

A TAXONOMIC ANALYSIS OF DIVERSIFICATION IN THE CONSUMPTION STRUCTURE IN HOUSEHOLDS IN THE EU COUNTRIES

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Abstract: The aim of the article was to identify differences in the consumption structure in households in the EU countries in 2010. Ward's method was used to identify the types of the EU countries with different structures of consumption in households and to present the diversification. The research problem in question was analysed on the basis of the data from Eurostat and the International Statistics Yearbook, published annually by the Central Statistical Office. As a result of the research with Ward's method eight types of the EU countries with different consumption structures in households were distinguished.

Keywords: consumption, households, Ward's method

INTRODUCTION

In the microeconomic approach referring to the household consumption¹ is understood as the process of using acquired, produced or shared goods to satisfy the joint and individual needs of its members [Kramer 1997, Piskiewicz 2009]. The scale and structure of consumption in households in the EU countries is clearly diversified, which is caused by such reasons as regional differences in the socioeconomic development. Historical, geographical and cultural factors are of equal importance.

¹ The Polish economic literature uses two terms referring to consumption – ‘konsumpcja’ and ‘spożycie’. Both terms are synonymous and interchangeable [Zalega 2012].

By analysis of the structure of expenditures in households it is possible to grasp the similarities and differences in their living standard and in consequence, to assess the living standard of entire society [Szumowicz 1995]. At present the issues related with people's living standard are becoming one of the key terms in politics and social development strategies.

The main goal of the article was to identify differences in the structure of consumption in households in the EU countries in 2010. Studies on the spatial diversification of phenomena more and more often use taxonomic methods, which enable the identification of homogenous groups of regions with similar traits, which are subject to analysis [Wysocki 2010]. Therefore, the diversification in the structure of consumption in households in the EU countries was assessed by means of cluster analysis - Ward's method.

RESEARCH METHODOLOGY

In order to determine diversification in the consumption structure in households in the EU countries data from national accounts were used. They present the consumption structure of the entire household sector as groups of commodities and services. The presentation of the structure of consumption expenditures on individual purposes eliminates the problem of diversification in the level of prices and income in households in individual countries.

The research problem in question was analysed on the basis of the data from *Eurostat* and the *International Statistics Yearbook*, published annually by the Central Statistical Office.

By means of Ward's method the EU countries were classified in the following stages according to the consumption structure in households in 2010 [Wysocki 2010]:

Stage 1. Partial measures of the consumption structure in households were selected on the basis of factual premises:

- X_1 – the share of expenditures on food and soft drinks in total expenditures (%),
- X_2 – the share of expenditures on alcoholic beverages and tobacco products in total expenditures (%),
- X_3 – the share of expenditures on clothing and footgear in total expenditures (%),
- X_4 – the share of expenditures on the use of lodgings and energy carriers in total expenditures (%),
- X_5 – the share of expenditures on furnishings in total expenditures (%),
- X_6 – the share of expenditures on health in total expenditures (%),
- X_7 – the share of expenditures on transport in total expenditures (%),
- X_8 – the share of expenditures on communication in total expenditures (%),
- X_9 – the share of expenditures on recreation and culture in total expenditures (%),
- X_{10} – the share of expenditures on education in total expenditures (%),
- X_{11} – the share of expenditures on restaurants and hotels in total expenditures (%).

In order to eliminate excessively correlated traits an invertible matrix was formulated for the correlation coefficients between them. No trait was rejected on the basis of the analysis of the diagonal elements of the matrix.

Stage 2. The values of the traits were classically standardised according to the following formula:

$$z_{ik} = \frac{x_{ik} - \bar{x}_k}{s_k} \quad (1)$$

where:

x_{ik} - the value of the k -th trait in the i -th object,

\bar{x}_k - the arithmetic mean of the k -th trait,

s_k - the standard deviation of the k -th trait.

Stage 3. Ward's method² was applied for cluster analysis, which consists in combining the closest units with each other until one cluster is made. It uses the analysis of variance to estimate the distance between units, aiming at minimisation of the sum of squared deviations within clusters [Stanisz 2006]. At each stage of the method, the pair of clusters which results in a minimally diversified combination is chosen from all combinable pairs of clusters [Everitt et al. 2011]. The desirable number of classes of the EU countries with a similar consumption structure in households was determined upon analysis of the diagram with the course of agglomeration.

Stage 4. The typological classes were interpreted and described. The identification of types consists in describing them by means of selected descriptive statistics (intra-class means) of selected traits. In order to identify the characteristic traits in each class the *difference-of-means measure* was calculated according to the following formula:

$$z_{ck(d)} = \frac{\bar{x}_{ck} - \bar{x}_k}{s_{k(w)}} \quad (2)$$

where:

C - the number of classes ($c = 1, \dots, C$),

K - the number of traits ($k = 1, \dots, K$),

\bar{x}_{ck} - the mean of the k -th trait in the c -th class,

\bar{x}_k - the overall mean of the k -th trait in a group consisting of N objects,

$s_{k(w)}$ - the average intra-class diversification in the k -th trait value, which is calculated according to the following formula:

$$s_{k(w)} = \left[\frac{1}{N - C} \sum_{c=1}^C (N_c - 1) \cdot s_{ck}^2 \right]^{1/2} \quad (3)$$

where:

² Statistica 10.0 software was used in the computing process.

s_{ck}^2 - the intra-class variance in the c -th class calculated in relation to the k -th trait.

$z_{ck(d)}$ - values were the basis for distinguishing characteristic traits in typological classes with the following scale of values, where [Wysocki 2010]:

1. $z_{ck(d)} \in (-\infty; -3) \vee (3; +\infty)$ - there is very high intensity of the k -th trait in the c -th class, the trait is highly characteristic (positively or negatively),
2. $z_{ck(d)} \in (-3; 2) \vee (2; 3)$ - there is high intensity of the k -th trait in the c -th class, the trait is averagely characteristic (positively or negatively).
3. $z_{ck(d)} \in (-2; 2)$ - there is average intensity of the k -th trait in the c -th class, the trait does not stand out and it is not characteristic.

RESEARCH RESULTS – THE TYPOLOGY OF THE EU COUNTRIES ACCORDING TO THE CONSUMPTION STRUCTURE IN HOUSEHOLDS IN 2010

Spatial diversification in the consumption structure in households in the EU countries was presented by means of cluster analysis. Standardised data concerning the consumption structure in households in the EU-27³ countries were classified by means of Ward's method. In order to determine the optimal number of clusters factual premises and conclusions from the analysis of the diagram with the course of agglomeration were taken into consideration. As a result, the community under investigation was divided into eight clusters (Fig. 1).

Tables 1 and 2 present a description of the identified types of countries with a similar consumption structure in households. Table 1 includes the intra-class values of simple traits describing the consumption structure in households in the identified typological classes. Two passive traits were used for the description (characterisation) of the identified types, i.e. the GDP value (euros per head) and the value of disposable income in the household sector (PPS⁴ per head). Table 2 includes the values of the *difference-of-means measure* for the traits under analysis in the group of 26 EU countries according to the identified classes. Specific and non-specific traits in the specified typological classes were identified on the basis of these values.

³ Bulgaria was not included in the research due to the absence of statistics published by *Eurostat*.

⁴ PPS - *Purchasing Power Standard* is a common contractual currency adopted in the European Union. Purchasing power parities are a kind of exchange rates which are used for the conversion of economic indexes expressed in national currencies into the common contractual currency.

Class I consists of two countries – Romania and Lithuania, which are characterised by the *food consumption model*⁵. This fact is proved by a very high share of expenditures on food and alcoholic beverages in the household budget of these countries, i.e. 27.8%. It is necessary to stress the fact that it was about 18% higher than in highly developed countries, which formed typological Classes VII and VIII (Fig. 1, Table 1). It is necessary to note the fact that Romania and Lithuania also had the highest share of fixed expenditures⁶ in the total household expenditures, i.e. 47%, whereas the European mean was 36.5% (Table 1). The share of necessary expenditures in total expenditures is a determinant of the living standard in societies. In highly socioeconomically developed countries the share of these expenditures in household budgets is low and does not exceed 35% of total expenditures (e.g. in the UK – 33.9%, in Luxembourg-33.5%, in Germany-35.6% in 2010). On the other hand, in less socioeconomically developed countries this share is much higher and limits the capacity to satisfy other needs in the household, especially higher-order needs (e.g. it was 52.6% in Romania in 2010) [*International Statistics Yearbook 2012*].

Apart from that, Class I countries are distinguished by the low share of expenditures on recreation and culture (5.4%) and those on restaurants and hotels (3.9%) in the consumption structure in households (Table 1). This may have been caused by such factors as the poorer economic situation of those households, because the average disposable monthly income in Romanian and Lithuanian households in 2010 amounted respectively to 40.3% and 56.0% of the average income in the household sector in the EU-27 [*International Statistics Yearbook 2012*].

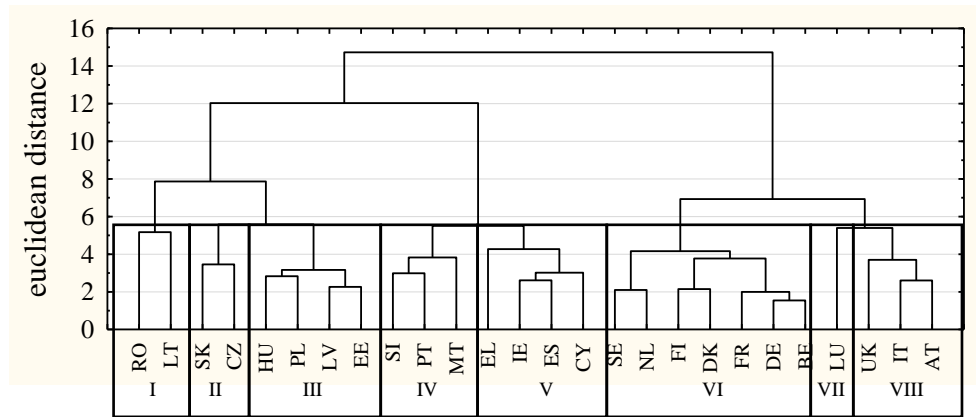
Class II consists of two countries – Slovakia and the Czech Republic. This group of countries was characterised by an average share of expenditures on food and soft drinks and a high share of expenditures on alcoholic beverages and tobacco products in the consumption structure of households, which in 2010 reached 15.6% and 7.1%, respectively. The high rate of the share of expenditures on alcoholic beverages and tobacco products in the household budgets in this group may be related with such factors as the tradition of beer consumption [Smoluk-

⁵ We can talk about the food consumption model when there is a high share of expenditures on food in total expenditures, which affects the capacity to satisfy other demands [Kuśmierczyk, Piskiewicz 2012].

⁶ The group of fixed (necessary) expenditures include the expenditures related with satisfying basic household needs, which cannot be postponed in time. Most researchers include expenditures on food and soft drinks and those related with the use of lodgings and energy carriers into this group. The other expenditures are free-choice expenditures (free decision fund). The division line between fixed expenditures and free-choice expenditures is fluid and disputable, especially as far as expenditures on transport, furnishings and health are concerned [Skrzypczak 2008]. The aim of comparison of the structure of consumption expenditures in households, including this division, is to assess the degree of modernity of structures in the typological groups under investigation.

Sikorska, Kalinowski 2011]. The countries in this class were also distinguished by the lowest share of expenditures on transport and the highest share of expenditures on communication in the total expenditures in households, i.e. 8.2% and 3.5%, respectively (Fig. 1, Table 1).

Figure 1. The classification of the EU countries ^{a)} by means of Ward's method according to the consumption structure in households in 2010.



^{a)} AT - Austria, BE - Belgium, CY – Cyprus, CZ-Czech Republic, DE - Germany, DK – Denmark, EE – Estonia, EL – Greece, ES-Spain, FR – France, HU – Hungary, IE – Ireland, IT – Italy, LU - Luxembourg, LT - Lithuania, LV - Latvia, NL – Netherlands, PL – Poland, PT – Portugal, RO - Romania, SE – Sweden, SI – Slovenia, SK - Slovakia, UK - United Kingdom.

Source: own compilation based on the data from the *International Statistics Yearbook 2012*, Central Statistical Office

Class III consists of four countries - Hungary, Poland, Latvia and Estonia, which are situated in Central and Eastern Europe (Fig. 1). The countries in this class had a high share of expenditures on food and soft drinks in the total expenditures in households, but this share was almost 9% lower than in Class I (Table 1). The high share of expenditures on food in the total expenditures in households in the countries belonging to Classes I and III shows certain disproportions in the economic development of those countries, as compared with the other ones.

In the countries that were grouped as Class III it is also possible to notice a relatively low share of expenditures on furnishings and those on restaurants and hotels in household budgets, i.e. 4.2% and 5.2%, respectively. This may have resulted from the lower socioeconomic development of those countries, which is measured with the GDP per head. This value affects the income in households, which chiefly influences the consumption level and structure (Table 1). The households in the countries which formed Class III, i.e. Hungary, Poland, Latvia

and Estonia, were in a much worse financial situation, because in 2010 they reached 57.2%, 62.6%, 46.5% and 56.0% of the average disposable income in the household sector in the EU-27, respectively [*International Statistics Yearbook 2012*].

Table 1. The inter-class diversity of the EU countries in the consumption structure in households in 2010

Specification	Typological group								Total
	I	II	III	IV	V	VI	VII	VIII	
	RO, LT	SK, CZ	HU, PL, LV, EE	SI, PT, MT	EL, IE, ES, CY	SE, NL, FI, DK, FR, DE, BE	LU	UK, IT, AT	
Food and soft drinks (%)	27,8	15,6	19,2	15,2	13,2	12,3	9,2	10,2	12,9
Alcoholic beverages and tobacco products (%)	5,5	7,1	7,5	3,1	4,1	3,6	8,6	3,4	3,5
Clothing and footwear (%)	5,6	3,6	4,6	5,2	5,0	5,0	3,7	6,0	5,3
Use of lodgings and energy carriers (%)	19,2	26,1	23,4	15,6	21,3	25,5	24,3	22,2	23,6
Furnishings (%)	5,0	5,8	4,2	6,4	4,9	5,8	6,8	6,6	5,8
Health (%)	4,3	3,3	4,0	4,3	4,7	3,8	2,1	3,0	3,7
Transport (%)	14,8	8,2	12,8	12,7	12,0	12,1	17,1	13,1	13,0
Communication (%)	2,3	3,5	3,3	3,1	3,2	2,7	1,7	2,1	2,7
Recreation and culture (%)	5,4	10,0	7,8	9,2	7,1	10,0	8,2	10,4	8,9
Education (%)	1,5	1,2	1,4	1,3	2,0	0,6	0,9	1,0	1,1
Restaurants and hotels (%)	3,9	6,6	5,2	11,0	14,2	5,8	7,0	9,9	8,6
GDP per head (euros)	7100	13150	9500	16200	21700	33300	79500	27500	24400
Disposable income per head in household sector (by PPS)	9318	13517	10961	16034	19288	21331	28882	21919	19359

Source: own compilation based on the data from the *International Statistics Yearbook 2012*, published by the Central Statistical Office (2012) and on the data from *Eurostat*.

Class IV consists of three countries - Slovenia, Portugal and Malta (Fig. 1). The countries were characterised by an average share of expenditures on food and soft drinks and a very low share of expenditures on the use of lodgings and energy carriers in the consumption structure in households in 2010, i.e. 15.2% and 15.6%, respectively. The low share of expenditures on the use of lodgings and energy carriers in households in those countries may be chiefly related with the climatic conditions. The group was also characterised by a relatively high share of expenditures on restaurants and hotels in the total expenditures in households, i.e. 11.0% (Table 1). The diversified values of the index of the share of expenditures on restaurants and hotels in the households of the EU countries can be explained with such factors as the diversified financial situation, the prices

of gastronomic and hotel services, the hierarchy of consumer needs and different lifestyles in societies.

Class V includes four countries - Greece, Ireland, Spain and Cyprus (Fig. 1). The countries have a relatively high level of socioeconomic development because in 2010 the average gross domestic product in this group was 21,700 euros per head. The countries also had a relatively low share of fixed expenditures in household budgets, i.e. 30.8% in 2010 (Table 1). This resulted from a relatively good financial situation of households in those countries. They were also characterised by a high share of expenditures on education (2.0%) and those on restaurants and hotels (14.2%) in the consumption structure of households, i.e. expenditures on higher-order needs (Table 1). In comparison with the other EU countries the differences in the share of higher-order expenditures in household budgets in this group may have been strongly influenced not only by economic factors but also by cultural factors related with the tradition of a particular country.

Table 2. The values of the *difference-of-means measure*^{a)} for the traits describing the consumption structure in households in the EU countries in 2010 according to the typological classes identified

Specification	Typological group							
	I	II	III	IV	V	VI	VII	VIII
	RO, LT	SK, CZ	HU, PL, LV, EE	SI, PT, MT	EL, IE, ES, CY	SE, NL, FI, DK, FR, DE, BE	LU	UK, IT, AT
Food and soft drinks (%)	8,0	1,4	3,4	1,2	0,1	-0,3	-2,0	-1,5
Alcoholic beverages and tobacco products (%)	1,6	3,0	3,3	-0,3	0,5	0,1	4,3	-0,1
Clothing and footgear (%)	0,3	-1,6	-0,7	-0,1	-0,3	-0,3	-1,5	0,7
Use of lodgings and energy carriers (%)	-1,8	1,0	-0,1	-3,3	-1,0	0,8	0,3	-0,6
Furnishings (%)	-1,3	0,0	-2,8	1,0	-1,5	0,0	1,7	1,3
Health (%)	0,6	-0,4	0,3	0,6	0,9	0,1	-1,5	-0,7
Transport (%)	1,4	-3,7	-0,2	-0,2	-0,8	-0,7	3,2	0,1
Communication (%)	-0,8	1,6	1,1	0,8	1,0	0,0	-2,0	-1,2
Recreation and culture (%)	-2,7	0,8	-0,8	0,2	-1,4	0,8	-0,5	1,1
Education (%)	1,0	0,1	0,8	0,5	2,3	-1,3	-0,5	-0,3
Restaurants and hotels (%)	-2,4	-1,0	-1,7	1,2	2,8	-1,4	-0,8	0,7

^{a)} The shades of grey refer to the medium and high absolute values of the difference-of-means measure ($z_{ck(d)}$), which were the basis for highlighting specific traits in individual classes (light grey – relatively high intensity, dark grey - very high intensity).

Source: own compilation based on the data from Table 1, processed with Statistica 10 computer software.

The most numerous Class VI was formed by seven countries - Sweden, the Netherlands, Finland, Denmark, France, Germany and Belgium, which are situated in northern and western Europe (Fig. 1). The consumption structure in households in those countries was the closest to the EU-27 average. These countries are characterised by a high level of socioeconomic development and high living standard of their inhabitants. This fact is proved by such indexes as the low share of expenditures on food and soft drinks in total expenditures, which amounted to 12.2% in this class. The characteristic trait in this typological class was a relatively low share of expenditures on education (0.6%) and those on restaurants and hotels (5.8%) (Table 1). When making comparisons and assessments of the indexes of the share of expenditures on basic goods and those on higher-order goods in the structure of expenditures related with consumption in the typological groups under analysis it is also necessary to bear in mind that the state finances some services related with health and education. Depending on the policy of public expenditures in a particular country households can benefit from free medical or educational services to a greater or lesser extent. Their tendency or need to spend extra funds on this purpose is low. In consequence, this implicates the low share of expenditures in these categories in total expenditures. The correction of expenditures in these categories by the share of the state in these expenditures makes a significant change in the relations between the expenditures on basic goods and those on higher-order goods.

Class VII was formed by one country, i.e. Luxembourg (Figure 1). The high level of socioeconomic development in this country influences very good financial situation of households, which were characterised by the lowest share of expenditures on food and soft drinks in total expenditures (9.2% in 2010) and a high share of expenditures on alcoholic beverages and tobacco products (8.6%), transport (17.1%) and furnishings (6.8%) (Table 1).

The last class – VIII was formed by three countries – the United Kingdom, Italy and Austria, which belong to the group of highly socioeconomically developed countries (Fig. 1). In 2010 the disposable income in households in those countries amounted to 113.2%, 103.5% and 118.3% of the average income in the household sector in the EU-27. The good financial situation of households in the countries in class VIII resulted in lesser burdening of their budgets with fixed expenditures, which reached 32.4% in 2010 (Table 1). The characteristic trait of the structure of consumption in those households was also a high share of expenditures on recreation and culture and those on restaurants and hotels, i.e. 10.4% and 9.9%, respectively.

The results of the assessment of diversification in the structure of consumption in households in the EU countries obtained by means of cluster analysis were compared with the results of the research by [Kuśmierczyk and Piskiewicz 2012]. The authors made a multidimensional analysis and identified six clusters with a similar consumption structure. As a result of our investigations eight

clusters were distinguished for the purposes of this article. The components of individual classes were largely identical.

CONCLUSIONS

Upon the analyses conducted by means of Ward's method eight types of the EU countries differing in the consumption structure in households were distinguished. The findings of the research lead to the following conclusions:

- Romania and Lithuania (Class I) and Hungary, Poland, Latvia and Estonia (Class III) were characterised by a high share of expenditures on food and soft drinks in the total expenditures in households. This fact points to certain disproportions in the economic development of those countries in comparison with the other countries.
- Slovakia and the Czech Republic (Class II) were characterised by an average share of expenditures on food and soft drinks in total expenditures and a high share of expenditures on alcoholic beverages and tobacco products in the structure of consumption in households.
- Slovenia, Portugal and Malta (Class IV) were distinguished by a very low share of expenditures on the use of lodgings and energy carriers in the structure of consumption in households, which chiefly resulted from the climatic conditions, and there was also a relatively high share of expenditures on restaurants and hotels in total expenditures in households.
- Greece, Ireland, Spain and Cyprus (Class V) were characterised by a relatively low share of fixed expenditures in household budgets and by a high share of expenditures on education and those on restaurants and hotels, i.e. higher-order goods and services. The differences in the share of higher-order expenditures in household budgets, as compared with other EU countries, may have been strongly influenced not only by economic factors but also by those related with the tradition of a particular country.
- The consumption structure in households in Sweden, the Netherlands, Finland, Denmark, France, Germany and Belgium (Class VI) was the closest to the average in the EU-27. These countries are characterised by a high level of socioeconomic development and a high living standard of their inhabitants.

- Luxembourg (Class VII) was characterised by the lowest share of expenditures on food and soft drinks in total expenditures and by a high share of expenditures on alcoholic beverages and tobacco products, transport and furnishings.
- The United Kingdom, Italy and Austria (Class VIII), which are classified as highly socioeconomically developed countries, were characterised by low burdening of household budgets with fixed expenditures and by a high share of expenditures on recreation and culture and those on restaurants and hotels in the structure of consumption in households.

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