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Typology Of Consumer Behaviour In Times Of Economic Crisis – A Segmentation Study From Bulgaria

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Abstract: This paper presents the second part of results from a survey-based market research of Bulgarian households. In the first part of the paper the author analyzes the changes of consumer behavior in times of economic crisis in Bulgaria. Here, the author presents market segmentation from the point of view of consumer behavior changes in times of economic crisis. Four segments (clusters) were discovered, and profiled. The similarities/dissimilarities between clusters are presented through the technique of multidimensional scaling (MDS) The research project is planned, organized and realized within the Scientific Research Program of University of National and World Economy, Sofia, Bulgaria.

Key words: consumer behavior, economic crisis, market segmentation, cluster analysis

1. INTRODUCTION

This paper presents the results of a segmentation study based on changes of consumer behaviour in times of economic crisis. It is a continuation of the paper presented at the 16th Scientific Conference at the Faculty of Economics (University of Niš). The methodology of the study was described in the paper "Changes of consumer behavior in times of economic crisis – empirical study from Bulgaria" (Katrandjiev, 2011, pp. 497-507). Here we go deeper into the analysis from the point of view of the market segmentation. We discovered, proved an analyzed the profiles of 4 clusters (market segments). The scope of the segmentation study includes citizens living in Bulgarian cities.

2. CLUSTER ANALYSIS-DEFINING THE CLASSIFICATION VARIABLES

The classification set includes 24 variables (Table 1). The first five variables are measured on the ordinal scale. The first variable contains data about the subjective assessment of the global financial crisis impact on Bulgarian economy. The optional answers in the questionnaire are: "very strong (1) – strong (2) – weak (3) – very weak (4). The second variable of the classification set includes data about the personal evaluation of global crisis's influence on respondent's household. As pointed out earlier the variable is measured on the ordinal scale (extremely positive (1) – positive (2) – no influence (3) – negative (4) – extremely negative (5).

The third classification variable is closely connected with respondent's assessment of global crisis's impact on his/her personal behavior. This variable measures the perceived harmfulness of the global economic crisis within 3 degrees (very harmful (1) – *a little bit harmful (2) – not at all harmful (3). The fourth variable in the* classification set presents the degree of income change before crisis and after that. The answers include the following options: increased (1) – remained the same (2) – decreased (3) – no opinion (4). An identical scale was applied for the next variable – "expenditure change" (see Table 1).

The next 5 variables in the classification set concern important changes of consumer behavior due to the economic and financial crisis. These 5 variable are measured on a 4-point Likert scale (strongly agree (1) –

TABLE 1 Classification variables

			Classification variables	Scale
1			Gender	Dichotomous
2			Age	Proportional
3			Subjective assessment of the impact of economic and financial problems over Bulgaria	Ordinal
4			Influence of global financial crisis on household	Ordinal
5			Perceived harm of crisis on consumer behaviour	Ordinal
6			Income change	Ordinal
7			Expenditure change	Ordinal
8	Basic changes of consumer behaviour	8.1	I had to „take care for the penny"	Ordinal
		8.2	I had to switch on cheaper goods	Ordinal
		8.3	I deprived myself of some goods	Ordinal
		8.4	I had to save more money for "difficult days"	Ordinal
		8.5	I had to cut off some big expenditure	Ordinal
9	Expectations of crisis end	9.1	The crisis is almost over	Ordinal
		9.2	The crisis will end in the end of 2011	Ordinal
		9.3	The crisis will end in 2012	Ordinal
		9.4	The crisis will end after 2012	Ordinal
		9.5	No opinion	Ordinal
10	Changes in consumption of basic goods and services	10.1	Electricity	Ordinal
		10.2	Water	Ordinal
		10.3	Heating	Ordinal
		10.4	Food	Ordinal
		10.5	Clothes	Ordinal
		10.6	Shoes	Ordinal
		10.7	Entertainment	Ordinal

somewhat agree (2) – somewhat disagree (3) – strongly disagree (4). The five statements are presented in Table 1 (6.1 – 6.5). The final 5 variables (7.1-7.5) in the classification set include data about respondents' expectations about the end of crisis. These variables are dichotomous with options "yes" or "no".

As can be seen we do not include all possible variables in the classification set. The reasons for this decision are two: first, including too many classification variables may reflect in difficulties with clusters interpretation; and second (which is more important), the variables which are excluded from the classification set will play an important role later in the analysis. On their basis the clusters will be profiled and validated. We need these variables (also called external variables) to assess the external validity of clusters (Катранджиев, 2005).

The variables are standardized before running the clustering procedure because they have different measurement levels (e.g. variables 7.1-7.5 in Table 1 are measured on the nominal scale while the rest of the variables are measure on the ordinal scale). In sit-uations like that standardization is preferred (Bacher 2002. p.18)

In this research a z-score standardization procedure was applied. We used the standardization options of the software program ClustanGraphics (clustan.com).

3. TYPE OF CLUSTERING METHOD SELECTION AND DETERMINING THE NUMBER OF CLUSTERS

For the needs of the research a combination of clustering methods was applied. First, a hierarchical clustering was conducted. The main goal of the hierarchical clustering was to help in determining the number of clusters. In the process of hierarchical clustering we used the method of Ward (also called Ward's Minimum-Variance Method). Second, after defining the number of clusters by the help of hierarchical clustering we applied a non-hierarchic method (the method of k-means) for final clustering. We chose this approach in order to avoid some limitations of hier-
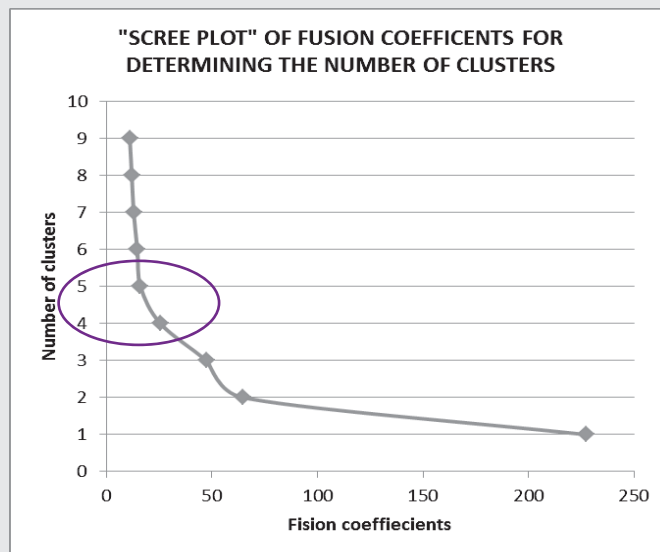
FIGURE 2 Dendogram
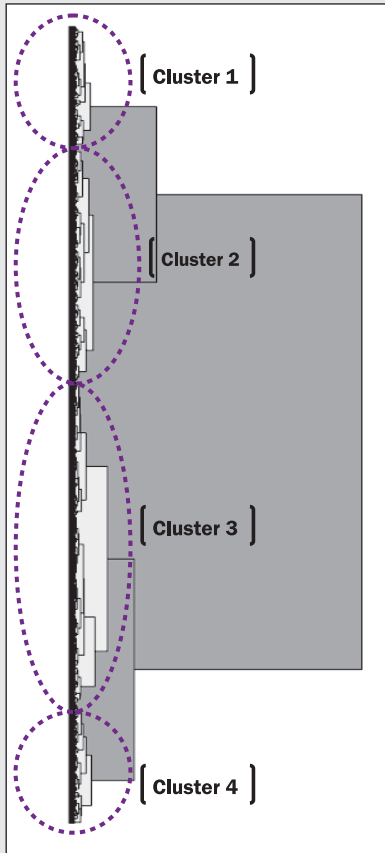
The advantages of hierarchical clustering methods include the following: (1) good clusters visualization; (2) relatively easy cluster interpretation; (3) relatively easy determination of the number of clusters. One of the most important advantages of hierarchical clustering methods is the 3rd one. Some authors even recommend to use the dendogram (produced by the method of hierarchical cluster analysis) to define subjectively the number of clusters and then to run an iterative method (non-hierarchical method). In our research we use the hierarchical cluster analysis to visualize groupings (clusters) as well as to do some tests for determining the number of clusters.

A common test for determining the number of clusters is the so called "scree test". The "scree test" means that one should "graph the number of clusters implied by a hierarchical tree against the fusion or amalgamation coefficient, which is the numerical value at which various cases merge to form a cluster" (Aldendefer, Blashfield, 1984, p. 66). If we point a look at Fig. 1 we could see that the flattering of the curve starts at the four-cluster solution. One could argue that the flattering starts at the five-cluster solution, but we took the final decision of 4 clusters after the validation of clusters and after running additional tests for the number of clusters.

The bootstrap procedure (offered by Clustan-Graphics 6) confirmed that the four cluster solution is appropriate. After the final determination of the number of clusters we chose to cluster the objects by one of the commonly accepted methods for iterative partitioning clustering (non-hierarchical) – the method of *k-means*. The main advantage of this method is

archical clustering as well some limitations of non-hierarchical clustering. In other words, we tried to compensate the limitations of both types of clustering methods.

FIGURE 2 Scree Plot

connected with the iterative possibilities. In the case of the k-means method the objects are grouped into a definite number of groups (in our case – 4). After that the objects are being moved from one group to another. But one object is being moved from one group (cluster) to another only if such a move leads to optimizing a certain criterion (e.g. the Euclidean sum of squares) (Everitt, Landau, Leese, 2001 pp. 90-117).

After completing the iterations and optimizing the Euclidean sum a final dendogram was plotted (fig. 2). The four clusters are outlined. They are more homogeneous compared to the 4 clusters produced by the hierarchical method (Ward's Minimum-Variance Method) which can be seen by the "height" of the diagram. The dendogram presented on Figure 2 is rotated and the "height" of the diagram is marked with "double arrow" (↔). The "height" of the initial dendogram (plotted on the base of Ward's Minimum-Variance Method) was bigger which indicates a relatively low level of cluster homogeneity. This initial dendogram is not presented here for the sake of space saving.

4. EVALUATION OF CLUSTERS' VALIDITY

4.1. Evaluation of Clusters' Heterogeneity

Evaluating clusters' validity is a rather difficult and disputable topic within the theory and the practice of cluster analysis. In the present research project we chose the "strongest" validation procedures. For the purpose of validating the clusters we tried to evaluate the statistical significance of the four clusters. This statistical significance is tested from the point of view of the classification variables (internal variables) as well as from the point of view of non-classification (external variables). This approach is reliable for assessing clusters' validity – especially the validation by external variables (the so called external validation). The external validation is strongly recommended because "the value of a cluster solution that has successfully passed an external validation is much greater than a solution that has not" (Aldendefer, Blashfield, 1984, pp. 90-117).

In this research analysis we can validate the four-cluster solution by external variables. This option was discussed earlier. We mentioned that we did not include all possible variables in the classification set. One of the reasons to take this decision was the option for external validation. The external variables include data about respondents' expectations for future consumption of certain goods and services. The

TABLE 2 Results from Chi square (χ^2) tests (realized by SPSS)

	External variables	Approx. Significance	Cramer's V
1	Electricity	0 (<α=0,05)	**0,426**
2	Water	0 (<α=0,05)	0,25
3	Heating	0 (<α=0,05)	**0,30**
4	Food	0 (<α=0,05)	**0,42**
5	Clothes	0 (<α=0,05)	**0,46**
6	Shoes	0 (<α=0,05)	**0,58**
7	Entertainment	0 (<α=0,05)	**0,71**
8	Fruit juice	0 (<α=0,05)	**0,44**
9	Coffee, tea	0 (<α=0,05)	**0,44**
10	Wine	0 (<α=0,05)	0,19
11	Alcoholic drinks	0 (<α=0,05)	**0,75**
12	Beer	0 (<α=0,05)	**0,45**
13	Bread	0 (<α=0,05)	0,13
14	Meat	0 (<α=0,05)	**0,43**
15	Salami	0 (<α=0,05)	**0,52**
16	Sausage	0 (<α=0,05)	0,28
17	Minced meat	0 (<α=0,05)	**0,30**
18	Fish	0 (<α=0,05)	**0,32**
19	Milk	0 (<α=0,05)	0,28
20	Yoghurt	0 (<α=0,05)	**0,35**
21	Cheese	0 (<α=0,05)	**0,34**
22	Yellow cheese	0 (<α=0,05)	**0,48**
23	Sunflower oil	0 (<α=0,05)	0,24
24	Margarine	0 (<α=0,05)	0,17
25	Chocolate	0 (<α=0,05)	**0,48**
26	Chocolate bars	0 (<α=0,05)	**0,48**
27	Biscuits, wafers	0 (<α=0,05)	**0,38**
28	Fruits	0 (<α=0,05)	**0,35**
29	Vegetables	0 (<α=0,05)	**0,31**
30	Cigarettes	0 (<α=0,05)	0,15
31	Washing powder	0 (<α=0,05)	**0,45**
32	Softeners	0 (<α=0,05)	**0,45**
33	Detergents	0 (<α=0,05)	**0,31**

data was gathered by the question of the type "When speaking about your personal consumption of … , what are your expectations for the next year?". The options for answer are the following: "will increase (1); will remain the same (2); will switch to cheaper substitutes (3); will decrease the volume of consumption (4); will stop to consume that good/service (5); I don't buy this good/service". We transformed this scale into a dichotomous one for the sake of applying correctly the Chi square (χ^2) test (Съйкова, И., А. Стойкова-Къналиева, С. Съйкова, 2002, p. 115). The options for answer we aggregated as follows – the

first two options we combined into one and the rest of the options formed another one. In fact, we derived a dichotomous variable that includes two options: consumption will not decrease (1) and consumption will decrease or will include cheaper substitutes (2). We analyzed the consumers' expectations for 33 goods and services.

Before that we created a new variable – "cluster membership" which contains data about each respondent's membership – cluster 1, cluster 2, cluster 3, or cluster 4. The cluster membership is measured on the nominal scale.

In fact we tested the following hypothesis:

H_0: *The cluster membership and the future changes of consumption of beer are independent.*
H_1: *The future consumption of beer varies significantly among the clusters, i.e. the cluster membership and the future changes in consumption of beer are related.*

The results of the Chi square (χ^2) test allowed to assume H_1 and to reject H_0. We can say that the expectations for future changes in consumption of beer varies significantly among cluster 1, cluster 2, cluster 3, and cluster 4. The strength of the relationship between the two variables is measured by Cramer's V (0,45), which indicates an average strength.

The Chi square (χ^2) test was performed for the rest 32 variables (Table 2). The null hypothesis (H_0) was rejected in all cases. In 24 product groups, average strength of relationship between cluster membership and expected changes in consumption were find (0,3≤V≤0,7). For two product groups ("alcoholic drinks" and "entertainment" Cramer's V is higher than 0,7, which indicates a strong relationship. The

strength of the relationship is weak (V<0,3) for the rest 6 cases. Bearing in mind the results from the Chi square (χ^2) tests *we* can state that **the four cluster solution can be accepted as valid**. **In other words, the four clusters differ significantly, i.e. they are heterogeneous.**

4.2. Evaluation of clusters' homogeneity

In the previous section we evaluated clusters' heterogeneity and we derived the conclusion that the four clusters differ significantly one from another. Now we have to assess the "in-cluster" homogeneity, i.e. the homogeneity of objects (consumers) belonging to each cluster. A popular approach for evaluation of clusters' homogeneity is the comparison of each cluster's variance to the sample variance. Some authors recommend the so called F-ratio (Otto-von-Guericke-Universität Magdeburg):

$$F_{jg} = \frac{\sigma^2_{(j,g)}}{\sigma^2_{(j)}}, \text{ where}$$

$\sigma^2_{(j,g)}$ is the variance of variable j within cluster g, while $\sigma^2_{(j)}$ is the sample variance of variable j within the sample. In an ideal situation, $F_{jg}<1$ for all variables.

Table 3 presents the results from the comparison between each cluster's variance and the sample variance. The F-ratio is calculated for 11 key variables. We can derive the following conclusions:

- Cluster 1 is relatively homogeneous – for four of the key variables the F-ratio is greater than 1 but for rest of the variables it is lower.

TABLE 3 Evaluation of in-cluster homogeneity by F-ratio

Variables (*j*)	*F* - ratios (for each cluster)			
	F$_{(j,1)}$	F$_{(j,2)}$	F$_{(j,3)}$	F$_{(j,4)}$
Subjective assessment of the impact of economic and financial problems over Bulgaria	**1,16**	0,73	0,48	**1,03**
Influence of global financial crisis on household	0,72	0,38	0,55	0,56
Perceived harm of crisis on consumer behaviour	0,64	0,71	0,11	0,56
Income change	**1,28**	0,88	0,38	**1,09**
Expenditure change	**1,30**	0,72	0,82	**1,43**
I had to „take care for the penny"	**1,77**	**1,17**	0,60	0,78
I had to switch on cheaper goods	0,77	0,57	0,34	0,25
I deprived myself of some goods	0,53	0,54	0,43	0,45
I had to save more money for "difficult days"	0,42	0,47	0,41	0,37
I had to cut off some big expenditure	0,80	0,72	0,25	0,69
I had to „take care for the penny"	0,60	0,71	0,20	0,94

- Cluster 2 is homogeneous – only variable possesses variance greater than the sample variance, i.e. $F_{jg}>1$.
- Cluster 3 is entirely homogeneous (if we restrict our analysis of homogeneity to the 11 key variables) – all F-ratios are below 1. This conclusion, however, may be misleading because if we look at the dendogram (Fig. 2) we can see that the "height" of dendogram for Cluster 3 is greater than the "heights" of the other clusters. This means that Cluster 3 has the lowest level of heterogeneity (among all clusters). Here Cluster 4 appears to be the most homogeneous because we derive our conclusions on the basis of 11 variables (not all possible variables).
- Cluster 4 is relatively homogeneous – for 3 key variables the F-ratio exceeds 1. For the rest of the variables the F-ratio is below 1

On the basis of the figures in Table 3 and the conclusion mentioned above we can summarize that the four clusters are relatively homogeneous, i.e. their "in-cluster" homogeneity is acceptable.

## 5. ANALYSIS OF CLUSTERS' PROFILES

In this paper we offer a non-traditional approach of profiling the four clusters. Instead of presenting and commenting numerous figures, plots, and tables we applied a multidimensional scaling procedure and

drew positioning maps. This approach is easy to understand by the readers, saves space and (which is the most important) clearly presents the differences among clusters.

In Fig.3 we present the cluster profiles from the point of view of two basic changes in consumer behavior in times of economic crisis: switching to cheaper brands and deprivation of some goods and services. Each of these two variables is presented at 4 levels (extents): high, average, low, and "not at all". The positioning map on Fig. 3 contains additional labels, added after the multidimensional procedure was run, i.e. these label are not produced by the multidimensional scaling. We are talking about the clusters' sizes (measured as proportions from the sample: K1 – 15%; K2 – 30%; K3 – 40%; K4 – 15%) and the clusters' names (given by the author after a thorough analysis of the cluster profiles).

The distances between clusters on the positioning map indicate their dissimilarities/similarities. Clusters that are close together are more similar compared to clusters that are far from each other. The axes of the positioning map are composite dimensions along which the four clusters differ. Variables placed close to an axis may be viewed as indicators of the meaning of that axis. The variance explained by the vertical dimension (73.8%) and the variance explained by the horizontal dimension (26, 2) indicate that the vertical dimension is more important in explaining clusters' profiles. The lines that originate from the center of

FIGURE 3 Clusters' sizes and profiles
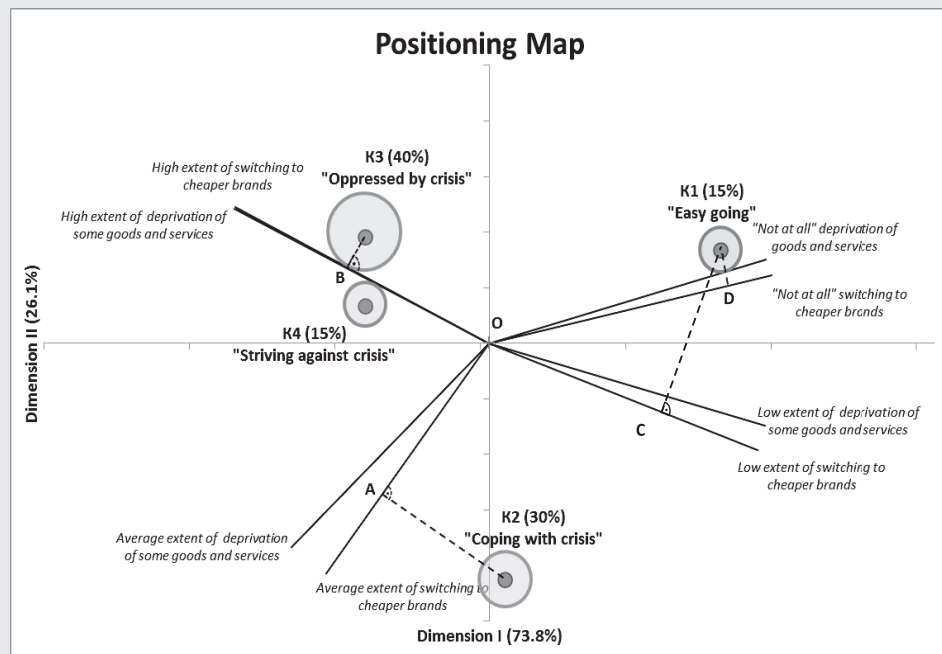
FIGURE 4 Clusters' profiles by changes of income and expenditures
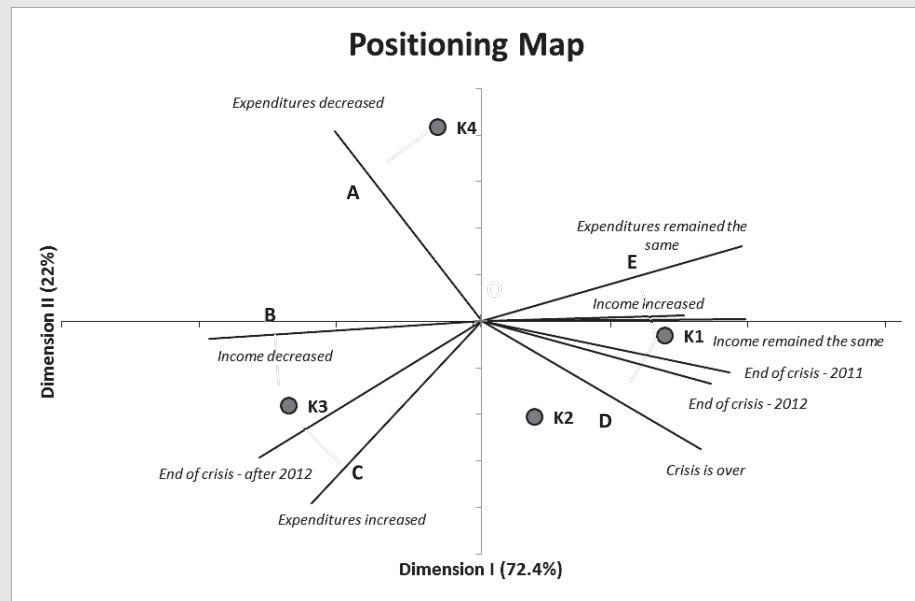
Positioning Map

the map and move away from that center express the direction in which a variable increases. The length of these lines indicates the amount of variance explained by the positioning map. In fact a longer line means a greater importance of the corresponding variable in differentiating among clusters. To assess a cluster on any variable, we can draw a perpendicular line from the cluster to any variable. The main principle of assessment is the following: the further a cluster is away from the center of the map (along the line of a variable) the higher is the proportion of customers given the corresponding answer. If we throw a look at Fig. 3 we can see that a differential characteristic of Cluster 1 (K1) is the high proportion of consumers who do not "switch to cheaper brands" (indicated by the length of line OD), while the differential characteristic of Cluster 3 (K3) is the very "high extent of switching to cheaper brands" (line OB).

The positioning map clearly shows that Cluster 2 (K2) has an "average extent of switching to cheaper brands" as well as an "average extent to deprivation from goods and services" in times of economic crisis. The fourth cluster (K4) is similar to cluster K3 but there is a difference – the propensity to "switching to cheaper brands" and to "deprive of goods and services" is not as severe as in cluster K3.

Figure 4 presents the clusters' similarities/dissimilarities from another point of view. This time we produced the positioning map by the data of different variables: (1) change of income in the period of economic crisis; (2) change of expenditures in the period

of economic crisis: (3) customers' expectations about crisis's end. We plotted a separate map in order to ease the visual perception of clusters' profiles. We could plot a single map but it would be overloaded with data and labels which would hamper the interpretation.

Fig. 4 clearly shows that Cluster K1 is living well in the time of the crisis. A great proportion of customers belonging to K1, declare that their expenditures remained the same as well as their income. It is curios to notice that some of the customers even declare that their income has increased since the beginning of the crisis. The proportion of these customers is about 4% from the sample. Cluster K1 is the most optimistic about crisis's end". The prevailing opinion among customers belonging to cluster 1 is that the crisis will end in 2011 although there are customers who believe the crisis is already aver as well customers who believe that the crisis will end in 2012.

Cluster K3 is more different (even opposite to some extent) compared to Cluster K1. The main characteristic of Cluster K3 is that customers belonging to that cluster are living in the most difficult situation – their expenditures increased while their income decreased during the period of the economic crisis. So the pessimistic attitude of cluster K3 ("crisis will end after 2012") is easy to be explained. The characteristics of cluster K2 include: increase of expenditures in the period of the economic crisis: relatively optimistic view about crisis's end (compared to cluster K3) but not as optimistic as Cluster K1; decrease of income but not as significant as the income decrease in cluster K3.

FIGURE 5 Clusters' profiles by changes of consumer behavior and income
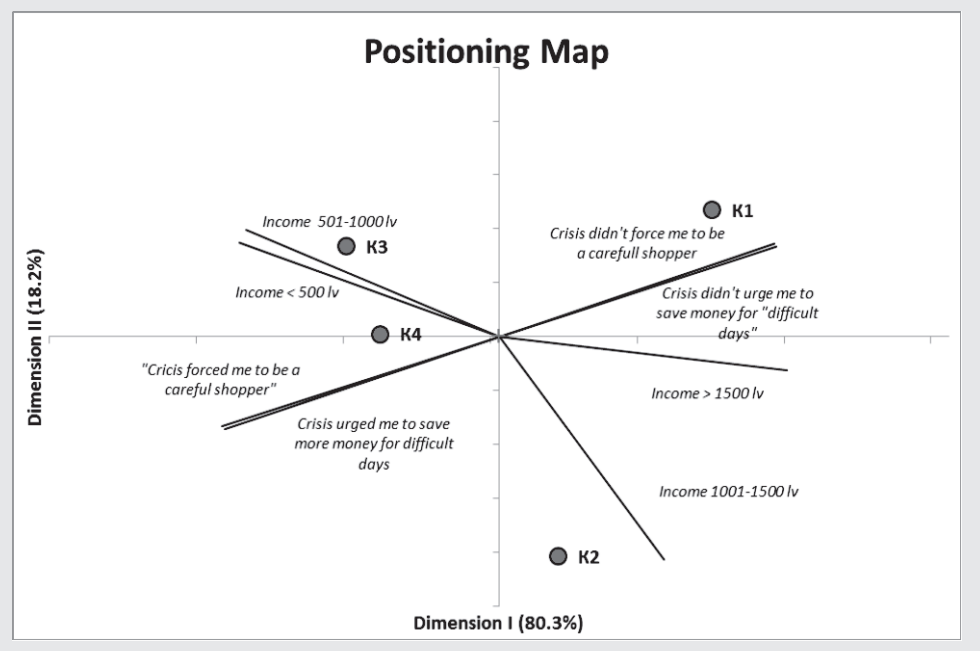
Cluster K4 declares that their expenditures decreased. Almost 20% of respondents belonging to that cluster say that their expenditures have decreased. This is the highest level among all clusters. But the analysis of the whole data set explained that fact: customers from Cluster K4 are trying to save as more money as they can "for difficult days". This is their strategy to manage with crisis. In fact the income level and the material possessions of people from Cluster K4 are similar to that of Cluster K3. Of course there some differences – the income level in Cluster K4 is higher compared to the income level in Cluster 3 but not as high as the level of Cluster K1 and Cluster K2. The consumers in Cluster K4 are trying to save money in order to cope with future difficulties. Perusing that goal they deprive themselves of goods and services they can afford. And here is the main difference between Cluster K3 and Cluster K4: the consumers in Cluster K3 are too poor to save money while the customers belonging to Cluster K4 a little bit wealthier and can afford to "save money" for difficult days.

The positioning map presented at Fig. 5 provides logical information and a basis for logical conclusion concerning clusters' profiles. We can see that Cluster K1 is the wealthiest cluster among all – a great proportion of consumers belonging to that cluster declare a monthly income over 1500 lv. Also the crisis didn't force these consumers to be careful shoppers neither urged then to save money for "difficult days". Cluster K2 is not as wealthy as Cluster K1 but the consumers in that cluster declare a higher income compared to

the rest of the clusters – K3 and K4. A substantial proportion of consumers belonging to cluster K2 declare a monthly income between 1001 and 1500 lv.

The profile of cluster K4 is added by the important fact that a substantial proportion of consumers (32%) declare a monthly income below 500 lv. It is important to point out that over 74% of consumers in that cluster declare a monthly income below 1000 lv. Then it seems logical the other conclusion concerning cluster K3 – the crisis forced the consumers to be careful shoppers.

As plotted on the positioning map (Fig. 5) cluster K4 is suffering in the period of crisis but not as much as consumers belonging to cluster K3. The consumers from Cluster K4 have little bit higher income than consumers belonging to K3. At the same time, they try to shop carefully and to save money for difficult days. In fact, the consumers in cluster K4 are less wealthy than consumers in clusters K1 and K2.

5. CONCLUSION

In our analysis, we defined four clusters (market segments) from the point of view of consumer behavior in times of the economic crisis. Cluster K1 is passing through the crisis with ease and without troubles. The income of consumers in that cluster is high and these people did not change their consumer behavior significantly during the period of economic crisis. They neither switch to cheaper brands, nor deprive them-

selves of goods and services. Their income and their expenditures are relatively steady. Some of them even declare that their income has increased since the beginning of the economic crisis. These consumers are very optimistic about the end of the crisis – a great proportion of them believe that the crisis is already over or it will be over by the end of 2011. We called Cluster K1 "Easy going". The proportion of that cluster is 15%.

The consumers belonging to Cluster K2 declare an average extent of switching to cheaper brands and deprivation of goods and services. Their income is relatively high, but not as high as the income of consumers from Cluster K1. These people changed their consumer behavior slightly in the period of the crisis. In fact they live without serious troubles and deprivations. We called that cluster "Coping with crisis". The proportion of Cluster K2 is 30% from the sample.

Consumers belonging to Cluster K3 are in the most difficult situation: their income is very low, so is their optimism about crisis's ending. The economic crisis has put the consumer in Cluster K3 in a very difficult situation – their income has decreased and their expenditures have increased since the beginning of the crisis. They desperately try to react to economic crisis by such change of their consumer behavior as "a high extent of switching to cheaper brands" and even "deprivation of some goods and services". These consumers are very pessimistic about crisis's end – they believe the crisis is here to stay. Cluster K3 is the biggest cluster among all – its proportion is 40%. We named this cluster "Oppressed by crisis".

Consumers in Cluster K4 receive a lower income compared to clusters K1 and K2 but higher compared to Cluster K3. These people have adopted a consumer behavior of "switching to cheaper brands" and "deprivation of goods and services". They are also careful shoppers. They declare that their expenditures have decreased since the beginning of the crisis. This is due to their attempt to protect from worsening of economic conditions by saving money for "difficult days. Their resources are scarce and they save some money with great sacrifices. We named this cluster "Striving against crisis". Its proportion is 15%.

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Rezime:

Tipologija ponašanja potrošača u vreme ekonomske krize – Studija segmentacije iz Bugarske

Hristo Katrandjiev

Rad prikazuje drugi deo rezultata istraživanja tržišta zasnovanog na anketiranju bugarskih domaćinstava. U prvom delu rada autor analizira promene u ponašanju potrošača u vreme ekonomske krize u Bugarskoj. Ovde autor prikazuje tržišnu segmentaciju iz ugla promena u ponašanju potrošača u vreme ekonomske krize. Četiri segmenta (klastera) je otkriveno i opisano. Sličnosti i razlike između klastera su prezentovane kroz tehniku multidimenzionalnog skaliranja (MDS). Istraživački projekat je planiran, organizovan i ostvaren u okviru istraživačkog projekta Univerziteta za nacionalnu i svetsku ekonomiju iz Sofije u Bugarskoj.

Ključne reči: ponašanje potrošača, ekonomska kriza, tržišna segmentacija, analiza klastera

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