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SEGMENTATION OF STUDENTS ACCORDING TO FOOD PURCHASE PREFERENCES USING METHODS OF MULTIDIMENSIONAL STATISTICAL ANALYSIS

Abstract. This paper presents the usage of PCA in segmentation of students according to their food purchase preferences. The aim of this research was to select and describe segments of young people with their various food preferences and attitudes. The criteria of segmentation were descriptive and psychographic characteristics.

The questionnaire survey was carried out in 2000 among students of 3 Rzeszów universities and 3 high schools in Rzeszów and Jarosław. The respondents were asked to rank the importance of factors determining food purchase. These factors were related to: product quality (attractive appearance, smell and taste, nutritional value, food safety, freshness, ease of preparation, attractiveness of packaging, and price) and psychographic factors such as: fashion and advertising influence, health care, food habits, diet, willingness to distinguish oneself, willingness to change one's diet, sensitivity to environmental pollution.

The PCA was used to reduce the data collection; there were 4 principal components isolated, explaining altogether 83.91% of variance. The first principal component was formed with price, smell and taste, ease to prepare, attractiveness and functionality of packaging. Respondents related to these factors can be referred to as "pragmatic" and their opposite as "thrifty".

The second principal component is formed with freshness, need to care about one's appearance, going on a food diet. Respondents related to these factors can be referred to as "image-creators" and their opposite as "apathetic".

The third principal component is formed with nutritional value, food safety, need to care about one's health and sensitivity to environmental pollution. Respondents related to these factors can be referred to as "modern" and their opposite as "traditional".

The fourth principal component is formed with attractive appearance of product, vulnerability to advertising and fashion, need to distinguish oneself. Respondents related to these factors can be referred to as "effect-makers" and their opposite as "conservative".

Key words: food purchase preferences, segmentation of students, PCA.

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1. INTRODUCTION

In western European countries, the United States of America and Canada, young consumer market created itself only in 1960s. At that time in Poland open market practically did not exist. In a centrally controlled economy it was associated mainly with delivery, which in most cases was rationed. Only the socio-economic changes of the early 1990s created market economy. As a result, various companies and research institutes showed interest in the needs and preferences of young consumers. At present, research issues concerning market behaviors of this segment of Polish society is vast (Olejniczuk-Merta 2003). It also covers food product market. The behaviors at this market and food preferences of young people from universities and secondary schools were the subject of the research conducted by Wądołowska et al. (1993, 1998, 2000), Babicz-Zielińska et al. (1998, 1999a, b, 2000a, b), Sikora (1996) and – as far as organic food goes – my own ones (Cichocka 2001a, b). None of the cited authors has tried to isolate – with references to specific chosen determinants – the segments of this group of consumers, various in terms of behaviors at the food product market. This area of the research appears to have a significant practical meaning and is of interest to people dealing with marketing in big companies. It requires accurate specification and selection of factors determining eating preferences and behaviors. According to many authors concerned with consumer market issues, within those factors, special attention should be paid to descriptive factors (connected with the quality characteristics of a product) as well as psychographic (showing attitudes towards i.e. health, natural environment, external advertising influence or the closest social environment) (Mazurek-Łopacińska 1997, Świtała, Mączka 2002, Neumark-Sztaier et al. 1999).

The aim of this research was to select and describe segments of young people with their diverse food preferences and attitudes. The criteria of segmentation were descriptive and psychographic factors, found during the study of literature and considered as important for young consumers.

2. AREA AND METHODS OF THE RESEARCH

The questionnaire survey was carried out in 2000 among students of 3 Rzeszów universities and 3 high schools in Rzeszów and Jarosław. The respondents were asked to rank the importance of factors determining food purchase. These factors were related to: product quality (attractive appearance, smell and taste, nutritional value, food safety, freshness, ease of

preparation, attractiveness and functionality of packaging, and price) and psychographic factors such as: vulnerability to fashion and advertising, care about one's health, food habits, the necessity of going on a special diet, need to distinguish oneself, need to change one's diet, sensitivity to environmental pollution. The possible answers were: (1) factor has no influence to food purchase preferences, (2) factor has little influence, (3) factor has average influence, (4) factor has considerable influence. The total amount of completed and collected questionnaires was 639. The respondents were of various sex, age, place of residence and monthly income per 1 person in-household and also they were classified into 2 groups: eco-consumers (the ones that had declared eating organic food) and traditional consumers (those who had not made such a declaration). The declared eco-consumption can be called as "quasi-eco-consumption" in the terms of fact that for consumers "organic food" means fruits and vegetable from their own gardens. These products – in consumers' opinion – are free from pesticides, but consumers do not take into consideration nor chemical fertilization neither the localization of farming; this fact has been showed in research conducted by Cichocka and Pieczonka (2001) and also Kuśmierczyk (2001) and it is the main condition of organic farming.

The structure of surveyed population is shown in the Table 1.

Table 1. Characteristics of the respondents

Specification		Quantity	%
Sex	Women	430	67.3
	Men	209	32.7
Age	16–18 years of age	217	34.0
	19–21 years of age	244	38.2
	22–24 years of age	178	27.9
Place of residence	Village	318	49.8
	Town up to 50 000 inhabitants	145	22.9
	Town over 50 000 inhabitants	169	26.4
Monthly income per 1 person in-household	Up to 300 PLN	226	35.4
	300–600 PLN	267	41.8
	Over 600 PLN	120	18.8
	Missing data (no answers)	26	4.1
Eco-consumption	Yes	366	57.3
	No	273	42.7

3. DISCUSSION OF SURVEY RESULTS

Table 2 presents the average level of importance of different food characteristics that determine food purchase preferences of the whole surveyed population.

Table 2. The average importance of descriptive and psychographic characteristics

Characteristics		Importance
Descriptive (food quality characteristics)	Freshness	3.95
	Smell and taste	3.67
	Attractive appearance	3.14
	Nutritional value	3.41
	Food safety	3.63
	Highly processed food	2.50
	Ease of preparation	2.91
	Attractiveness of packaging	2.27
	Functionality of packaging	2.41
	Price	3.22
Psychographic	Advertising influence	1.95
	Fashion influence	1.84
	Care about one's health	3.66
	Sensitivity to environmental pollution	2.92
	Care about one's appearance	3.49
	Food diet	2.51
	Need to distinguish oneself	1.77
	Need to taste new products	2.76
	Need to change one's diet	2.28
	Time saving	2.82
	Eating habits	2.99

As the results show, the level of importance of factors is strongly diverse. Some factors – especially those related to high quality of food product (freshness, smell and taste) and also to food risk (food safety, care about one's health, care about one's appearance) – were marked with the highest range (it means that they determine the food purchase preferences and behaviors very strongly). Some other factors were defined by the surveyed population of a little importance to food purchase decisions. They are the following factors: attractiveness of packaging, advertising and fashion influence or need to distinguish oneself.

Because of the great number of characteristics no classical statistical method was used (for example the analysis of variance) and – according to the aim of this research – the first thing to do was to reduce the data collection. To reduce the number of variables without loosing any data

Table 3. PCA results

Characteristics	Principal Component			
	1	2	3	4
	Factor loadings			
Freshness	–0.062	0.903	0.168	0.076
Smell and taste	–0.837	0.031	–0.118	–0.282
Attractive appearance	–0.187	–0.102	0.019	0.851
Nutritional value	0.036	0.072	0.952	–0.097
Food safety	0.036	–0.116	0.984	0.066
Highly processed food	0.513	0.271	0.616	–0.036
Ease of preparation	–0.879	–0.069	–0.202	–0.179
Attractiveness of packaging	–0.779	0.387	0.086	0.329
Functionality of packaging	–0.837	0.089	–0.157	0.001
Price	0.796	0.315	–0.363	0.117
Advertising influence	–0.226	0.536	–0.041	0.621
Fashion influence	0.314	0.342	0.023	0.796
Care about one's health	–0.045	0.160	0.962	0.087
Sensitivity to environmental pollution	0.465	0.221	0.730	0.344
Care about one's appearance	–0.059	0.949	0.187	0.157
Food diet	0.197	0.881	0.276	–0.136
Need to distinguish oneself	0.328	0.225	0.256	0.875
Need to taste new products	0.018	0.757	–0.286	0.127
Need to change one's diet	0.139	0.663	0.647	0.278
Time saving	–0.580	–0.146	–0.270	–0.432
Eating habits	–0.418	0.089	0.042	–0.707
Eigenvalue	7.441	4.198	3.559	2.425
% of variance	35.43	19.99	16.95	11.55
Cumulative %	35.43	55.42	72.37	83.91

they carry, the procedure of factor analysis (principal component analysis) was used. The number of principal components was established according to criteria – the eigenvalue more than one. Thus 4 principal components were isolated, explaining in common 83.91% of variance. After that the configuration of surveyed objects (the segments of surveyed population, formed according to demographic and socio-economic factors) in a space formed by principal components. The results of PCA (factor loadings) are showed in table 3.

As the results show the first principal component is represented by the factors related to functionality of packaging and food product as well (easy to prepare, attractiveness and functionality of packaging) that causes time saving during preparing the meal; and also by smell and price of the product. Psychographic characteristics related to health and environmental care and also the need to change one's diet (the necessity of going on a special diet, care about one's appearance, need to taste new food products) formed the second principal component. The third principal component was created by factors such as: care about one's health and environmental pollution, nutritional value, food safety and highly processed food. One can say that respondents think that highly processed products are save and reach in nutrition ingredients.

Table 4 presents the configuration of segments according to factors.

Table 4. Configuration of segments according to factors

Specification	Factor 1	Factor 2	Factor 3	Factor 4
Women	0.375	1.172	0.581	−0.390
Men	−0.183	−2.144	−0.926	0.871
16–18 years of age	−0.100	1.393	−0.074	2.069
19–21 years of age	1.453	−0.758	0.169	−1.012
22–24 years of age	−1.170	−0.349	0.180	−1.062
Village	0.898	−0.264	0.529	1.027
Town up to 50 000 inhabitants	−0.716	1.625	−0.671	−1.158
Town over 50 000 inhabitants	−0.068	−0.555	−0.126	−1.139
Income up to 300 PLN	1.133	0.121	0.528	0.504
Income 300–600 PLN	0.257	−0.038	−0.090	−0.463
Income over 600 PLN	−2.332	−0.453	0.339	0.687
Eco-consumers	−0.021	−0.122	1.959	−0.068
Traditional consumers	0.475	0.370	−2.398	0.134

Configuration of the segments in the space shows that such segments as: people at the age of 19–21, living in villages, with the lowest income (coefficient are plus values) and also people at the age of 22–24, living in towns up to 50 000 inhabitants, with the highest income, are situated close to first factor. Comparing these results with the factors related to the first principal component one can say that price of product plays significant role for students of the first year of education, coming from villages and with the lowest income. These people can be referred to *thrifty* (Figure 1). As other survey showed (Lappalainen et al. 1998, Figiel 2000), price is very important for consumers with low income, housewives, elderly people and people doing big shopping for the whole family. The eldest respondents (22–24 years of age) can be referred to *pragmatic*. For those people it is important that food they buy is quick and easy to prepare and let them save the time on preparing meals; also they pay attention to attractiveness and functionality of packaging. Ease of preparation, related to saving of time is characteristic of households contained 1 or 2 people (Hełpa, Trębacz 1999) as well as young American consumers (Wardle et al. 1997).
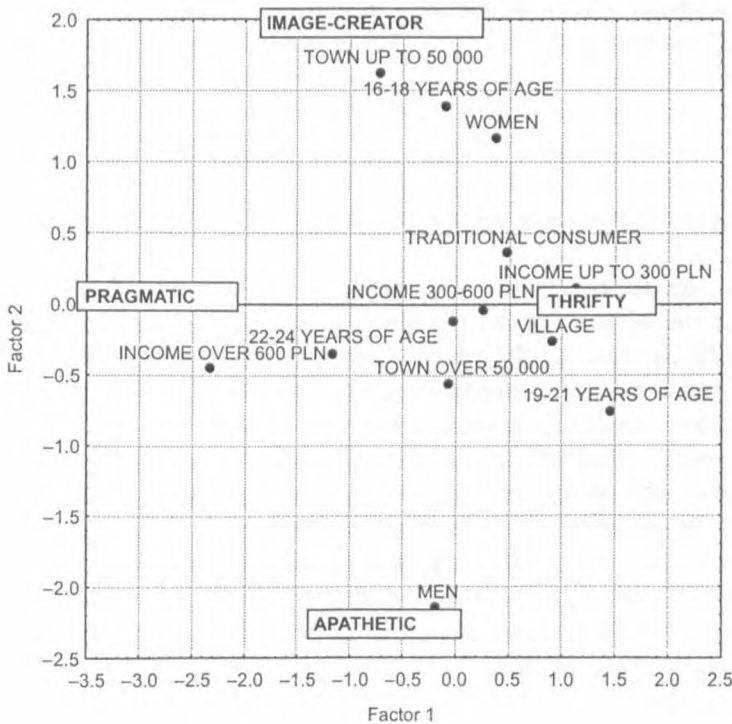

Fig. 1.

Around the second factor are situated: men, consumers at the age of 19–21 and opposite – women at the age of 16–18, from towns up to 50 000 inhabitants. It is just these girls who buy food products concerning the care about their appearance and going on a diet. To realize this aim they are ready to change their eating habits. The necess of going on a diet should be understood as a subjective need of loosing weight, not recommended by a doctor. These young people can be referred to *image-creators*. The reasons mentioned above are unfamiliar to men at the age of 19–21 – they can be referred to *apathetic*. The need of loosing weight is created by the media and makes many people think that they are fat whereas they are not in fact. In research taken by Wardle et al. (1997) 43% of the surveyed women coming from European countries thought they are overweight although obesity was characteristic only of 3% of them.

Around the third factor are situated the following segments of consumers: men, consumers who did not declare eco-consumption (for both of them coefficient in minus values) and consumers who declared eco-consumption. It is just for eco-consumers the factors determining food purchase are: highly processed food, nutritional value, food safety and the ecological reason – sensitivity to environmental pollution. Declaring willingness to reduce environmental pollution is a sign of a new consumer – proecological interests (Kędzior, Karcz 1999). However, the characteristics which constitute the second principal component do not have an important influence on food purchase for men who did not declare the eco-consumption. This segment is a typical *traditional consumer* different from a pro-ecologically oriented *modern consumer* who declared eco-consumption (Figure 2).

Close to the fourth factor are: men at the age of 16–18, living in villages, with the highest income (coefficient are plus values) and people at the age of 19–21 and 22–24 years, coming from towns and cities. The young men buy fashionable products, that looks attractive, and in this way they realize their need to distinguish oneself. As other survey shows (Mazurek-Łopacińska 2003, Szczepieniec-Puchalska 2002), young consumers, especially men and those ones with high income, are very sensitive to fashion and advertising influence, being simultaneously widely open to market signals. They have highly developed need of "the effect of demonstration" and following the fashion let them demonstrate the success and to attract attention (Odorzyńska-Kondek 2003). This group can be referred to as *effect-makers*. Fashionable food is not an important factor determining food purchase for respondents at the age of 19–24, coming from towns and cities – for these people the most important thing are their eating habits, that is why they can be referred to as *conservative*.
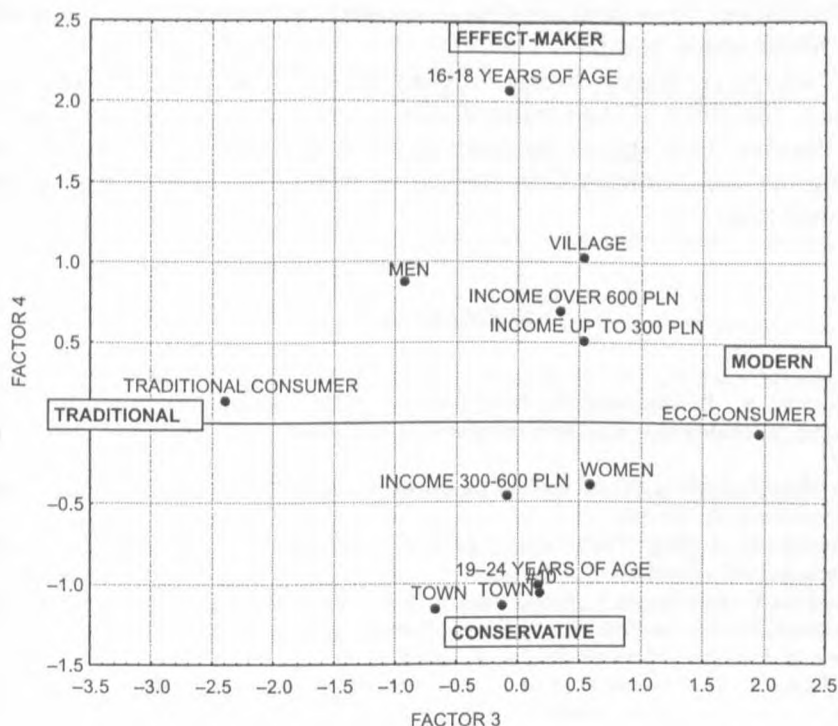
Fig. 2.

4. CONCLUSIONS

The survey results allow to form the following conclusions:

1. There are two sub-segments among schoolboys and students (men): the first one do not care about one's health or appearance, do not pay attention to freshness of product, nutritional value and food safety. The second one is formed by men at the age 16–18, living in villages and declaring relatively high income. This is a segments of "effect-makers", vulnerable to fashion an advertising influence and willing to distinguish oneself.

2. The segment of girls contains one sub-segment. The are "image-creators" – girls from the last grades of secondary school, living in towns up to 50 000 inhabitants. These girls pay special attention to care about one's appearance and going on a food diet.

3. A part of young respondents declared eco-consumption. This segment is neither vulnerable to advertising and fashion influence nor pay attention

to functionality of food products, but is sensitive to environmental pollution or care about one's health.

4. Students are highly diverse in terms of their food purchase preferences. This is the effect of their vulnerability to many descriptive and psychographic factors. This should be bone in mind by people involved in the marketing of food products with the aim of increasing demand among the young consumers.

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Izabela Cichocka

SEGMENTACJA STUDENTÓW W ZAKRESIE PREFERENCJI NA RYNKU ŻYWNOŚCI METODAMI STATYSTYCZNEJ ANALIZY WIELOWYMIAROWEJ

(Streszczenie)

W artykule przedstawiono zastosowanie analizy głównych składowych do segmentacji studentów ze względu na ich zachowania nabywcze na rynku żywności. Celem wykonanych badań było wydzielenie i opis tych segmentów spośród młodzieży ostatnich klas szkół średnich i studentów, które istotnie różnią się postawami i preferencjami na rynku produktów żywnościowych. Podstawę segmentacji stanowił zespół czynników deskryptywnych i psychograficznych. Badania wykonano w 2000 r. metodą bezpośredniego wywiadu na terenie trzech szkół wyższych Rzeszowa oraz trzech szkół średnich (w Rzeszowie i Jarosławiu). Do respondentów skierowano pytanie o subiektywnie odczuwaną ważkość – przy podejmowaniu decyzji o zakupie żywności – wskazanych cech jakościowych produktów żywnościowych oraz czynników psychograficznych. Chcąc wykonać redukcję danych i zachować jednocześnie informacje zawarte w ich zbiorze, zastosowano procedurę analizy czynnikowej – metodą głównych składowych. Wyodrębniono 4 składowe główne wyjaśniające, łącznie 83,91% wariancji. Pierwszą składową główną formują: cena, smak i zapach, łatwość przygotowania do spożycia, atrakcyjność i funkcjonalność opakowania. Respondentów zwracających uwagę na te właśnie parametry produktu można by nazwać „pragmatykami" – ich przeciwieństwem są „konsumenci oszczędni". Druga składowa

główna reprezentowana jest przez: świeżość produktu, dbałość o własny wygląd, konieczność stosowania diety. Respondentów kierujących się przy zakupie żywności powyższymi przesłankami można by nazwać „image'owcami" – ich przeciwieństwem są konsumenci „apatyczni". Z trzecią składową główną skorelowane są: wartość odżywcza produktu, bezpieczeństwo jego spożywania, dbałość o własne zdrowie i chęć zmniejszenia skażenia środowiska naturalnego. Respondentów zwracających przy zakupie żywności uwagę na powyższe aspekty można by określić mianem „nowoczesnych"; ich przeciwieństwem są konsumenci „tradycjonalni". Czwartą główną składową reprezentują: wygląd produktu, podatność na wpływ mody lub reklamy, potrzeba wyróżniania się w środowisku. Respondentów kierujących się przy zakupie żywności takimi motywami można określić mianem „efekciarzy" – ich przeciwieństwem są konsumenci „konserwatywni".