

ANALYSIS BETWEEN FOOD CONSUMPTION PREFERENCES

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ABSTRACT

Food preferences of the consumers are an important indicator for agricultural production, especially when it comes to finding new markets. Obviously, these preferences are modified in the long run. However, due to geographical, climatic, cultural and other conditions these changes will not proceed diametrically. But, undoubtedly, the consumption of various food products is changing in each country because of the opening up of borders, as in case of countries that joined the European Union, or due to more nutritional awareness of the consumers [Małysa-Kaleta, A. 2003]. For example, in Poland after 1990, there was an increase in the diversity of food consumption [Grzelak, A., & Gałazka, M., 2013] whereas research in the Mediterranean countries indicates a gradual resignation from traditional food in this region [Balanza, R. et al, 2007]. This presentation attempts to analyze the total changes in consumer food preferences in European countries between 2005 and 2020. To avoid listing individual product groups, one approach applied to this issue may be to compare structural profiles in two extreme time periods for each country and to build a synthetic rate that will definitely determine the value of these changes. Thus, the aim of the study is to rank the European countries according to the value of changes in consumption of different group of food products in European countries between 2005 and 2020 and to divide countries into groups according to similar level of changes in food consumption over the years. The study used data in kg per capita on the consumed products in each country. The data came from the United Nations Food and Agriculture Organization (FAO) [www.fao.org].

Keywords: Dissimilarity of structures, synthetic rate, ranking, multidimensional data analysis, grade data analysis.

INTRODUCTION

Consumer food preferences are an important indicator for agricultural production, especially when it comes to finding new markets. Obviously, these preferences are modified in the long run. However, due to geographical, climatic, cultural and other conditions these changes will not proceed diametrically. But, undoubtedly, consumption of various food products is changing in each country as borders open up, as in the case of countries that joined the European Union, or due to increased nutritional awareness of consumers (Maysa-Kaleta, 2003). For example, in Poland after 1990, there was an increase in the diversity of food consumption (Grzelak, Gazka, 2013) whereas research in the Mediterranean countries indicates a gradual resignation from traditional food in this region (Balanza et al., 2007). This paper attempts to analyze the total changes in consumer food preferences in EU countries between 2001 and 2013. To avoid listing individual product groups, one approach applied to this issue may be to compare structural profiles in two extreme time periods for each country and to build a synthetic rate that will definitely determine the value of these changes. Thus, the aim of the study is to rank the EU

countries according to the value of changes in consumption of different group of food products in EU countries between 2001 and 2013 and to divide countries into groups according to similar level of changes in food consumption over the years.

The study used data in kg per capita on the consumed products in each country. The data came from the United Nations Food and Agriculture Organization (FAO) (www.fao.org). There is also information on the annual consumption of food products in the European Union between 2001 and 2013, divided into 14 product groups. To clarify obtained results some of the groups were excluded and some were combined. However, this did not affect the reliability of the study. Thus, 9 different variables were identified: x1 Cereals, x2 Sugar and sweeteners, x3 Legumes and vegetables, x4 Fruits, x5 Meat and offal, x6 Milk products, x7 Eggs, x8 Fish and seafood, x9 Potatoes and potato products.

The methods and tools used in this study are techniques of Multidimensional Data Analysis and Grade Data Analysis. The averages of variables from three consecutive years of two separate periods (years 2001-2003 and 2011-2013) were used in the comparative study. Then, one of the synthetic rates was used, which considered consumption levels in the product groups counted per capita. Calculation of this rate was based on the “ar” measure used for measuring the differentiation of two structures (Gastwirth, 1971; Arnold, 1987; Binderman et al., 2014).

RESULTS

To determine the significance of changes in consumer preferences, we may calculate the ar_{max} rate analogously by comparing the food consumption structures for individual EU countries in the two separate periods 2001-2005 and 2011-2020. For example, for Poland, determining the value of these changes means calculating the ar_{max} value for relevant non-decreasing arrangement of the components in these two periods in relation to the quotient of corresponding structures.

Table 1: Average annual consumption of product groups in kg/person, their structures and cumulative structures for Poland (PL) in years 2001-2005 (PL1) and 2011-2020

X	PL1 (2001-2005)			PL2 (2011-2020)			wPL2/ wPL1
	kg/pers	wPL1	kg/pers	wPL2	kg/pers	wPL1	
x	11.	1.45%	1.45	8.1	1.04%	1.04%	0.71
x	130.	16.39	17.84	110.	14.07%	15.11%	0.85
x	45.	5.77%	23.61	44.	5.65%	20.76%	0.97
x	123.	15.52	39.13	120.	15.46%	36.22%	0.99
x	153.	19.26	58.39	151.	19.35%	55.57%	1.00
x	195.	24.60	82.99	201.	25.73%	81.31%	1.04
x	75.	9.53%	92.52	78.	10.08%	91.38%	1.05
x	9.04	1.13%	93.65	10.	1.30%	92.68%	1.14
x	50.	6.35%	100.00	57.	7.32%	100.00	1.15
Total	796.	100.00		782.	100%		

In this case the armax dissimilarity rate indicating the value of changes in Polish consumers preferences over the 10-year is: $ar_{\max} = 0.04032$.

Ar_{\max} dissimilarity rates for each EU country are given below. They compare (as in the Polish example) the structure of food consumption in two extreme periods 2001-2005 and 2011-2020. Calculating the ar_{\max} rates allows us to create a ranking that values countries where the changes were most important. If we treat the ar_{\max} rates as synthetic rates Q_i describing the values of changes in a food consumption structure in years 2001-2020, we may divide these countries into groups. The method of distribution may be, e.g. quite clear division used by Professor Kukuáa (Kukuáa, 2010, 2012, 2014a, 2014b; Ząbkowski, Szczesny, 2012). After the arrangement of synthetic variable Q_i according to non-decreasing values (in this case $Q_i = ar_{\max}$), we may calculate the range $R(Q_i)$ for this variable:

$$R(Q_i) = \max Q_i - \min Q_i = 0.18299$$

If we decide to divide the objects into 3 groups, we need to determine the size of the division parameter k according to formula:

$$k = \frac{R(Q_i)}{3} = 0.061$$

And then divide all objects into groups according to the following pattern:

Group 1 for: $Q_i \in (\max Q_i - k, \max Q_i]$ in our case (0,14351 , 0,20451)

Group 2 for: $Q_i \in (\max Q_i - 2k, \max Q_i - k]$ in our case (0,08251 , 0,14351)

Group 3 for: $Q_i \in (\max Q_i - 3k, \max Q_i - 2k]$ in our case (0,02151 , 0,08251)

Table 2: Ranking of the EU countries according to armax rate presenting the value of changes in food consumer preferences in two extreme periods 2001-2005 and 2011-2020.

Rankin	Countr	ar _{max}	Group	Ranking -	Country -	ar _{max}	Group
1	H	0.20451	1	15	F	0.05783	
2	L	0.12020		16	G	0.05714	
3	B	0.11824		17	N	0.05589	
4	IE	0.10422		18	S	0.05541	
5	E	0.09261		19	SI	0.05435	
6	D	0.08719		20	G	0.05221	
7	S	0.08434		21	R	0.04766	3
8	E	0.07820		22	P	0.04302	
9	L	0.07510		23	FI	0.03845	
10	L	0.07508		24	P	0.02971	
11	H	0.07366	3	25	IT	0.02800	
12	A	0.06258		26	C	0.02468	
13	M	0.06059		27	D	0.02152	
14	B	0.05901			k	0.06100	

In the first group with the highest level of the investigated complex phenomenon, the biggest change in terms of nutritional preferences was found in Croatia. The second group

with moderate nutritional preferences includes, Lithuania, Bulgaria, Ireland, Spain, Denmark and Slovakia and the third group, with the least significant changes, comprises of the rest of the EU countries (including Poland).

CONCLUSIONS

The method used in this paper to compare the consumption structures of different food product groups is one of many options for multidimensional analysis, but it is quite clear and produces quite good results as it is more sensitive to minor differences between the structures. The attempt to group European countries for food consumption in 1993 and 2000 was carried out with cluster analysis by Dudek and Orowski (Dudek, Orowski, 2006). However, despite changes in the consumption of food products in individual countries, the sets of countries in obtained concentrations in 2000 and 1993 were almost identical.

The results of this study indicate that the structure of food consumption changed very slowly over a period of 10 years. The most visible difference, compared to other countries, may be observed in Croatia, which creates a separate, one-element group, indicating that its nutritional preferences have changed most strongly compared to other surveyed countries. This can be explained by the fact that in 2013 Croatia became a member of the European Union, and in the process of trying to obtain this privilege, it has undergone many economic changes, gained more access to other food products and export food prices decreased. As a result, its structure of consumption has become similar to other states of the EU. Analysis of this country example showed that the greatest change was observed in the consumption of potatoes and its products (x9). From a 15% share in a group of investigational products, its consumption decreased to 6%. The consumption of dairy products increased significantly (from 25% to 32%) and we observed a slight increase in meat consumption. This would confirm the research conducted over the past 40 years in the Mediterranean countries, which shows that in this region the consumption of milk and its products has constantly increased to the detriment of other products, such as cereals. (Balanza et al., 2007; Notarnicola et al., 2017).

A group of countries with average changes includes 6 countries: Lithuania, Bulgaria, Ireland, Spain, Denmark and Slovakia. The changes in the largest group (20 countries, including Poland) over ten years were very slight, and the structure of the food products has not actually changed, but the population has had similar nutritional preferences for years. The authors think that it would be interesting to do research in the future on the similar field but designed for food producers as useful information for defining possible food markets.

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