the citizens. Smallbone (2005) concludes on similar results, which states that financial incentives in the form of refund in case of participation in recycling have little influence and would convince a few people to recycle.

Finally, the motivation of the citizens towards their family and friendly environment to participate in recycling and the attitude of the citizens to recycle paper, glass, plastic and tinplate packaging do not interpret the frequency of application of recycling for any level of statistical significance.

$$Frequency (Q11) = b_0 - 0,201 income + 0,559 q10.4 - 0,408 q16 + \epsilon i$$

The net monthly income of the family is a statistically significant determinant of frequency of recycling at a level of 1%. The negative sign of the estimated coefficient suggests that citizens with lower monthly household income recycle more often than citizens with a higher monthly family income or that citizens with higher incomes do not often recycle.

The attitude of the citizens to recycle aluminum (q10.4) does positively affect the frequency of recycling and the estimated coefficient is statistically significant at the level of 1%. Citizens who recycle aluminum seem to recycle more often than citizens who do not recycle aluminum.

The agreement on the voluntary participation of the citizen in some effort of the municipality of Aigaleo for the improvement of recycling is a statistically significant determinant factor for the frequency of recycling. The negative sign indicates that citizens who do not intend to voluntarily participate in some effort of the municipality of Aigaleo for the improvement of recycle more often than citizens who intend to participate in the activities of the municipality.

Taking into consideration the table above, according to the coefficient of determination R square the independent variables which are examined in the original model interpret 29.1% of the dependent variable. Furthermore, the independent variables which are statistically significant in the original model are examined in the final model and interpret 22.3% of the dependent variable again according to the coefficient of determination R square.

In conclusion, of the above we conclude that the citizens with lower monthly household income recycle more often than citizens with a higher monthly family income. Also, it is observed that citizens who recycle aluminum appear to recycle more often than citizens who do not recycle aluminum. Finally, citizens who do not intend to voluntarily participate in some effort of the municipality of Aigaleo for the improvement of recycling do recycle more often than citizens who intend to participate in the activities of the municipality.

4. CONCLUSIONS

Of the examination in consumer's behavior regarding recycling we see that the majority (61%) of citizens apply recycling through the use of blue bins. The materials recycled through the system of the blue bins by the citizens are paper, plastic, glass, aluminum and tinplate packaging. We also observed that most (72%) of citizens who apply recycling via blue bins do it or rarely do it (35%) or sometimes (37%). The amount of waste that is recycled is mainly medium in quantities (some quantities of 35%). Furthermore we see that relatively high sample percentages of the citizens (41%) do not implement recycling mainly due to the absence of bin in their neighborhood.

In relation to the motives that push residents to recycle, the financial motivation came up to be the strongest ones.

Regarding recycling of paper a significant percentage of citizens (82%) appears to agree with the installment of recycling paper bins and is positive with the perspective of recycling paper in specific bins.

In relation with the demographic data we see that income is a statistically significant factor of recycling and the frequency that is applied. This result is partly in agreement with the results of other researches concerning the emergence of income as determinant factor of recycling. However the majority of the surveys that we reviewed [Smallbone (2005), Jenkins et al., (2003), Martin et al., (2006), Afroz et al., (2009), Ojeda-Bentitez et al., (2003)], show that income is positively correlated with recycling, meaning that consumers with higher income are more likely to recycle than those who have less income, this is contrary to the logistic regression result in this work that showed that the residents of the municipality of Aigaleo with less income are more likely to recycle compared to with higher income.

The level of awareness among citizens on environmental issues and their knowledge of the use of blue garbage bins are statistically significant determinants of recycling. Residents who have a higher level of awareness on environmental issues and know the use of blue recycling bins are more likely to recycle compared with citizens who have a lower level of awareness on environmental issues and do not know the use of blue bins. The surveys of [Jenkins et al., (2003), do Valle et al., (2004), Aljaradin et al., (2011), Hansmann et al., (2006)] do conclude in similar results.

The encouragement of the citizens towards their family and friendly environment to participate in recycling and their agreement with the proposal that if -aware citizens were to be rewarded with financial relief from municipal taxes, that would make people participate more actively in recycling are statistically significant determinants of recycling. Residents who recycle are more likely to encourage positive their family and friendly environment for the participation in recycling compared to citizens who do not recycle. Also, citizens who agree with the above proposal are more likely to recycle than those who disagree. The researches of Vicente and Reis (2007) and Yau (2010) came up with similar conclusions. In addition factors affecting the frequency of recycling by citizens are their participation in voluntary programs and their attitude to recycle aluminum.

In conclusion we should once more emphasize to the contribution of recycling in the sustainable development of modern societies. Its offer is great mainly in environmental, economic and social level, since the goals of recycling is on the one hand the reduction of the environmental burden of wastes produced and on the other the savings of resources. To conclude, the distance to be covered from the current situation until the "recycling society in Greece" is huge. The transition speed will depend not only on the sensitivity and effectiveness of the central government and local and regional authorities, but also by the awakening and determination of civil society, to adopt different standards and behaviors as far as consuming is concerned and to take separate paths from the stereotypes that bind them to the current stagnation.

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