

Change Of The Citizens' Attitude Towards Car Use And Fuel Consumption In Hungary¹⁷

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ABSTRACT Despite the directives and decisions of the European Union, the role of citizens is more and more important in reaching the national and common targets of environmental protection. The behaviour of individuals can be influenced by legal and economical tools and measures; however, the desired way is to build the personal and internal motivation. "Green thinking" – for example selective waste collection, avoiding unnecessary packaging, energy saving – may change the daily life of the households and it may improve the quality of their living environment and eventually, their life. Therefore, energy conscious behaviour may be considered as a form of environmental awareness and also as an individual behaviour.

In this paper, I evaluated a part of Hungarian surveys, where the scope of the questions were the citizens' habits related to car use, the willingness to use biofuels and as the initial point of all the above mentioned, the elementary knowledge about these topic. Beyond the results of descriptive statistics, I used the possibilities of SPSS software package and I tried to find connection between responses, as nominal variables and demographic ones.

KEYWORDS environmentally conscious behaviour, biofuels, willingness to use, renewable energy sources

Introduction

In order to analyse the change of the citizens' attitude towards car use and fuel consumption in Hungary two main topics should be examined, the macroeconomic trends of fuel prices and the citizens' behaviour.

The first may be explored by the data of Hungarian Central Statistical Office, while the citizens' behaviour may be assessed according to the database of my own survey.

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Macroeconomic aspect of liquid fuels

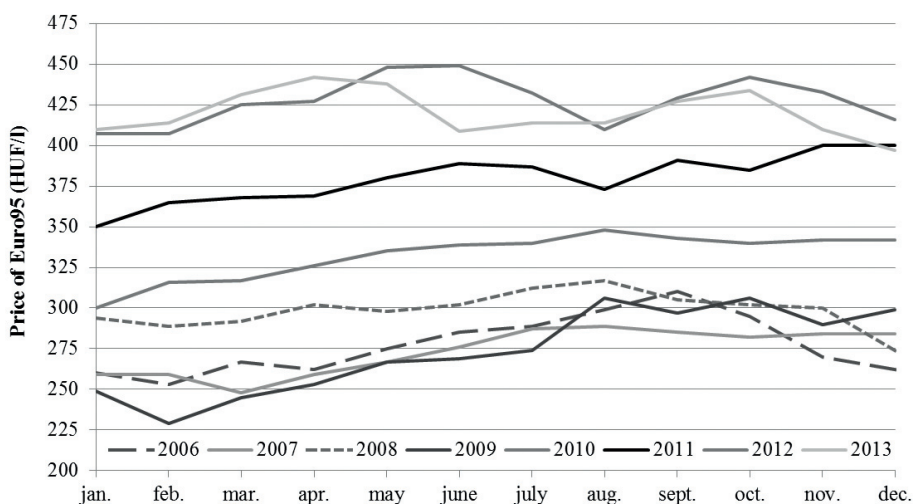
Nowadays – despite the temporary changes - the fuel prices are increasing, as it can be known and it can be observed directly through the car use or indirectly through everyday life when the price of goods include the price of energy.

From 2011, according to the EU's and fuel markets intention, the diesel one has become more expensive. The reasons behind of this process can be the lobby of car and oil industry because the diesel cars are more effective and that is why these cars use less fuel.

The Liquid Petroleum Gas (LPG) is purchasable from June of 2007 in Hungary.

The price of unleaded oil (Figure 1) in 2006 and 2007 remained almost unchanged. In 2008, it can be seen a definite increase and the prices decreased to the level of 2006 and 2007 by the end of the year. In 2009, the prices of the Euro95 oil remained at the previous level because of the global economic crisis and first of all, the collapse of the car – and generally the heavy – industry. After 2010 and 2011 – as they can be called “transition” or “recreation” years – it seems that it is defined on a new price level from 2012.

Figure 1: Change of price of Euro95 in each year (2006 -2013)

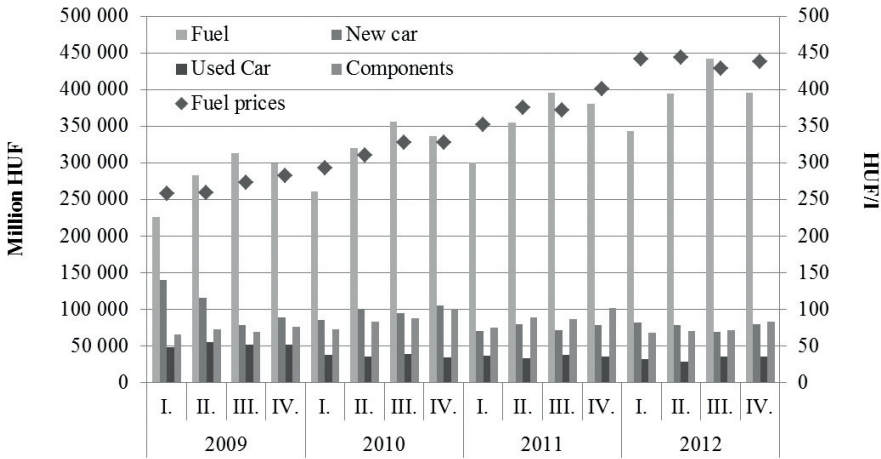


Source: Own construction (2013) by homepage and data of NTCA

The changes of the price of Diesel oil are basically similar to the Euro95, but after 2009, the price level could not reach the price level of 2006 and 2007 and there was only one transition year in 2011.

Figure 2, illustrates the amount of fuel sales at the retailers according to the different categories of motor vehicles and the average fuel price from the previous database.

Figure 2: The amount of retail sales of fuel and certain categories of vehicle and the average price of fuel from the same period



Source: Own construction (2013) by homepage and data of NTCA and HCSO

The conclusions of the graph's trends may be considered as simple, so – despite it is not the focus of this present work – it is justifiable by calculations performed by Pearson's correlation. Based on these results, it can be concluded that there is a positive and strong correlation (0,7989) between the price of fuel and used vehicles sales, while with the vehicle components the correlation cannot be shown. It is important to note that the sale of vehicles – especially the new ones – is significantly affected by the tightening of credit facilities and the change of household income resulted by the economic crisis. In order to filter out these distorting factors, it can be required to calculate an additional partial correlation.

Social attitude towards car use and (bio)fuel consumption

The globalized world and society, the overpopulation process, the deepening of the gap between different consumer groups and living standards, the environmental pollution and of course its differences and contradictions were emphasized by Kohlheb et al. (1995) as the most serious problems, which require for the awareness of each players of the economy. Environmentally conscious behaviour became an everyday term and not only the citizens but also the enterprises, the

state owned sectors, and different producers and services are involved in this way of thinking and acting. A possible way to improve awareness is considering taxation issues. (Illés and Kohlhéb, 1999) The Hungarian biofuel programs were evaluated by Lakner et al. (2010) in which they summarized the economic aspects of these programs. Our main objective was to examine the “human” factors, the attitudes of the society towards energy conscious behaviours.

The starting point of this research was the assumption of Ek (2005), who wrote, if the consumers have preferences for the environment, they probably have “green” preferences, which means they might pay the premium price of the “green” electricity. If we accept this statement and we accept that the strong connection between environmental protection and energetics can be considered as a starting point of the assessment of energy conscious behaviour, then we can examine this topic together with environmentally conscious behaviour, which has very broad literature. (See Table 1.)

Table 1: Summary of some research towards environmentally and energy conscious behaviour – scope of the analysis

Analysis of the environmentally conscious behaviour	Analysis of the energy conscious behaviour and the attitude towards renewable energy sources
1. Typology of environmentally conscious behavior in the United States of America in relation of demographical variables (Roberts, 1996) and the New Environmental Paradigm Scale (Roberts, 1997)	1. Energy saving and energy effective attitude depending on information of energy bill (Wilhite and Ling, 1997)
2. The consumers' knowledge about production process (Vágási, 2000)	2. Knowledge of renewable energy sources (Bai, 1998, 2009) and the barriers of the wider spread of use (Tamus, 2006; Domán et al., 2010a and b)
3. Degree of the persuasion and the undertaken compromise (Pattie, 2001)	3. Habits for choosing between filling station brands (Kolos-Berács, 2000)
4. Waste management practices, knowledge of waste (Vida, 2011)	4. Attitude towards „green electricity” in relation of wind energy (Ek, 2005)
	5. Consumers' evaluation in relation of environment and wind energy (Borchers et al., 2007)
	6. Energy saving and energy conscious behaviour (Boardman, 2004)
	7. Attitude towards renewable energy sources (Illés et al., 2013; Vida, 2013a)
8. Attitude towards environment, environmentally conscious consumption, selective waste collection, energy saving in households (EBS 247, 2006; EBS 262, 2007; Schäfferné, 2008)	

Source: VIDA (2013b)

The starting point of the research of Borchers et al. (2007) was the following (hypothetical) groups:

1. positive willingness to pay towards green electricity – as general commodity – and its role in the environment protection,

2. analysis of preference through green electricity in relation with environmental protection,
3. consumers' evaluation from price and origin.

Table 2: Summary of Hungarian surveys in relation of environment and energy conscious behaviour

	Tamus et al. (2006 and 2010)		Bai (1998 and 2009)		Kolos – Berács (2000)	Tóth – Baross (2008)
Timescale	May 2006	2009	1996. from July to Nov.	2002. from April to Aug.	Autumn of 1997	2003 and 2008
Area within Hungary	Counties: Heves, Jász- Nagykun-Szolnok, Borsod-Abaúj- Zemplén, Nógrád, Pest, Szabolcs-Szatmár- Bereg, Hajdú-Bihar and Budapest		No infor- mation	Hajdú- Bihar, Borsod- Abaúj- Zemplén, Dunántúl	Budapest	around Encs and Forró 5 % of total households
Total number of surveys	600		123	389	362	Encs 112 Forró 41
Number of sample	598	806				
Representa- tivity	No information (According to gender, age and habitation, the two samples are similar.)		It is presumable from the consistence of sample		No information	
The scope of the survey	General knowledge about renewable energy sources (popularity, willingness to use)				Habits for choosing between filling station brands	General knowledge and accept- ance of renew- able energy sources valuation of phenomena of NIMBY ¹ and local benefits
Statistical methods	De- scriptive	Descriptive statistics				
	Factor analysis					

Source: Own construction by the referred sources, Vida (2013b)

1 NIMBY: Not In My Backyard: Term of theoretical support of use of renewable energy sources but far from the responder closest environment.

According to the three points, it has been proved that the consumers can distinguish between different energy sources and they prefer the green energy. It has been verified that consumers must to have relevant knowledge about advantage of each energy sources in point of themselves and in point of environment. To avoid the overvaluation and undervaluation in the course the decision process, it is essential to know the consumers' preference scale, in other words: what is valuable for the consumers.

The Table 2 summarizes the main characteristics of related Hungarian researches and it provides a basis for comparison of my own research.

Methodology

For my researches, I have created a questionnaire, but this paper deals with only six questions. My present work covers only those citizens who have own cars and do not use company car. The reason of this theory is that these citizens may decide independently about their car expenses.

The first interview – in 2011 – was a Computer Assisted Telephone Interview (CATI) and according to the practice of EUROBAROMETER (EBS), the database is representative at gender and age. As a result of the sampling process 1000 persons (older than 18 years) were interviewed. The data were processed by SPSS 21 programme package.

I have repeated the survey in 2012 and 2013. Because of the infrastructure and the budgetary need of a representative research, the method was random and the type of interview was personal and that is why these simple are not representative.

Table 3: The analysed questions and variables of the own survey

Questions		Demographic variables	
1.	Will you reduce the use of your own car when the fuel price will be more than 400 HUF? [EBS 258, 2006 ²]	Gender Age Salary level Region	
2.	If your response "yes", which way is the best for you?		
3.	Is it important for you to always fill the tank at the same brand of gas station?		
4.	Do you know the amount of biocomponent in your (usually) used fuel?		Questions of biofuels
5.	Would you fill to the tank with fuels which contain more biocomponent than the obligatory?		
6.	Would you pay for it higher price?		

Source: Own survey (2011)

² The original question: Would you be prepared to pay more for energy produced from renewable sources than for energy produced from other sources? (IF YES) How much more would you be prepared to pay?

The survey contained two question groups, the first was concerning the usual car use habit while the second was connected to willingness to use and to pay of biofuels (Table 3). In my research, the type of answers was simple answer choice, and there were only one choice. Finally, I have worked on nominal variables.

For the data processing, at first, I used descriptive statistic methods; the non-metric data were processed by cross table analysis, which is one of the most important tools for researches of social sciences (Babbie, 2001; Ketskemény and Izsó, 2005) and finally, the used method was the Cramer's V.

The application of Cramer's V is justified by the reliability. It means that it is less sensitive to the sample size and its interpretation is simpler such as the contingency coefficient. Cramer's V is an applicable methodology to all sizes of cross tables and this fact is another important advantage. (Jánosa, 2011; Sajtos and Mitev, 2007) Due to the listed advantages, the Cramer's V will be used to examine the significant connections inside each of the three databases. During the presentation of the results of descriptive statistical analysis, it will be emphasized the year of 2011 because of the representativeness of the sample.

Results and discussion

Through the questions, I tried to find the factors that affect the amount of the used biofuel directly or indirectly. Firstly, I present the results of descriptive statistic methods.

Examining those questions which try to find answer to the vehicle and fuel use habit, they are answered by citizens, who do not use company vehicles. The reason for this was – in my opinion – that in this case (when the respondent decides about the cost and services of vehicles) the decision is depend on the personal attitudes and the everyday use is independent on the rules of company vehicle use (e.g. the fuel card is given).

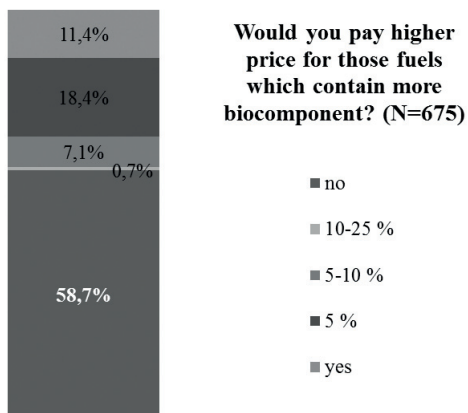
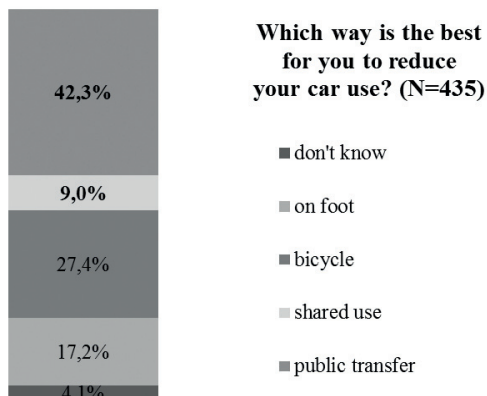
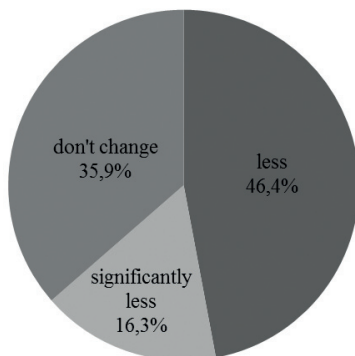
According to the survey which was performed in 2011, 54% of respondents would reduce vehicle use when the fuel price increases over 400 HUF/l. (Figure 3)

Despite the reasons above, many people were added to their “no change” reply a short addition. Although they do not use company cars, it is an indispensable tool for their job and that is why the use of it cannot be reduced significantly despite the rise of prices.

The use of a private vehicles could be substituted by public transport (42.3%) or a common (with friend or colleague) vehicle use (9.0%). This reaction would not lead to a sharp decline in terms of less biofuel demand. The reason of it in this regard, the buses are technically able to use the biodiesel in significant amounts in the public transport.

Figure 3: The citizens' reaction to the increase of fuel price

Will you reduce the use of your own car when the fuel price will be more than 400 HUF? (N=675)

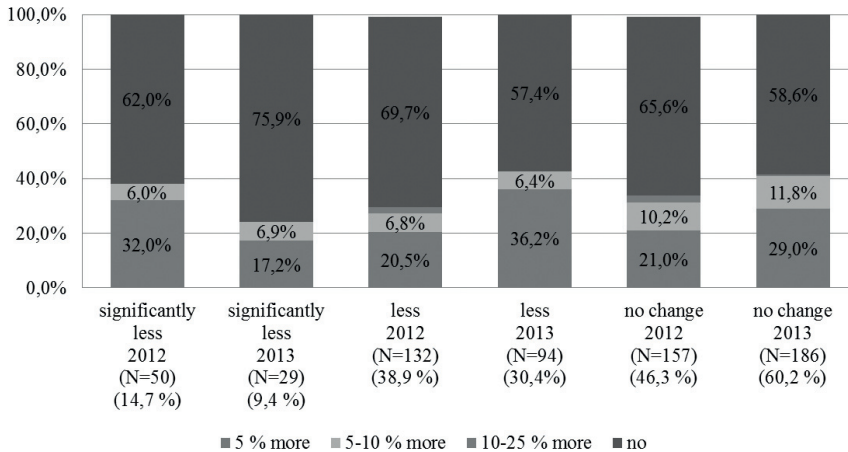


Source: Results of own calculation (2013)

It is important to note that although it is not a specific hypothesis of this paper but I assumed that consumers generally accept and adapt to the higher price level. As a result of this thread, citizens will not change dramatically the vehicle use but their willingness to pay for higher biofuel content will be reduced, because the higher biocomponent content also means higher price.

Taking into account the patterns of the years 2012 and 2013 features (see Methodology chapter), Figure 4 shows the respondents' habits towards car use after the price increase. Among those citizens who radically changed their car use, the willingness to pay is sharply decreased from 2012 to 2013. The picture is reverse into the other two categories: the rate of answers about willingness to pay grew from 2012 to 2013 in each point.

Figure 4: Results in relation of willingness to pay and change of vehicle use in the year of 2012 and 2013



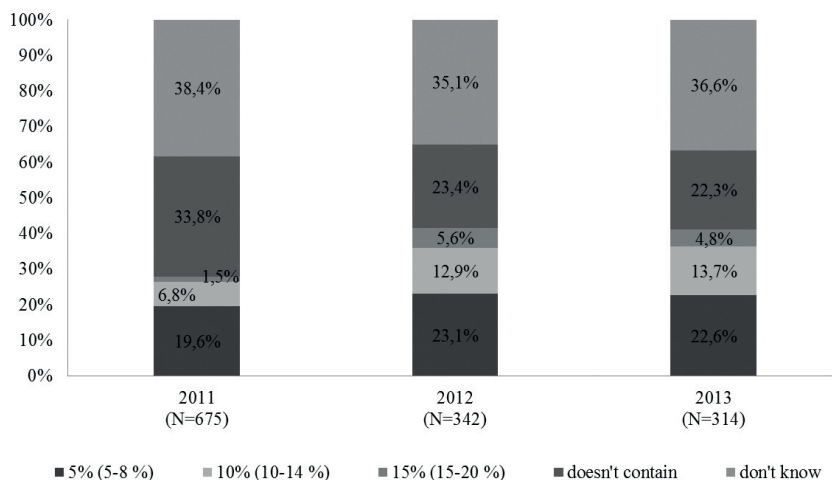
Source: Results of own calculation (2013)

In this case, the knowledge and the information about biofuels is significant in two points of view. Firstly, in order for the consumer could decide why they should pay more, it has to know the general bio-component measure in the everyday used fuels. Secondly, the consumers need to know their vehicle and they should be able to define what the expected effect is through the use of higher bio-component content fuel.

When the consumer's decision is considered to these relevant and exact information, their habit can be called „fuel conscious behaviour”. In relation of the first topic, the ratios of the given answers for each of the three years are shown by the Figure 5. It can be seen that those who have been able to say exactly the right mixture, were

only about 20% of the total respondents. The partition is very similar in 2012 and 2013. Nearly 10% higher is the proportion of those who believe that the general fuel does not contain any bio-component in the (representative) sample of 2011.

Figure 5: Knowledge of citizens about the biofuel content



Note: I assumed that the *difference between the required mixing ratio and the volume ratio could be deceptive* therefore I changed the proportions of possible responses in 2012 and 2013. This is shown in the brackets.

Source: Results of own calculation (2013)

The focus of the next question was the consumers' willingness to use in relation of second issue. I wished to explore the respondent willingness to use towards fuels with high biofuel-component content. In all three years, nearly the same number of respondents (in order of years: 24,4%, 23,3%, 22,3%) would not use such a fuel because they do not know that it is suitable for use in their vehicles. This similarity of rates remains in case of "yes, but only if it reduces the cost of fuelling" answer but in a few higher rate. It can be said on the base of responses that the environment protection is the most expected effect from the use of bio-fuels (in order of years: 40,6%, 29,0%, 30,1%). Reacting to the additional notes, I added another option to the survey of the year of 2012 and 2013 as "no, because I know that my car is not suitable for use". This was chosen by the 13,8% and 16,5% of respondents, so it seems to improve the respondents' awareness.

Table 4 shows the cross table of knowledge and the willingness to pay questions. As a result of this aspect, (taking into consideration the limitations of the methodology of descriptive statistics) it is possible to define the term of "fuel (save) conscious behaviour" which is also was analyzed by Cramer's V test.

It can be seen on the table that the 14-22 % of those citizens who know the correct mixing ratio of bio-component are able to pay more for higher biofuel content (regarding all of three years). It is important to emphasize that the percent of analyzed citizens is the highest on “I do not pay more” answer.

On the right side of the table can be also seen that the highest percent of answers is “don’t know” or (in 2011) “doesn’t content” in each category of willingness to pay. The last column the ratio of said organic component observed visible matter is that every year and every category of “do not know” is the highest value.

On the left side of the table, it can be seen the consumers’ responses of the question about willingness to use on the relation of the willingness to pay. Analysis of the responses in this manner is consistent with the finding of the previous aggregation: those who are willing to pay more for fuel with high bio-component content, they are influenced by the expected positive environment impact and this is true independently on year.

Table 4: Cross-table of willingness to pay and the two questions about knowledge

Would you fill to the tank those fuels, which contain more biocomponent (bioethanol, biodiesel) than the obligatory measure?				Would you pay higher price for those fuels, which contain more biocomponent?	Do you know the amount of biocomponent (bioethanol, biodiesel) in your usually used fuel?						
No, because I do not know	Yes, because I know	Yes, ... if it reduces the fuel prices	Yes, ... environment		5% 5-8%	10% 10-14%	15% 15-20%	Doesn't content	Don't know		
22,1	3,9	7,8	66,2	Yes, 2011							
8,9	4,8	16,1	67,7	2011	2011	19,4	7,3	1,6	34,7	37,1	
9,2	5,3	19,7	53,9	2012	5% more	2012	21,1	15,8	5,3	25,0	32,9
12,9	5,4	23,7	47,3	2013		2013	22,3	12,8	5,3	23,4	36,2
8,3	4,2	8,3	79,2	2011		5-10% more	2011	14,6	8,3	0,0	39,6
14,8	11,1	11,1	44,4	2012	2012		17,9	25,0	7,1	17,9	32,1
10,0	3,3	10,0	60,0	2013	2013		16,7	16,7	10,0	16,7	40,0
20,0	0,0	20,0	60,0	2011	10-25% more	2011	20,0	0,0	0,0	20,0	60,0
28,6	0,0	14,3	57,1	2012		2012	14,3	14,3	0,0	57,1	14,3
0,0	0,0	0,0	100,0	2013		2013	0,0	0,0	0,0	100,0	0,0
31,8	5,1	36,4	23,5	2011	no	2011	21,7	7,1	1,5	34,3	35,4
28,9	4,4	34,2	18,2	2012		2012	24,7	10,3	5,4	22,9	36,8
29,3	3,8	31,0	16,3	2013		2013	23,7	14,0	3,8	21,5	37,1
24,0	0,0	12,0	20,0	don't know, 2011		2011	12,0	0,0	0,0	28,0	60,0

Source: Results of own calculation (2013)

Those who refuse to pay the over price, they expect the price reduction.

The summarizing table shows only those factors where the responses were significantly different from the other categories. According to the results, there is no

decisive difference in self-financed car owners by gender and age. In the case of net revenue per capita, the highest rate is 43.3% of the category of 50,000 - 100,000 HUF.

It can be assumed on the base of the following two revenue categories and their low ratios that the higher income involves the exist of company vehicle. The proportion of car owners is Highest in Central Hungary and Western Transdanubia region. The fuel price changes the car use habit of women and over 50 year old citizens will change significantly as it is explored by the analysis. The way of car replacement by age and sex were typically the public transport while the over-50 age group preferred the possibilities with no additional cost. The car would be replaced by bicycle and pedestrian transportation in the Southern Transdanubia region.

In the case of the fuel station, the results are:

- the price is the selection criterion in group under 40 year and 100,000 - 200,000 HUF income level, and
- over 40 and 50,000 - 100,000 HUF income level, the price and the routine are dominant.

In contrast to the previous categories, the expected and experienced fuel quality is the emphasized point of view in course of choice between gas stations in the Southern Transdanubia region. Those who would refuel high bio-component content fuel, they are typically men, younger than 40 years, the income per capita is between 100,000 to 200,000 HUF and live in the Central Hungarian region.

I prepared previously a detailed analysis about the knowledge of biofuel content but there is one important result. The demographic breakdown of the income categories shows that when the income is under 50 000 HUF, the “do not know” responses were significantly higher than other variables. I also examined the relationship of income categories and the willingness to change. According to the results of the calculations, the higher income (per household capita) results moderate willingness to change which is affected by the fuel price increase.

As I mentioned earlier, it is necessary to examine the relationship between variables, which was made in all three databases in relation to demographic variables. The results of CramerV calculations are presented by Table 5.

Table 5: Summary of results of Cramer's V method

Nr. of Q.	2011.				2012.				2013.			
	G.	A.	Rev.	Reg.	G.	A.	Rev.	Reg.	G.	A.	Rev.	Reg.
1.	✓	✓	✓		✓		✓	✓				
2.	✓	✓		✓		✓				✓		
3.		✓		✓	✓							
4.	✓	✓										
5.				✓			✓					
6.	✓	✓				✓						

Source: Results of own calculation (2013)

The intensity of the colours indicates the strength of connection and the mark indicates the significance. Significant relationship was observed by gender and the age in the representative database of 2011. However, most moderately strong relationship was demonstrated with the regional variable. It can be said that the general vehicle use habit and the willingness to change are affected by demographic characteristics. The knowledge of biofuels and the willingness to pay are influenced by age and gender and the willingness to use (stronger than the previous ones) is linked to the region as well.

Conclusions

As a result of the analyses, the following conclusions can be drawn:

- The research clearly showed that the general approach is not enough effective during the communication for environmental and energy conscious behaviour because the population is not homogeneous neither knowledge nor motivation point. It is showed that consumers do not know neither the fuel combination, nor the technical suitability of own cars.
- The most expected positive effect from the use of biofuels is the environment protection effect and at the same time it is also the price advantage. It means that the consumers also expect that the high bio-component fuel would be cheaper or at least should not be more than the traditional version. Consumers separate the technical ability of car and the expected positive effects (e.g. lower price or environmental protection). To realize the common advantages and national targets, the information must also be taken into account in these two considerations.
- The CramerV indicator resulted significant connection between age and willingness to change in all of the three databases. Based on the descriptive statistics, it is also showed that most of the over 50 year olds are willing to change their habits when the fuel price will increase/increased over 400 HUF/l. However, it can be assumed that the primarily motivation is economic and their habit is not the result of the energy or the environmentally conscious.
- The activity and the consciousness of the **population over the age of 50 are significantly higher in everyday decisions despite their environmental education was not that emphasized than nowadays. It is assumed that their engagement to the environment protection is based on emotional motivation. That is why the information should focus to useful practical skills in everyday life and it should need less of the theoretical knowledge. It is also very important in that aspect that they can set an example – through their role in the family – to young generation, which has significant theoretical knowledge however has less everyday experience**

or routine. The importance of the intergenerational relationship is also outstanding because – as shown above – the attitude of young adult group – as “would rather pay than do” - can be compensated on (national or local) social level.

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