ENVIRONMENTAL QUALITY, STIMULATING FACTOR CONSUMPTION IN THE XXI CENTURY

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Abstract
The XXI century consumer changes the behaviour, directing it to an environmentally friendly attitude. This appears as the need to find ways that permits the consumer behaviour, rights and interests of their, following the adoption of a preventive consumer behavior in relation to goods and services that affect or are affected by deteriorating environmental quality elements. Estimated environmental effects raise serious problems due to lack of markets for trading the most environmental goods and services. For such reasons, most often the only way to quantify the environmental effects is indirect estimation. The behavior of individuals on the related markets reveals the value they assign to the environmental improvements. The research targeted a community located near a garbage pit hole. There are lots of variables through which the way people change their behavior is analyzed, for which reason it is necessary to search for as small a number of explainable variables as possible that should best express the separation of the individuals in classes. The article presents a way of using discriminant statistical analysis in order to obtain estimation in behaviour of XXI century consumer valuation by awareness of environment effects.

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Keywords: multiple discriminant, environmental effects, estimation, XXI century consumer

JEL Classification: C30, C53, Q51

Introduction

The XXI century consumer changes the behaviour, directing it to an environmentally friendly attitude. Compared to goods and services affected by pollution or by their use, induce adverse effects on the environment, interest is increasingly lower. Consumer rights and interests acquired new valences as a result of a preventive attitude towards consumption. This appears as the need to find ways that permits the consumer behaviour, rights and interests of their, following the adoption of a preventive consumer behavior in

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relation to goods and services that affect or are affected by deteriorating environmental quality elements.

Major challenge in such an approach is to identify techniques to quantify the monetary values needed to evaluate the preventive consumer behavior that premise rights analysis but also the interests of XXI century consumer. Estimated environmental effects raise serious problems due to lack of markets for trading the most environmental goods and services. For such reasons, most often the only way to quantify the environmental effects is indirect estimation. This allows find a value to be assigned to an environmental good by using data about the real choices made by individuals on related markets (markets of substitution). The behavior of individuals on the related markets reveals the value they assign to the environmental improvements.

The first part of the paper presented affiliation ways of the environmental goods and services value. Having identified the typology it proposed, the application of discriminant analysis, the basis of wich can outline the rights and interests of consumers as are reflected in terms of awareness of environmental effects.

1. Value categories used in the assessment of the preventive behaviour

Approaching total economic value involves its dissection into categories of value, each good or service consisting of a number of attributes, some of them easily measurable, others more difficult. Total economic value is the sum of these components. The value of usage may be direct, indirect and of choice.

Value of direct usage is also known under the name of value of extraction, of consumption or structural value deriving from the goods that can be extracted, consumed or that bring benefits directly. For example, in the case of a forest, the value of usage by extraction could derive from the value of wood or fruits that can be sold on the market. But the value of direct usage can also refer to non-consumption (for example, a group of tourists enjoying the forest landscape where they camp for a few nights). In this case, the forest as a resource is not consumed but the respective group of individuals receives a direct value. All these benefits are real; they can be measured, even if an individual's consumption does not affect another individual's consumption (non-rival consumption of free goods). The value of direct usage is usually easy to get.

Value of indirect usage is also called functional value and it derives from the services provided by the environment (for example, the recreational park-provided opportunities). Their price is difficult to establish.

Value of choice is a value obtained by considering the direct usage value of a choice as being full of advantages. Is a special case of the usage value and it may be compared to the value of an insurance policy. It is the value that the individuals would agree to pay in order to protect the natural assets, if they are sure that their preferences are not going to change. Beside their wish to satisfy their own pleasures, less selfish reasons could be added, a choice for others of the current or future generations. Lack of selfishness may also manifest in favor of other species.

It contrast with the value of usage, the intrinsic value is not connected to either the effective usage or to the potential one. It originates in the value conveyed by the existence itself of

the asset or of the respective resource, irrespective of whether they are benefited from directly or indirectly in the present of future (Negrei, 1996).

It is about recognizing the fact that certain things have a value in themselves, a sentimental value, a value that people attach to the environmental elements for existing, without them intending to use them. Thus, people attach a value to the blue whales or Panda bears even if they have never seen these beings and they are never going to see them. If the blue whales disappeared, a lot of people would feel this loss. The will value is the value derived from the will to pass on something valuable to the future generations. The intrinsic value is the most difficult to assess depending on the people's behavior, by definitions, and it is sometimes completely unobservable for this reason.

Indirect estimation allows a value to be assigned to an environmental good by using data about the real choices made by individuals on related markets (markets of substitution). In the absence of the market data the availability to pay (AP) can be estimated with the help of some substituting goods sold on a market. The behavior of individuals on the related markets reveals the value they assign to the environmental improvements. By assessing the preventive behaviour, different values are obtained from observing how people change their behavior (using air filters, boiling water before drinking it, apply health care treatments) as a response to the modifications in the quality of environment.

The technique of the preventive behavior involves an analysis of the way in which the individuals facing a certain level of the environment risk adopt a preventive behavior to reach an optimum level of health. This technique refers to the fact that an individual will behave preventively as long as the benefit thus obtained exceeds the cost involved by his action.

Hypothetically, if each preventive action triggers a risk reduction on health, the respective individual will continue to adopt a preventive behavior until cost equals AP for the risk reduction on health (Shogren et Crocker, 1991). Thus, the estimating of the benefits through this technique is performed based on two groups of information: cost triggered by the adoption of the preventive behavior; efficiency of the individual s actions given by the way he/ she perceives the compensation of environmental elements quality deterioration.

The individuals for which the environmental benefits are analyzed fall into two main categories: they have or they have not a preventive behavior as a response to the quality deterioration of the environmental elements. There is obviously a third category on the verge of the first two, their behavior being an indifferent one. The discriminant analysis may be relevant as a tool in assessing of the environmentally friendly consumer behaviour. There are lots of variables through which the way people change their behavior is analyzed, for which reason it is necessary to search for as small a number of explainable variables as possible that should best express the separation of the individuals in classes. This is, actually, the descriptive purpose of the discriminatory analysis. Besides, based on such an analysis the extent could be checked upon, to which any individual, not yet categorized resembles the individuals in a certain class and, if this resemblance does exist, his distribution in the respective class could be decided upon.

We would like to present bellow the results of a study focused on the statistic population composed of 14 families at a distance of maximum one kilometer from a garbage pit hole.

2. Empirical data

The existence of the garbage pit hole in the very close neighborhood affects the quality of drinkable water, air and soil having different effects on the community. Population is not connected to a centralized network of drinkable water provision so that they use fountain water for consumption in their households. Focus was put on how the fountain water, air and soil quality deterioration for self-consumption agriculture is perceived by the individuals living on the 14 real estate properties located at one kilometer away from the tip.

The premise used as a starting point was that the existence of the garbage pit hole increases the pathogen character of the water, generates a pestilential smell and can have negative effects on the agricultural goods produced by the subsistence economy. The representatives of each family were asked to respond to the question: „Does the existence of the garbage pit hole raise the need for specific consumption measures for health protection?" by choosing from the answers „yes" or „no". Thus, eight of the families were considered a priori as individuals with preventive behaviour, while six were considered not to have a preventive behaviour.

Over two weeks, the behaviour of the family members was observed from the perspective of the established objectives. By analyzing the behaviour related to water consumption, a statistic variable was established as „the use of fountain water". It was considered that the members of a family had a preventive behavior in the case of a low- frequency usage of the fountain water (bottled water or water brought from the farther away fountains was used). Scores from 1 to 10 were given, the biggest score being given to the family which does not use the water from the closest fountain to the garbage pit hole.

For analyzing the degree of perception of the pestilential smell, the statistical variable was determined to be „the use of air conditioning to filter the air from the house". It was considered that using air conditioning, even if the outside temperature did not make it necessary, represents a measure for the perception of the pestilential smell. Scores were given from 1 to 10, the biggest score being given to the family with the highest frequency of use of air conditioning.

For the analysis of soil degradation for subsistence agriculture, the statistical variable was considered to be „the area around the house cultivated for agricultural purposes (self consumption)". Scores were given from 1 to 10, the biggest score being given to the family which has the smallest plot for self consumption agriculture.

The scores obtained from each family on the three variables used in the study and the grouping of those depending of the question „Does the existence of the garbage pit hole determine the need for specific consumption measures for health protection?" are presented in table no. 1.

There are lots of variables through which the way people change their behavior is analyzed, for which reason it is necessary to search for as small a number of explainable variables as possible that should best express the separation of the individuals in classes. This is, actually, the descriptive purpose of the discriminatory analysis. Besides, based on such an analysis the extent could be checked upon, to which any individual, not yet categorized resembles the individuals in a certain class and, if this resemblance does exist, his distribution in the respective class could be decided upon.

Table no. 1: Assessment of preventive behavior

Real estate property	Fountain water usage x_1	Air filtering device usage x_2	Self-consumption soil cultivation x_3
Individuals with preventive behavior			
1	7	8	9
2	8	9	10
3	9	10	9
4	7	9	9
5	10	9	9
6	8	7	8
7	9	8	8
8	8	9	7
Average assessment	8,25	8,62	8,62
Individuals without preventive behavior			
9	3	6	7
10	2	6	7
11	6	2	5
12	2	3	2
13	2	5	4
14	2	2	2
Average assessment	2,83	4,00	4,50
Difference between the average assessments	5,42	4,62	4,12

The discriminatory analysis highlights the existing connections between the explainable quantitative characteristics and a characteristic to be explained (Bouroche et Saporta, 1980). The method allows for this to be done through visualizing the characteristics on a factorial level. At the same time, it includes the modalities of the explained characteristic beginning with the values assumed by the explainable characteristics.

3. Description of the method

Let s consider a lot of individuals and monitor a qualitative characteristic having q modalities. Each individual will be identified by a single modality of that characteristic, part of the lot of individuals being defined in q disjunctive classes. On this lot the quantitative p characteristics are measured and, whether the q classes differ in the ensemble of quantitative characteristics is studied (Foxall, 2006). Thus, a new characteristic is determined through some linear combinations of the old characteristics.

The discriminatory analysis will lead to a decision rule with the help of which, depending on the values of the explicative variables, the individuals belonging to a certain class will be established; based on these results forecasts on other individuals belonging to classes will be made (Bouroche et Saporta, 1980).

The values observed are noted with $(x^1, x^2, ..., x^j, ..., x^p)$ for those p characteristics focused on those n individuals. Each individual is characterized by a weight $p_i > 0$ with

$$\sum_{i=1}^{n} p_i = 1.$$

In the space of the individuals R^p, each observation is identified by a vector $(x_i^1, x_i^2, ..., x_i^j, ..., x_i^p)$.

The characteristics being centered, the weight centre of the cloud of individuals is mistaken for its origin. The matrix of the total variance is determined $V=X^tDX$.

Let's take a new characteristic $c = Xu$, whose variance is equal with

$$\|c\|^2 = c^t Dc = u^t X^t DXu = u^t Vu \tag{1}$$

The variance of this characteristic may be decomposed into: variance between classes generated by the dispersion of the weight centres of those q classes around the origin; and variance inside the class generated by the dispersion of the individuals of a class around their centre of weight (1990).

The quality of discrimination does not depend on the normalization of the characteristics for which reason they are considered to have a low variance.

The following are calculated:

- sums ($\sum x_{i_1}$, $\sum x_{i_2}$, $\sum x_{i_3}$);

- the square sums ($\sum x^2_{i_1}$, $\sum x^2_{i_2}$, $\sum x^3_{i_3}$);

- sums of the products ($\sum x_{i_1} x_{i_2}$, $\sum x_{i_2} x_{i_3}$, $\sum x_{i_1} x_{i_3}$) without considering the type of behavior.

The square sums and the sums of the products are expressed in the form of the deviation from their own average with the help of the relation below:

$$\alpha_{kl} = \sum X_{ik} X_{il} - \frac{\sum X_{ik} \sum X_{il}}{n} \tag{2}$$

where: n is the sample size, k=1:3, l=1:3.

A linear system of $\begin{cases} \alpha_{11}a + \alpha_{12}b + \alpha_{13}c = DX_1 \\ \alpha_{21}a + \alpha_{22}b + \alpha_{23}c = DX_2 \\ \alpha_{31}a + \alpha_{32}b + \alpha_{33}c = DX_3 \end{cases} \Leftrightarrow$ (3)

is generated:

$$\begin{cases} 120{,}93a + 81{,}65b + 80{,}86c = 5{,}42 \\ 81{,}65a + 97{,}22b + 83{,}29c = 4{,}62 \\ 80{,}86a + 83{,}29b + 89{,}72c = 4{,}12 \end{cases}$$

As a result values for the discriminant's coefficients are obtained: a=0,031; b=0,029 and c=-0,009. The discriminant's ecuation is built, having the following form:

D=0,031 X_1 + 0,029 X_2 - 0,009 X_3 (4)

Using t test it verifys that the obtained coefficients are real or their values are due to random errors occurring observation. Fix the null hypothesis that the three coefficients aren't statistically significant and that the alternative hypothesis is the opposite. If the calculated value of t test for each of the three coefficients, exceeds the statistical theoretical value considered, then it will reject the null hypotesis, dragging the conclusion that three coefficients are significantly different from zero. The theoretical value of Student distribution for a significance threshold of 0,05 and 12 degrees of freedom is 2,1788. The calculated values are: t_a=2,8521, t_b=2,4822 and t_c=2,1932. Each of the three calculated values exceeds the value 2,1788, pulling the conclusion that, for a significance level of 0,05, the multiple linear discriminant equation is correct.

X_1, X_2 and X_3 are replaced by the average assessments separately for the individuals with a preventive behavior (cp) and for those without a preventive behavior (fcp) and the result is made up of two numerical thresholds delimiting the respective areas:

$$D_{cp} = a \times \overline{X_{1cp}} + b \times \overline{X_{2cp}} + c \times \overline{X_{3cp}} = 0{,}462 \tag{5}$$

$$D_{fcp} = a \times \overline{X_{1fcp}} + b \times \overline{X_{2fcp}} + c \times \overline{X_{3fcp}} = 0{,}154 \tag{6}$$

4. Results and paraphrases

Monitoring the stages of the discriminating analysis the thresholds were determined by which individuals can be grouped depending on the importance they give to the deterioration of the environmental elements quality. (Figure no. 1)
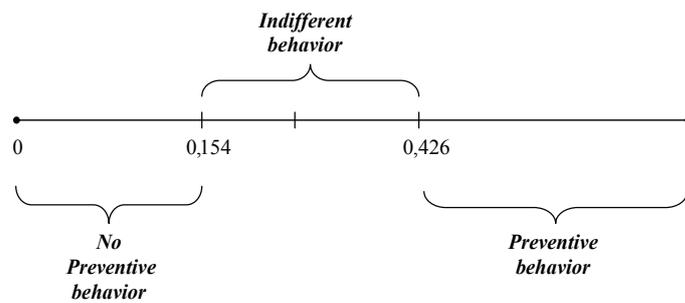
Figure no. 1: Grouping of individuals by the importance given to the quality deterioration of the environmental elements

Based on the equation of the multiple linear discriminant having the form $D = a\,X_1 + b\,X_2 + c\,X_3$ it could be decided on whether an individual whose behavior has not yet been directly studied attaches any importance to the environmental elements' quality deterioration through adopting a preventive behavior. He is required to assess the criteria considered and then the threshold given by the equation of the multiple linear discriminant is determined $D_i = 0{,}031\,X_1 + 0{,}029\,X_2 - 0{,}009\,X_3$.

In this case three situations can be discussed:

- if $D_i < 0{,}154$, the individual does not behave preventively;

- if $D_i > 0{,}426$, the individual does behave preventively;

- if $0{,}154 < D_i < 0{,}426$, the individual behaves indifferently.

In table no. 2 there are the assessments of the above - mentioned criteria made by a representative of each household included in the research. For each of them the threshold was determined as given by the equation of the multiple linear discriminant, thus deciding on the behavior type.

Table no. 2: Selecting individuals in the target group

Individual	Criterion			D_i	Preventive behavior
	X_1	X_2	X_3		
1	6	6	3	0.333	indifferent
2	10	8	9	0.461	yes
3	10	4	2	0.408	indifferent
4	8	7	6	0.397	indifferent
5	9	9	9	0.459	yes
6	7	7	7	0.357	indifferent
7	7	8	9	0.368	indifferent
8	8	9	8	0.437	yes
9	9	9	9	0.459	yes
10	9	9	9	0.459	yes
11	2	2	2	0.102	no
12	2	3	3	0.122	no
13	3	3	3	0.153	no
14	10	9	9	0.49	yes

Conclusions

The worsening of the quality of the environment makes necessary the use of new instruments for the protection of the rights and interests of consumers. The need to adopt a preventive behaviour imposes additional costs for the individuals which perceive the threat of environmental degradation.

For the community considered in the study, the expenses made by all the individuals with a preventive behavior to purchase water from other sources than the contaminated fountains, to use the air-conditioning devices although the outer temperature does not require it and to

procure the food that might have been obtained by cultivating the house surrounding land surface represent a measure of the environmental effect obtained by shutting down the garbage pit hole and neutralizing its effects.

The study was realized under restrictions imposed by problems which are difficult to solve like the data necessary to estimate AP. Necessary data to estimate AP include detailed info about the seriousness, frequency and duration of symptoms; exposure to polluting factors; actions taken to improve or mitigate damages; cost involved and other variables affecting the health status (age, sex, chronic conditions). On the other hand, certain types of preventive behavior also supply other benefits (for example, apart from the air-filtering, the air-conditioning devices cool the air; apart from reducing the illness risk, the bottled water tastes good). In order to have a real AP estimation done to mitigate risk the value for the interest effect must be isolated from the value of the other benefits resulted from the preventive activity. This represents a challenge for future research

The present proves the migration of the interest of consumers in the area of friendship with the environment. This is reflected in the fact that the consumer behavior is conscious of the importance of health of a civilized lifestyle, hygiene, dynamic and oriented towards environmental responsibility. The 21st century consumption will be strongly influenced by environmental based behaviour.

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