

# USING MULTIPLE CORRESPONDENCE ANALYSIS TO EVALUATE SELECTED ASPECTS OF BEHAVIOUR OF CONSUMERS PURCHASING LOCAL FOOD PRODUCTS

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## Abstract

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The paper compares selected aspects of behaviour of consumers when purchasing local food products in the Czech Republic or food products labelled as local or regional using correspondence analysis vis-à-vis customer gender. Its purpose is to identify aspects which each group of the consumers (that is men vs. women) consider important when purchasing local food products. Information about the preferences of customers purchasing local food is important for marketing activities of retailers and producers. Data from 269 respondents have been processed in total according to gender and purchasing frequency. Correspondence analysis was used in order to evaluate consumer preferences and to identify their behaviour. MCA is an exploratory multivariate statistical analysis that allows investigation of several qualitative parameters. Appearance and information on the packaging, qualitative parameters (visually declared), anticipated health benefits and declared nutritional values were the focus of the research. This paper is significant in terms of using sign schemes, correlation and correspondence analysis, therefore the analysis demonstrates differences in these aspects between men's and women's behaviour when purchasing local food products inter alia, according to their purchasing frequency, which previous papers have not considered while using multivariate statistical methods.

Keywords: Local food, regional food, correspondence analysis, behaviour, gender, perceptual map, Czech Republic.

## INTRODUCTION

“Local food” is a movement which aims to connect food producers and food consumers in the same geographic region in order to develop more self-reliant and resilient food networks, improve local economies, or to have an impact on the health, environment, community, or society of a particular place (Feenstra, 2002). Ittersum *et al.* (2003) defines a regional product as the one the quality and/or renown of which can be connected with the region and whose marketing is based on the name of the region of its origin. Musil (2010) understands

a region as a unit demarcated by administrative borders of the region, as a higher territorial self-governing unit. However, currently there is no unified definition of local food. Localness is usually restricted by the distance, for example according to Roosevelt (2006), “local” food is food grown within 100 miles (160 km) of its point of purchase or consumption, but according to the USA's Farm Act (Congress of the United States of America 2008) it is 400 miles. Some of the aspects which influence the term “local” are for instance population density or climate (Martinez, 2010).

A number of researchers have identified numerous aspects which influence a store choice of various consumers, for example the product quality, assortment, price, one-stop purchase, speed and the quality of service as well as the atmosphere of their in-store experience (Morschett *et al.*, 2005) or importance of customers' overall comfort in the purchasing process (Briesch, 2009). McEntee (2010) emphasises the aspects of food origin, since customers' interest in local foods as an alternative to imported food products is on the increase. A carbon footprint or environmental taxes also influence consumers' and producers' behaviour (Smutka *et al.*, 2015). Other authors have investigated differences in consumer behaviour according to age (Netopil *et al.*, 2014), price and convenience (Zeithaml, V., 1988).

Czech consumers have also moved their demand to food products with higher added value; they place more emphasis on perceived quality, longer durability and special product characteristics (Turčínková and Stávková, 2009). Highlighting the local origin of food products can be their competitive advantage (Turčínková and Kalábová, 2011). Consumers' interest in local foods results in greater popularity of farmers' markets (Dodds, *et al.*, 2014). Qualitative parameters are perceived by the consumer of local food products similarly to organic foods (Hempel and Hamm, 2016). Local food products appear fresher, more palatable, safer to consumers and reach better quality and safety than those produced on the opposite side of the world (Conner, *et al.*, 2010; Roosen *et al.*, 2003; Schupp and Gillespie, 2001). By preferring these products, the consumer supports local producers and domestic economy (Keeling-Bond, *et al.*, 2006). Local food attributes can connect with the consumer on multiple cognitive and emotional levels (Delind, 2006) and they influence the consumer's willingness to pay for local products (Campbell *et al.*, 2014).

Regional foods have become an interesting marketing article and the subject of research interest. Starzyzna *et al.* (2013) emphasises that understanding customer motivation and behaviour (when purchasing local food) is a prerequisite for lasting customer relationships. Selection of a store is also recognized as a cognitive process. The choice of retail mix elements is crucial for vendors (Milosavljevic *et al.*, 2011). Some authors discuss specific brands of regional food products (for instance Chalupová *et al.*, 2012), support of local economy (Writhgen, 2008) or a particular local product (D'amico, M., *et al.*, 2014).

One of the methods used to investigate consumer behaviour is correspondence analysis (for example Nielsen, 1998; Ngapo, 2007; de Hooge *et al.*, 2017). This paper compares selected aspects of consumer behaviour (men and women) when purchasing local food products in the Czech Republic or products labelled as local or regional using this analysis with regard to purchasing frequency. Its purpose is to identify aspects which this group of consumers (that is men vs. women) consider important when

purchasing local foods. The price is not included in the aspects since Finn and Louviere (1996) have ascertained that low price is crucial for 86% of consumers in order to change their in-store choice. The importance of price for Czech consumers, chiefly the older ones, has been confirmed for example by Netopil (2014). The aspects which can further be focused on by marketing are the subject of this paper. The research questions are as follows: (1) Are there statistically significant differences between perception and preferences in selected aspects between genders? The aspects include food appearance (packaging) and information on the packaging, declared qualitative parameters and, predominantly, declared nutritional values and anticipated health benefits. (2) Which aspects in making a purchase are preferred by men and which by women?

## MATERIALS AND METHODS

Since there is no standard for what "local food" is, consumer research usually defines the term relatively narrowly as purchasing from farmers' markets, purchasing groceries with a logo/label such as "Regionální potravina" (Regional Food), Klasa (national label for quality product), Český výrobek/Česká potravina (Czech product/Czech Food), Biozebra – biopotravina, (organic food with the logo authorised by the national inspection institute), protected geographical indication, protected designation of origin and traditional speciality guaranteed. Furthermore, these brands often receive state support. For instance, in order to support brands Klasa and "Regionální potravina" (Regional Food), the Ministry of Agriculture allocated more than 2.463 million CZK during 2008 and 2013. However, the effectiveness of these campaigns has not been monitored (SAO, 2016). According to CNA (2016), promotion of the Klasa brand only was put out to another tender for 298 million CZK. Purchasing regional/local foods might represent declaration of one's sense of belonging, their support of local economy, employment etc. This is also manifested in the presentations and marketing campaigns run by the Ministry of Agriculture of the CR (MA, 2017). Identification of customer behaviour might enable better targeting of marketing activities for these brands.

The gender aspect has recently started to be monitored as a part of consumer behaviour, predominantly where it might be influenced for example by ethical questions or social responsibility. (e.g. Bryant and Thompson, 2016; Jones *et al.*, 2017; Kayal *et al.*, 2017), which also includes declaration of origin, quality, production methods, use of ingredients in local foods. For this reason, the gender aspect has been considered in this study as well.

The data have been acquired using a personal questionnaire survey (F2F – PAPI) in the Czech Republic in the period between November 2015

and February 2016. The respondents were selected based on their active participation in purchasing food, purchasing local food products and age between 20 and 50. No other socio-economic characteristics have been considered. The research primarily focuses on the influence of the purchasing frequency on consumer behaviour in the field of local food. As Hye-Jung Park *et al.* (2008) state, purchasing frequency is the most influential factor in shopping, followed by conformity, age, consumer ethnocentrism, social recognition, and pocket money, respectively. In total, 269 respondents have been evaluated according to their gender and purchasing frequency. The variable gender is the main factor in the observation since women are more willing to pay a higher price for local food (Darby *et al.*, 2006). Appearance and information on the packaging, qualitative parameters (visually declared), anticipated health benefits and declared nutritional values have been the focus of the research.

Two random variables X and Y with two values only: 0 and 1 have been considered. When these are considered, tables 2x2 were obtained, including frequencies *a*, *b*, *c*, *d* with one degree of freedom, and then a simplified formula was used to calculate the chi-square statistic:

$$\chi^2 = \frac{n(ad-bc)^2}{(a+b) \cdot (a+c) \cdot (b+d) \cdot (c+d)} \quad (1)$$

The table must be sufficiently occupied in order for the chi-square test to be valid. Therefore, the following two criteria are considered:  $a + b \approx c + d > 5$  or  $a + b > 5$ ,  $c + d > (a + c)/3$ . Provided the occupancy of the table cells is lower, Fisher's test is used instead of the chi-square test (Hendl, 2012). The Phi-coefficient can be used when a 2x2 contingency table can be created based on the available data. Should variables with more than two categories appear, a measure of association called Cramer's V can be used. The correlation coefficient Phi 0.1–0.29 is regarded as low to medium correlation, 0.3–0.49 is regarded as medium to strong, 0.5–0.69 as strong to very strong, and 0.7–0.99 very strong to perfect for categorical

variables (Mareš *et al.*, 2015). A sign scheme was calculated for the correlations in which some intensity of correlation has been verified, where the symbol "o" represents no difference between the measured count and the expected count, "+" the measured count is higher than the expected count of measurement, "-" the measured count is lower than the expected count of measurement, one sign at the 95% significance level, two signs at 99% and three at the 99.9% level of significance.

Correspondence analysis is an exploratory technique used to illustrate relations in a two-dimensional contingency table of frequencies in a way that suitably derives two dimensions that represent row and column table categories. Its use thus enables explanation of the chi-square value, and the independence test statistic in the contingency table. A correspondence map illustrates and helps to interpret the relations and variability in the correspondence table (Hair *et al.*, 2010; Hendl, 2012).

The technique is used prevalently within the ambit of explorative-descriptive analyses (DiFranco, 2015).

Detection of dependence was processed using IBM SPSS Statistics 24. The MCA ordination results and the corresponding relationships were generated and then interpreted along with the two dimensional biplot diagram. A biplot of objects and variables can be used to visualise similarities and differences among the conceptual profiles. (Jaeger and MacFie, 2010). Correlations of variables in a biplot are related to the angles between the vectors. The distances between the points correspond to the similarities between the profiles of observations. These correlations between variables are detected by the angle of their vectors, and the similarity of the observations profiles is depicted by the closeness of their points (Williams, 1998).

## RESULTS AND DISCUSSION

The survey has been conducted on 269 respondents from the Czech Republic aged between 20 and 50 who stated that they purchased

I: Frequency – combination of gender and purchasing frequency

	Frequency	Percentage	Cumulative Percentage
man-fortnightly or less	2	0.7	0.7
man-once a week	18	6.7	7.4
man-several times a week	69	25.7	33.1
man-daily	31	11.5	44.6
woman-fortnightly or less frequently	3	1.1	45.7
woman-once a week	21	7.8	53.5
woman-several times a week	91	33.8	87.4
woman-daily	34	12.6	100.0
<b>Total</b>	<b>269</b>	<b>100.0</b>	

Source: own research (2016)

local food, 149 women and 120 men. Secondary education (39%) and higher education (22%) predominated. The average age of respondents is 38. 63% of the respondents are from Prague and the Central Bohemian Region and 37% from other regions. Since the questions were interconnected and some of them were only complementary or explanatory, the following text contains interpretation of the most important responses as well as information related to the research questions.

Tab. I illustrates the distribution of the respondents according to their gender and purchasing frequency. Consumers purchasing several times a week (that is 2–3× a week) occur most frequently and, by contrast, those purchasing once a week or fortnightly and less frequently are represented marginally. Women purchasing once a week represent the median category based on cumulative frequency (53.5%).

In addition, the following relations between variables have been tested which can demonstrate the differences between purchasing behaviour and preferences of men and women who purchase local foods. Appearance and primary information on the packaging are some of the monitored aspects in purchasing. The packaging attracts attention and is an important instrument for marketing. Foret (2006) states that although no dependence between the customer's income and influence of packaging has been confirmed in his research, some impact of the packaging on the selection of food has been mentioned by 55% of the respondents. Information on the packaging is defined (and restricted) mainly by Act about foodstuffs no. 110/1997 Coll., on the amendment and supplementation of some related acts.

On the other hand, according to the study for the EU (Ipsos – London Economics EAHC, 2013) the Czech Republic together with France, Portugal and Italy occupies the third place of ranking according to the number of labelling schemes (following Spain and Germany). This might be an advantage for consumers' interest in particular information although, on the contrary, this might cause consumers' lack of interest in this information

if it is not fully understood. It might be anticipated that consumers of local food are aware of these schemes and the need for information as well as the attractiveness of the packaging will be the aspects which is important for purchasing food and can be used by marketing. The input data were thus transferred to the crosstab in Tab. II.

The results indicate that appearance and information on the packaging are less important aspects to this group of respondents. Concurrently, higher proportion of men (82.5%) does not consider the appearance of packaging and information stated on the product important. On the contrary, women (69.1%) consider this aspect more important. The results are also confirmed by the sign scheme which indicates that there is a higher frequency than expected with men who disregard appearance, and regarding information on the packaging with women who consider appearance and information on the packaging.

According to the chi-square test at the significance level 5% it has been ascertained that there is a statistically significant correlation between gender and appearance and information on the packaging ( $p\text{-value} = 0.012$ ). The coefficient of association Phi 0.154 represents low to medium degree of dependence.

Regarding women who purchase local food products, the aspects of appearance and information on the packaging are partially exploitable by marketing. The question is which group of female respondents consider this information important.

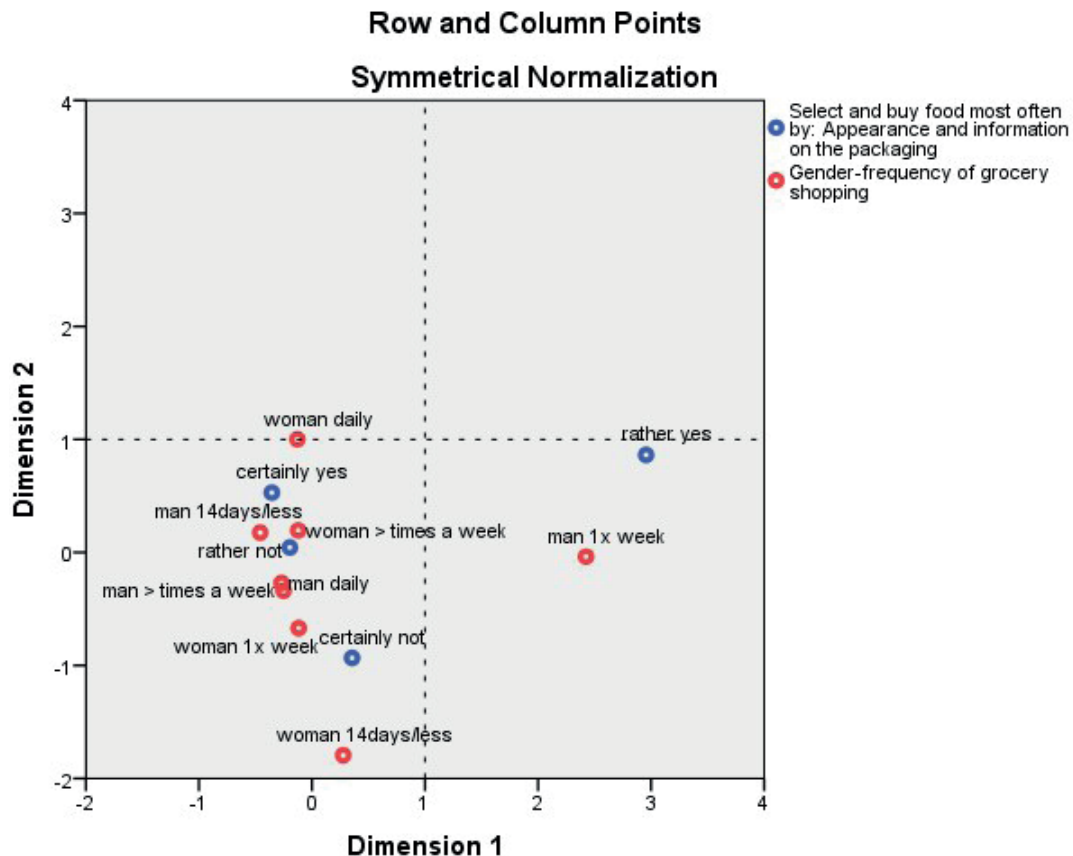
Subsequently, the relationship between gender, purchasing frequency and the aspects of appearance and information on the packaging are illustrated using correspondence analysis in the two dimensional biplot diagram (see Fig. 1).

This statement implies that appearance and information on the packaging is important predominantly to women who make their purchases daily, however, it is completely unimportant to women who make their purchase once a week. Women who make their purchase several times a week consider this aspects as rather unimportant.

II: Crosstab for gender and appearance and information on the packaging

			Appearance and information on the packaging		Total
			no	yes	
Count	Gender	man	99	21	120
		woman	103	46	149
	Total		202	67	269
% within Gender	Gender	man	82.5%	17.5%	100.0%
		woman	69.1%	30.9%	100.0%
	Total		75.1%	24.9%	100.0%
Sign Scheme	Gender	man	+	-	
		woman	-	+	

Source: own research (2016)



1: Two dimensional biplot for the relationship of appearance and information on the packaging vis-à-vis gender and food purchasing frequency combination group.  
Sources: own research (2016)

Nevertheless, some hesitation is evident here which might create potential space for marketing activities.

Quality is a major criterion and the most important parameter to consumers in food retailing according to research by Xiaojun (2012). Qualitative parameters which are clearly declared on the product are additional aspects which might be perceived by the consumer. This does not concern flavour, smell or colouring, but attributes declared in writing (for instance, the content of meat in meat products, the content of proteins, the content of

cocoa mass, absence of additives and other aspects). The quality might also be represented by a logo which guarantees its standard (for example, organic food, Klasa, regional food).

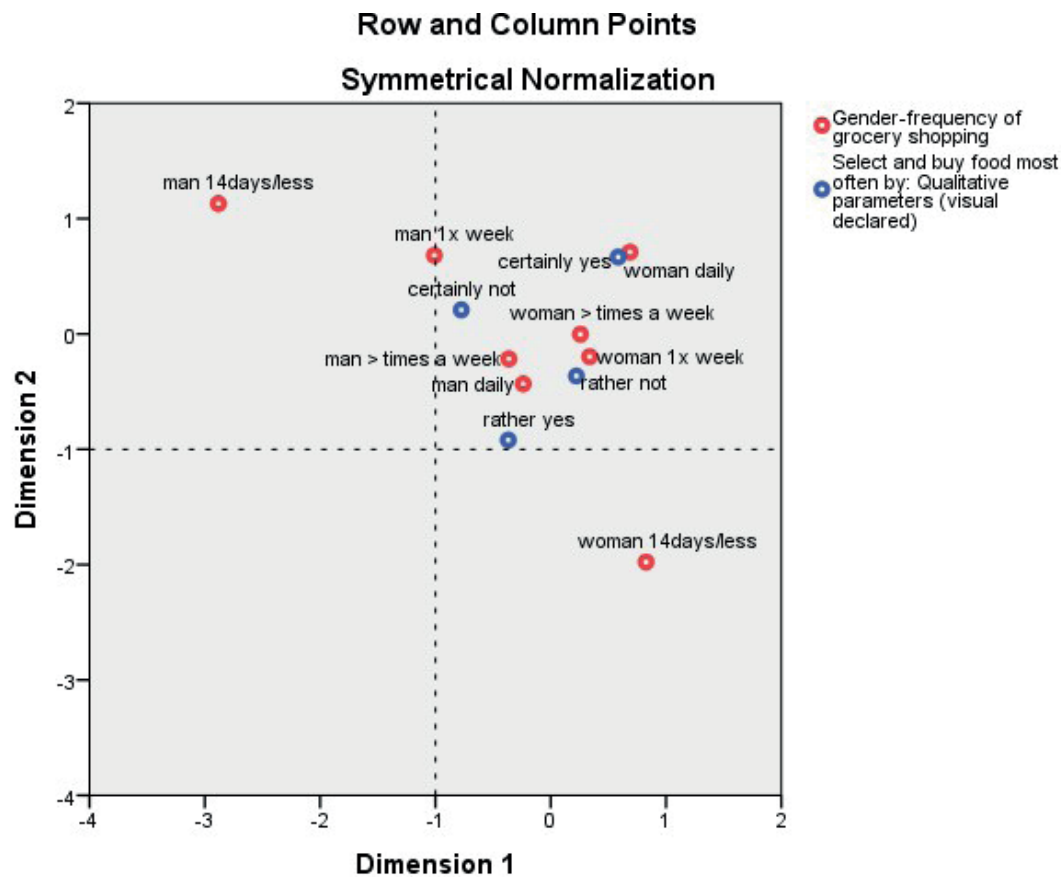
It might thus be assumed that these parameters are important to consumers of local food products when they are selecting them. The Tab. III again illustrates distribution of men and women with regard to importance of these qualitative parameters to them.

III: Crosstab for gender and qualitative parameters

			Appearance and information on the packaging		Total
			no	yes	
Count	Gender	man	101	19	120
		woman	108	41	149
	Total		209	60	269
% within Gender	Gender	man	84.2%	15.8%	100.0%
		woman	72.5%	27.5%	100.0%
	Total		77.7%	22.3%	100.0%
Sign Scheme	Gender	man	+	-	
		woman	-	+	

Source: own research (2016)





2: Two dimensional biplot for the relationship of visually declared qualitative parameters vis-à-vis gender and food purchasing frequency combination group  
Source: own research (2016)

It is rather surprising that the majority of the respondents stated that visually declared qualitative parameters are not important to them. Again, qualitative parameters are regarded as unimportant by men (84.2%) than women (72.5%). The sign scheme suggests that the measured frequency is higher than expected with men who disregard qualitative parameters and with women who consider qualitative parameters. This corresponds with the findings that men tend to be less interested in nutritional values and healthy nutrition (Shupp *et al.*, 2001).

According to the chi-square test at the importance level of 5% it has been ascertained that there is a statistically significant difference between gender and visually declared qualitative parameters ( $p$ -value = 0.022). The coefficient of association Phi is 0.140. This represents low to medium degree of dependence.

Subsequently, the relationship between gender, purchasing frequency and visually declared qualitative parameters is illustrated using correspondence analysis in a two-dimensional biplot (see Fig. 2).

Qualitative parameters are definitely important to women who make their purchase daily and rather important to men who make their purchase

daily. Women's and men's purchasing frequency once a week or several times a week deviates to the statement "rather not" and "certainly not". Consumers who make their purchase every fortnight remain completely differentiated. Purchasing frequency "daily" might suggest consumers (women) who prefer freshness, which is one of the qualitative attributes and for this reason they might be interested in monitoring other qualitative parameters.

Further investigation was conducted at the level of a gender relationship and the anticipated health benefits which has demonstrated similar findings at a percentage level, although without any further important connections. 68.4% of the respondents in total have stated that they do not monitor the aspects when making their purchase, or that they do not attribute greater importance to them. According to the chi-square test at the significance level of 5% it has been ascertained that there is no statistically significant relationship between gender and anticipated health benefits ( $p$ -value = 0.613).

Based on the results of correspondence analysis, anticipated health benefits are monitored mainly by women who make a purchase several times a week and partially by women who make their purchase daily. Men purchasing once or several times a week

IV: Crosstab for gender and declared nutritional value

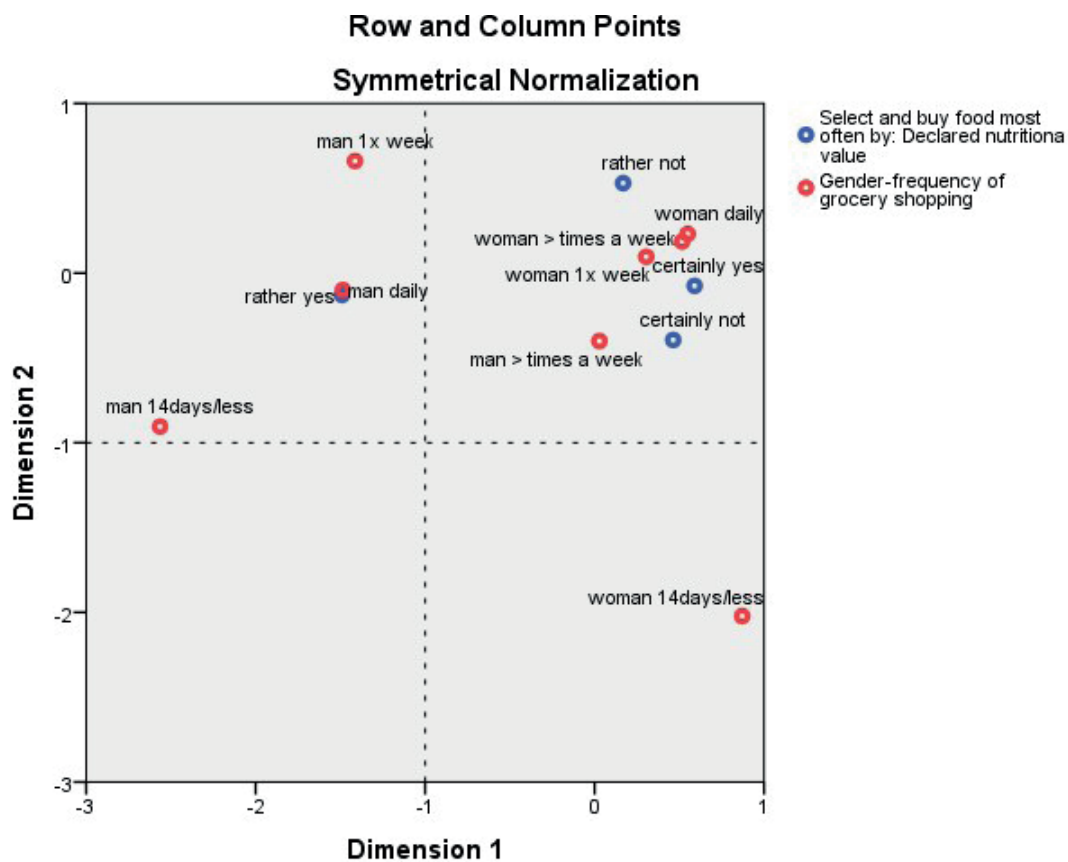
			Appearance and information on the packaging		Total
			no	yes	
Count	Gender	man	60	60	120
		woman	111	38	149
	Total		171	98	269
% within Gender	Gender	man	50.0%	50.0%	100.0%
		woman	74.5%	25.5%	100.0%
	Total		63.6%	36.4%	100.0%
Sign Scheme	Gender	man	--	++	
		woman	+++	--	

Source: own research (2016)

consider this information important only partially. In contrast, men who make their purchase daily or every fortnight consider this aspect completely uninteresting. From a marketing viewpoint, this aspect could appeal to consumers who are interested in healthy lifestyle and who adjust their purchases accordingly. Local food products can, under some circumstances, show characteristics of “foods beneficial to health”, nevertheless, consumers of local food do not monitor this attribute primarily.

Declared nutritional value is specific information on the packaging which becomes involved in anticipated health aspects of purchased food. Based on the previous results, disinterest was anticipated from consumers in this parameter. Greater disinterest from men (50% in real) was anticipated than from women (25.5% in real). The findings have been processed to create a crosstab (see Tab. IV).

The results suggest that predominantly men are interested in declared nutritional values. 50% of male respondents consider this aspect important



3: Two dimensional biplot for the relationship of visually declared nutritional values vis-à-vis gender and food purchasing frequency combination group

Source: own research (2016)

when they are selecting food. On the contrary, 74.5% of women stated that they are not interested in this aspect or that it is not important when making a decision about purchasing food. The sign scheme implies that the measured frequency is higher than expected with men who consider declared nutritional values and with women who disregard them. This contradicts the findings of a number of authors (for example Nayga *et al.*, 1998, Kim *et al.*, 2001, Annunziata, 2016) who state that considering individual characteristics, several works converge on the conclusion that women are generally more interested in nutritional and health information than men.

According to the chi-square test at the significance level 5% it has been ascertained that there is a statistically significant relationship between gender and declared nutritional values ( $p$ -value = 0.000). The coefficient of association Phi shows negative correlation ( $\Phi = -0.253$ ). The degree of dependence is low to medium.

Processing data using correspondence analysis (see Fig. 3) leads to the findings that declared nutritional values are rather important to men who make their purchase daily and probably for men making their purchase fortnightly and to men who make their purchase once a week. By contrast, men who make their purchase several times a week have marked this aspects definitely unimportant.

The final investigated aspect was current promotions (leaflets, advertising spots). 80.8% out of the total number of men stated that this aspect is unimportant when they make their purchase, this was equally stated by 75.2% of women. According to the chi-square test at the significance level of 5% it has been ascertained that there is no statistically significant relationship between gender and current promotions (leaflets, advertising spots) ( $p$ -value=0.267). Correspondence analysis has not confirmed any interesting correlation between

gender, purchasing frequencies and the given aspects. Had the respondents' experience with the product and their recommendations on it been included in the aspects, then based on the conducted correspondence analysis this aspects would be important predominantly for women who make their purchase several times a week, and women making their purchase daily and men making their purchase once a week. However, the relationship is not statistically significant.

In a number of cases, the conducted survey demonstrates different consumer behaviour of men and women when purchasing local/regional foods with regard to purchasing frequency. This aspect appears to be constant in time (see Darby *et al.*, 2006).

Women who make their purchase daily should thus be the target group for marketing activities connected with these products. Purchasing frequency might demonstrate that they represent predominant food shoppers. This aspect has also been highlighted by Zepeda and Li (2006).

The qualitative aspect tends to be perceived by the consumer through information on the packaging. This might be declared by stating the origin, by brand, logo, composition or nutritional values. It has been ascertained again that in the Czech Republic it is women who make their purchase daily that react well to the quality. This is in contrast to, for example, Slovakia. According to Horská *et al.* (2011), the symbol of quality reaches rather low perception values by the Slovaks. A significant number of consumers do not recognize the food name with the symbol on the packaging. On the other hand, packaging with the quality symbol influences Polish consumers very positively. Also, Hempel and Hamm (2016) say, that quality aspect "local" complements "organic" in purchase decisions of organic-minded consumers in Germany.

## CONCLUSION

Consumer behaviour is differentiated in a number of aspects depending on the type of the product, external and internal environment, income, education, gender, and other elements. This paper investigates aspects which a particular group of consumers considers important when purchasing local food products, namely differences in preferences between men and women with respect to frequency of their purchases.

In total, data from 269 respondents have been processed. The results from the conducted analyses demonstrate that the majority of anticipated aspects are unimportant to the consumers. There are statistically significant differences between perception and preferences in selected aspects between genders. Similarly to the study by Bryant and Thompson (2016), in which gender identification of social signals conveyed through pictures and logos have been ascertained, there is weak to medium dependence between the following aspects: appearance and information on the packaging, visually declared qualitative parameters and declared nutritional values. Women seem to be more sensitive to the first two aspects than men. What might be interesting from a marketing viewpoint is monitoring purchasing frequency and behaviour of the respondents of different gender. In a number of cases, men and women have identical preferences when the purchasing frequency is the same. This concerns for example "appearance and information on the packaging", which appears equally uninteresting to men and women who make their purchase several times a week, or "qualitative parameters" which are important for both women and men who make their purchase daily. The information about the preferences of customers purchasing local foods is important for marketing activities. The range



of aspects which the consumer can focus on when making a purchase is broad and these aspects will be the subject of further research.

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