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A Modified Model of the Willingness to Pay for Functional Foods

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Abstract: The aim of this research was to develop a modified version of the Munene model summarizing the factors influencing willingness to pay for functional foods, adjusted to the Hungarian population. The questionnaire survey was conducted in 2014 in Hungary on a sample of 500 individuals, representative for gender, age, settlement type and region. Building blocks of the Munene model were examined and tested with a Latent Variable Path Analysis with the Partial Least Squares (LVPLS) model. According to the results, the strongest relationship in the modified model was identified between attitudes towards, and beliefs about, the attributes of functional foods, i.e. the more consumers believe in the health protecting effect of functional foods, the more positive their attitudes towards those foods, and the more they are willing to pay a premium for them. The highest explanatory power in the model was attributed to the attitudes towards functional foods, followed by beliefs about the attributes of functional foods, and then by consumer demographics. The modification of the original Munene model based on a Hungarian sample contributes to an examination of its usability and provides an example of how it can fit to another culture. Moreover, a comprehensive model including factors influencing WTP has not yet been developed among Hungarian consumers.

Keywords: functional food, willingness to pay, WTP, consumer attitude

Declarations of interest: none.

1. Introduction

In todays' fast-moving world it is difficult to meet the requirements of various lifestyle factors – including the requirements of a balanced diet – which affect the preservation of excellent health (Antal, 2007). It is not a coincidence that in the last few decades chronic diseases have spread en mass in developed countries, and increasingly in less developed countries, too. Civilisation illnesses include overweight and obesity which cause further chronic diseases (cardiovascular diseases, various cancers, depression, and type 2 diabetes and its complications) (Dixon, 2010), as well as the increasingly common osteoporosis (IOF, 2018). In the development of these diseases – besides other factors – an unbalanced diet plays a significant role, partly through weight increase (Biró, 2008; Raynor and Champagne, 2016).

In recent times, however, a value change can be observed: instead of consuming excessive quantities, consumers are increasingly looking for the benefits of quality (Törőcsik, 2007). One of the manifestations of the new value orientation is the positive change in health behaviour (Szakály *et al.*, 2014). This new trend poses new challenges to the food industry: companies have to develop and launch foods that – through their health protecting effect – prevent and slow down the spread of civilisation illnesses. Collectively, these foods are called functional foods (Szakály, 2009).

Functional foods have no widely accepted definition (Krystallis *et al.*, 2008); indeed, the number of definitions recommended by national authorities and scientific organisations exceeds one hundred (Jasák, 2015). Based on the various concepts, however, it can be stated that the foods which are included in this category are perceived by consumers to provide a beneficial effect on health (Urala and Lähteenmäki, 2003), contain ingredients enriched or fortified by technological processes, and from which allergens and harmful components have been removed (Roberfroid, 2002). They also have a nutritional function, i.e. they are an integrated part of usual nutrition behaviour, and not delivered through a tablet or capsule; furthermore, they are foods which have an effect on health when consumed in normal quantities (Ashwell, 2002; Diplock *et al.*, 1999; Doyon and Labrecque, 2008).

The development and production of functional foods, however, is a risky process (Maynard and Franklin, 2003; van Kleef *et al.*, 2002), since consumers are slow to adopt technological innovations such as functional foods (a phenomenon called neophobia, see e.g. Barrena and Sánchez, 2013; La Barbera *et al.*, 2016; Labrecque *et al.*, 2006) and they are often sceptical about the health effects (Hollingsworth, 2001). Besides this, in EU countries there is a general dislike of food products that have been engineered to yield health benefits (Siró *et al.*, 2008). Accordingly, it is vital for firms seeking to market these foods that they know their potential consumers' willingness to pay (WTP), and, if they are willing to pay, who is willing to do so and how much will they spend.

1.1. Theoretical Background

Several research studies have already examined WTP for functional foods (e.g. Asselin, 2005; Barreiro-Hurlé *et al.*, 2008; Bitzios *et al.*, 2011; Bower *et al.*, 2003; Di Pasquale *et al.*, 2011; Dolgopolova and Teuber, 2016; Dolgopolova and Teuber, 2017; Hellyer *et al.*, 2012; Hu *et al.*, 2011; Lawless *et al.*, 2012; Markosyan *et al.*, 2007; Markosyan *et al.*, 2009; Maynard and Franklin, 2003; Munene, 2006; Øvrum *et al.*, 2012; Teratanavat and Hooker, 2006); however, most of them ignore the fact that WTP can be influenced by attitudes towards these foods, too. An exception is Munene (2006), who developed a conceptual model showing the factors affecting consumers' WTP for functional foods (Figure 1) by extending Moon and

Balasubramanian's (2004) and Ajzen and Fishbein's (1980) multi-attribute and mediation models.

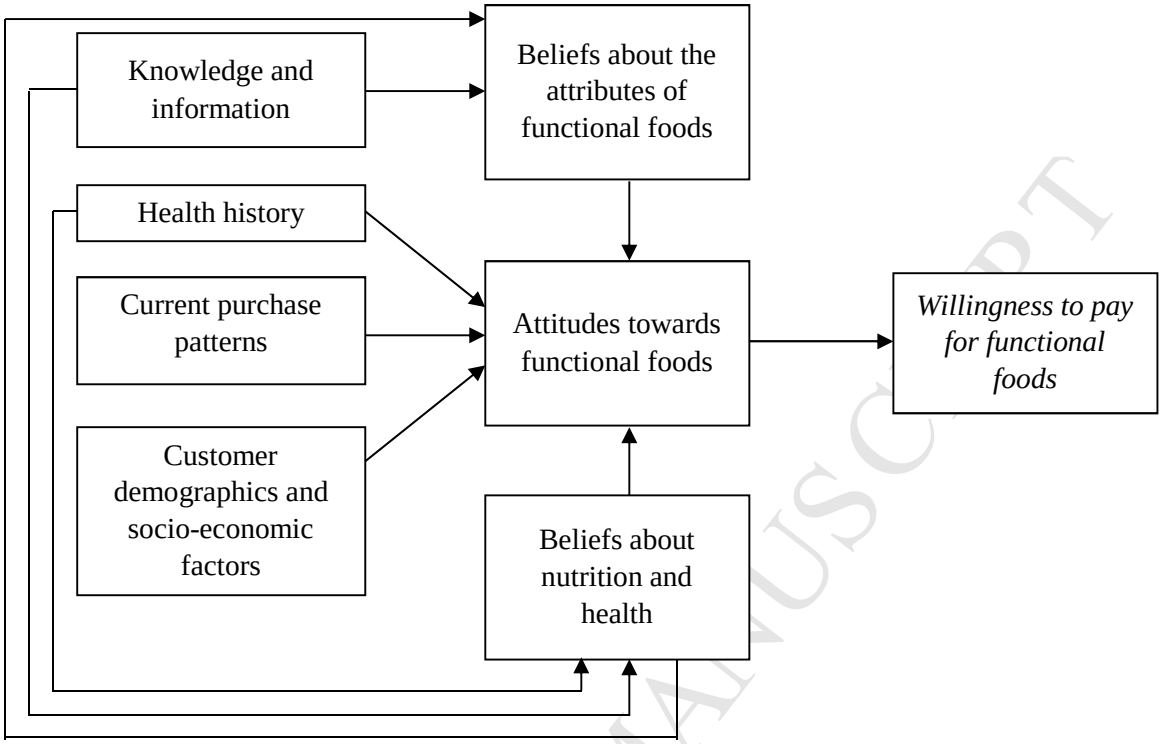


Figure 1. Model of factors affecting willingness to pay (WTP) for functional foods
Source: Munene, 2006

According to the model, WTP for functional foods is influenced by attitudes towards them, and, based on Markosyan *et al.* (2007), it can be assumed that the direction of the relationship is positive. Attitudes towards functional foods are influenced, first of all, by consumers' beliefs about the attributes of functional foods (Pappalardo and Lusk, 2016). According to Louviere *et al.* (2000), consumers rank products based on these beliefs, and then choose among them depending on other influencing factors. For example, if a consumer associates functional foods with high prices, then this association affects his or her attitudes towards the product (in either a positive or a negative direction, depending on whether he or she perceives the price to be too high, or the product to be of better quality or more reliable because of the higher price). Similarly, if a consumer sees functional foods as medicines (even though they are not), this can also influence his or her attitudes towards them in a positive or a negative direction. A study by Unnevehr *et al.* (1999) provides a good example of this; elderly subjects showed a higher demand for functional foods than students, who believed themselves inherently healthier, and thus did not feel the need for those products. According to several researchers, the most important factor in functional food purchase decisions is the belief in the products' health benefits (Cox and Bastiaans, 2007; Urala and Lähteenmäki, 2004; Verbeke, 2005), or at least these beliefs positively influence purchase decisions (Labrecque *et al.*, 2006).

Attitudes towards functional foods are also affected by beliefs about the relationship between nutrition and health. It can be assumed that consumers with strong beliefs about the relationship between nutrition and health have positive attitudes towards functional foods (Ares *et al.*, 2008), with stronger purchase intentions (Hung *et al.*, 2016; Jeżewska-Zychowicz and Królak, 2015), and willingness to pay for them (Munene, 2006).

Beliefs are formed during the individual's life through direct observation or by accepting external information sources indirectly (Ajzen and Fishbein, 1980). Because of this, subjective knowledge and information about functional foods – beside the direct influence (Ong *et al.*, 2014) – affect attitudes towards functional foods indirectly through beliefs about the attributes of functional foods and about the relationship between nutrition and health. If the consumer believes he or she is aware of the real attributes of functional foods and the relationship between nutrition and health, he or she will more be likely purchase them (Munene, 2006) and will have a higher WTP, as confirmed by the research of Di Pasquale *et al.* (2011) and Bower *et al.* (2003). It has to be noted, however, that Hu *et al.* (2011) found a significant relationship between subjective knowledge and WTP only in the case of two examined products out of three.

The effects of consumer socio-demographic characteristics on WTP have already been examined by several research studies; their conclusions, however, are not the same, as is indicated by Table 1. Some of the previous studies found no significant relationship between demographic characteristics and WTP (e.g. Asselin, 2005; Lawless *et al.*, 2012; Markosyan *et al.*, 2009); others found that some demographic characteristics predict WTP significantly, while some of them do not (e.g. Barreiro-Hurlé *et al.*, 2008; Di Pasquale *et al.*, 2011; Hellyer *et al.*, 2012; Hu *et al.*, 2011; Markosyan *et al.*, 2007); and still others found that all of the examined demographic variables significantly influenced WTP (e.g. Gajdoš Kljusuric et al., 2015; Maynard and Franklin, 2003; Nordström, 2012; Øvrum et al., 2012; Teratanavat and Hooker, 2006). The situation is further complicated by the fact that in many cases the presence and direction of the relationship are different for different product types (e.g. Di Pasquale *et al.*, 2011; Hu *et al.*, 2011). We can conclude, however, that if a relationship exists, in most of the cases income and education affect WTP positively, while age affects it negatively, and women are more willing to pay a higher price for functional foods (Dolgopolova and Teuber, 2016). It is worth noting, however, that attitudinal variables have a far greater power than the more conventional socio-economic variables (Bitzios *et al.*, 2011; Lähteenmäki, 2013; Urala, 2005).

Table 1. Relationships between consumer socio-demographic characteristics and WTP for functional foods in the literature

	age	**gender**	**income**	**education**	**presence of children in the family**	**household size**	**employment status**	**number of children in the family**	**marital status**
Asselin (2005)	no	no						no	
Barreiro-Hurlé et al. (2008)	no	no	no	yes(+)					
Bower et al. (2003)	yes(+)	yes							
Di Pasquale et al. (2011)	yes(-/+)		yes(-/+)/no						
Gajdoš Kljusuric et al. (2015)	yes(-)	yes	yes(+)	yes(+)					
Hellyer et al. (2012)	yes(-)	no							
Hu et al. (2011)	yes(-)/no	no	yes(+)/no	yes(+)/no	yes(-)/no	yes(+)/no	no		no
Lawless et al. (2012)	no	no	no						

Markosyan et al. (2007)	no	no	no	yes(+)			
Markosyan et al. (2009)	no	no	no	no	no	no	no
Maynard and Franklin (2003)					yes(+)		
Nordström (2012)	yes(-)	yes					
Øvrum et al. (2012)	yes(+)	yes	yes(+)	yes(-)			
Teratanavat and Hooker (2006)	yes(-)	yes	yes(+)	yes(+)			

Notes: +: positive relationship; -: negative relationship; -/+: mixed results.

The attitudes towards functional foods, and eventually the WTP itself, are influenced by the consumer's health history (e.g. awareness of deaths due to chronic diseases in the family, usage of regular medical examinations, acceptance of medical advice, and level of physical activity) directly or indirectly through their beliefs about the relationship between nutrition and health. Individuals who themselves or whose close relatives are affected by a chronic disease do not only show more positive attitudes towards functional foods, but are more willing to acknowledge the relationship between nutrition and health (Munene, 2006), to accept functional foods (Annunziata and Vecchio, 2011; Siró *et al.*, 2008; Verbeke, 2005) and eventually to pay a higher price for them (Asselin, 2005; Bower *et al.*, 2003), as Di Pasquale *et al.* (2011) revealed in the case of yoghurts.

Current consumption habits also affect WTP, directly or indirectly through attitudes. For example, consumers who purchase organic foods might show negative attitudes towards artificially fortified or enriched products, hence they are not willing to pay a higher price for functional foods (Munene, 2006). According to the results of Teratanavat and Hooker (2006), we can assume that consumers who purchase functional foods occasionally or frequently are willing to pay a higher price for such products.

Obviously, the previously mentioned findings are not equally true for every functional food. Several research studies have already showed that the attitude towards, the WTP for and the willingness to buy functional foods, as well as the factors influencing them largely depend on the type of the carrier product (Ares and Gámbaro, 2007; Bech-Larsen and Grunert, 2003; Di Pasquale *et al.*, 2011; Hailu *et al.*, 2009; Poulsen, 1999; Siró *et al.*, 2008; Urala and Lähteenmäki, 2007).

Although WTP for functional foods in Hungary has already been examined by a few studies (among others KE, 2010; Németh-T. *et al.*, 2014; Sebesy, 2014; Szakály, 2009), a comprehensive model which attempts to summarize the influencing factors has not yet been developed. Therefore the aim of the current research is to test the original Munene model on a Hungarian sample and develop its modified version accordingly.

2. Materials and Methods

2.1. Sampling Method

The questionnaire survey was conducted personally by trained interviewers between 15 July and 15 August 2014 and involved 500 consumers in Hungary. The time allowed for the questionnaire was 15 minutes each. In the sampling process representativeness was ensured for regions and settlement types, so their structure perfectly matched the quota set in advance by the Hungarian National Statistical Office (quota sampling). In each region and selected

settlement a stratified random sampling was used and the strata variable was the birthday date. Hence, from among the residents of the households visited those participants were selected for the interview whose birthday was the closest to the date of the survey. With this method randomness was ensured only in each strata. Furthermore, there is still bias as the participants had to agree to participate. The range of the sample's random error was estimated by the relative standard error of the sample mean for each question; i.e. the sample standard error divided by the sample mean. This error was between 0.8% and 2.5%. In order to estimate the bias effect we performed a bootstrap resampling for each question and determined the bias of the mean. In each case the bias was under 0.05 and the number of bootstrap samples was 1,000. The sample reflects the population composition according to four factors: gender ($Chi^2(2,2)=0.02$; $p=0.887$), age ($Chi^2(5,2)=0.44$; $p=0.979$), settlement type ($Chi^2(3,2)=2.55$; $p=0.280$), and region ($Chi^2(7,2)=1.01$; $p=0.985$). Table 2 shows the percentage distribution of socio-demographic groups of individuals involved in the survey and the population composition according to the previously mentioned four factors.

Table 2. Distribution of the sample according to the most important background variables (N=500) and population composition according to representative variables

Label	Sample distribution		Population distribution[a]
	Count	%	%
Male	237	47.4	48.9
Female	263	52.6	51.1
18-29 years	115	23.0	21.2
30-39 years	98	19.6	22.1
40-49 years	94	18.8	19.8
50-59 years	108	21.6	19.4
60-69 years	85	17.0	17.6
Budapest	90	18.0	17.7
Other town	278	55.6	52.7
Village	132	26.4	29.6
Western Transdanubia	50	10.0	10.0
Central Transdanubia	58	11.6	10.8
Southern Transdanubia	47	9.4	9.3
Northern Great Plain	72	14.4	15.0
Central Hungary	143	28.6	30.0
Northern Hungary	62	12.4	11.9
Southern Great Plain	68	13.6	13.0
Primary school	53	10.6	
Vocational school	157	31.4	
High school	200	40.0	
Higher education	90	18.0	
Active physical worker	205	41.0	
Active intellectual worker	120	24.0	
On maternity leave	11	2.2	
Retired	91	18.2	
Pupil	37	7.4	
Housewife	7	1.4	
Unemployed	21	4.2	
Other inactive earner	6	1.2	

Other dependant	2	0.4
Primary purchaser	303	60.6
Not primary purchaser	197	39.4
Can live on it very well and can also save	24	4.8
Can live on it but can save little	137	27.4
Just enough to live on but cannot save	248	49.6
Sometimes cannot make ends meet	66	13.2
Have regular financial problems	17	3.4
Not known / No answer	8	1.6

Note: [a] Source of data: Hungarian Central Statistical Office (2018a; 2018b).

2.2. Structure of the Questionnaire

The question blocks of the questionnaire followed the structure of the Munene (2006) model and the majority of questions originate from this research (namely question blocks about consumer knowledge and information, beliefs about nutrition and health, beliefs about the attributes of functional foods, and attitudes towards functional foods); in some cases, however, they were modified according to the local conditions. The following seven question blocks were examined: subjective consumer knowledge and information (5 items on a 5 point Likert scale from Munene, 2006, and 15 items on a 7 point Likert scale about the putative healthiness of 15 functional foods from Szakály, 2011); beliefs about nutrition and health (5 items on a 5 point Likert scale from Munene, 2006); health history of the respondent (10 dichotomous items about being personally concerned by 10 types of diseases from Munene, 2006, and Szakály 2011); current purchase patterns (15 items on a 7 point Likert scale measuring the purchase frequency of 15 functional foods from Szakály *et al.*, 2012); beliefs about the attributes of functional foods (5 items on a 5 point Likert scale from Munene, 2006); attitudes towards functional foods (5 items on a 5 point Likert scale from Munene, 2006); and WTP.

Before assessing WTP, respondents were provided with the following definition of functional foods: "A food can be regarded as 'functional' if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of the risk of disease. Functional foods must remain foods and they must demonstrate their effects in amounts that can normally be expected to be consumed in the diet: they are not pills or capsules, but part of a normal food pattern." (Diplock *et al.*, 1999, p. S6).

Following the methodology of Szakály (2009), WTP was measured by a hypothetical buying situation (contingent valuation), in which respondents had to choose among seven marginal WTPs starting at a price of 100 HUF and decreasing by 15 HUF. The product was a probiotic (functional) yoghurt, whose virtual package contained a health statement, and respondents were informed about the price of a tub (150 g) of normal yoghurt (95 HUF). Yoghurt was chosen for the survey because consumers perceive yoghurt as inherently healthy (Ares and Gámbaro, 2007; Poulsen, 1999; Bech-Larsen and Grunert, 2003) and therefore as a credible carrier of functional messages (Kraus, 2015; Lu, 2015; Siró *et al.*, 2008), resulting in a high level of acceptance of the product as a functional food (Kraus, 2015; van Kleef *et al.*, 2005; van Trijp and van der Lans, 2007). Moreover, a number of diary-based probiotic products are marketed in Hungary so respondents could be assumed to be familiar with these products – again causing a higher level of consumer acceptance (Bech-Larsen and Grunert, 2003; Urala and Lähteenmäki, 2007) – thereby lessening the potential bias associated with a hypothetical product set (Hailu *et al.*, 2009).

Socio-demographic background variables such as gender, age, education, primary food purchaser, economic activity, and subjective income were placed at the end of the questionnaire as the eighth variable group.

2.3. Mathematical and Statistical Evaluation

In order to estimate the casual relations between the question blocks of the model, Latent Variable Path Analysis with Partial Least Squares (LVPLS) with a reflective method for index construction (Diamantopoulos, 1999) was applied, using R 3.0.3 software. The sample contained 500 valid observations, which is more than sufficient for this type of analysis. The composite reliability of the blocks was tested by the Dillon Goldstein's rho indices. For conceptual reasons some of the items were left out of the model, based on their relatively small (less than 0.6) factor loading in the LVPLS model (Hair *et al.*, 1995).

In the present research bootstrapping was applied for model testing and parameter estimation in which 500 samples were generated from the original data as suggested by Chin (1998). This means that path coefficients were estimated in each sample and the mean and standard error of the parameters were computed from the total number of samples. Only those path coefficients were statistically significant that were at least twice their respective standard error. Goodness-of-fit (GoF) as proposed by Amato *et al.* (2004) was used to measure the overall model fit by obtaining bootstrap resampling. The GoF of 0.10, 0.25, and 0.36 can be considered an adequate, moderate and good global fit, respectively (Wetzels *et al.*, 2009). In the course of latent variable (LV) reliability assessment, only those variables are retained which exhibit higher than 0.6 correlation with their LVs. In order to assess the discriminant validity of the model the Fornell and Larcker (1981) criterion was applied.

3. Results

Table 3 represents the key building blocks of the modified Munene model revealed by the LVPLS model. The dimensions identified have a reliability above the recommended 0.6, and all factor loadings were also greater than 0.6. All variables in Table 3 were retained in the final model as they exhibited correlations with their LVs clearly higher than 0.6.

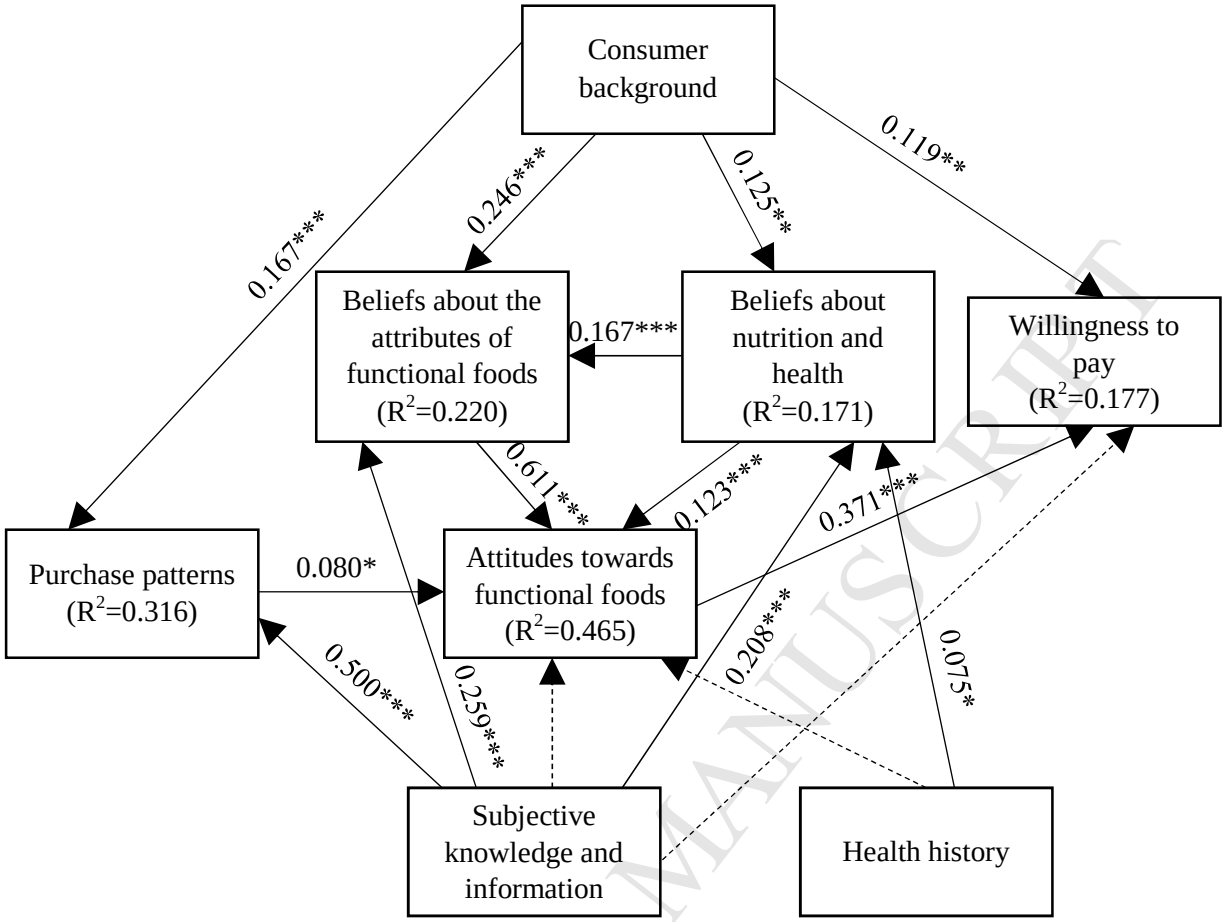
Table 3. Factor loadings and reliability of the building blocks of the modified Munene model

	Mean	**Std. dev.**	**Factor loading**	**Reliability (Cronbach's alpha)**
Willingness to pay			1.000	1.000
Health history[a]				0.916
Cancer			0.902	
Weakened immune system			0.869	
Diabetes			0.802	
Osteoporosis			0.778	
Chronic stress			0.676	
Gastrointestinal complaints			0.660	
Cardiovascular diseases			0.640	
High cholesterol			0.635	
Subjective consumer knowledge and information[b]				0.862
To what extent do you believe products enriched	4.916	1.713	0.857	

by minerals (e.g. calcium) are healthy (e.g. Kalci cheese[d])?				
To what extent do you believe products enriched by vitamins (e.g. vitamin C) are healthy (e.g. muesli)?	4.892	1.799	0.839	
To what extent do you believe probiotic products with live flora are healthy (e.g. yoghurt, kefir)?	5.364	1.531	0.766	
Beliefs about the relationship between nutrition and health[c]				0.842
Adopting better dietary habits is essential to reduce deaths from a variety of chronic diseases.	4.230	0.871	0.852	
I believe I have some control over my health.	4.010	0.974	0.779	
Diet and nutrition play a major role in my health.	4.434	0.774	0.744	
Attitudes toward functional foods[c]				0.850
Eating health-enhancing (functional) foods is beneficial for me.	3.242	1.320	0.872	
Foods enriched with health-enhancing ingredients are worth the extra cost.	2.896	1.273	0.826	
All grocery stores should carry health-enhancing (functional) food products.	3.364	1.296	0.723	
Beliefs about the attributes of functional foods[c]				0.826
I trust foods that promise to improve my health.	3.408	1.175	0.818	
Health-enhancing (functional) foods are affordable.	2.604	1.320	0.774	
Healthy foods taste as good as conventional foods.	2.706	1.491	0.753	
Purchase patterns (how often do you purchase?)[b]				0.823
Products enriched by vitamins (e.g. vitamin C) (e.g. muesli)	4.820	1.730	0.834	
Products enriched by minerals (e.g. calcium) (e.g. Kalci cheese[d])	5.026	1.706	0.775	
Probiotic products with live flora (e.g. yoghurt, kefir)	4.368	1.640	0.725	
Consumer socio-demographic background				0.721
Education			0.791	
Subjective income			0.707	

Notes: [a] Dichotomous questions, [b] 7-point Likert scale questions. [c] 5-point Likert scale questions. [d] A Hungarian brand of a calcium-enriched cheese available at the time of the survey.

Figure 2 provides a graphical representation of the parameter estimates in the modified model. For the sake of better understanding, only statistically significant ($p<0.05$) path coefficients are depicted and nonsignificant paths are indicated by dashed lines. The overall model has a good global fit as the GoF was 0.39. The Fornell and Larcker (1981) criterion provides evidence of discriminant validity as all average communality (AVE) values for the LVs are higher than the squared intervariable correlations. Moreover, AVE values are greater than 0.5, hence the model is strongly adequate.



Notes: The non-significant paths have been indicated by dashed lines. *: p<0.05; **: p<0.01; ***: p<0.001

Figure 2. Final path model and path coefficient estimates from the bootstrapping

The primary outcome variable (WTP) has an R^2 value of 0.177 (t=5.9; p<0.001). The prediction of attitudes towards functional foods is the largest, with an R^2 value of 0.465 (t=13.6; p<0.001), but purchase patterns also has a large prediction with an R^2 value of 0.316 (t=10.2; p<0.002). The total R^2 for beliefs about the attributes of functional foods is 0.220 (t=6.8; p<0.001) and for beliefs about nutrition and health is 0.171 (t=7.4; p<0.001).

WTP is strongly positively affected by consumer attitudes towards functional foods (B=0.371; p<0.001), and beside this, there is a positive relationship between the background of the consumer (education and subjective income level) and WTP (B=0.119; p=0.005). In turn, consumers' beliefs about the attributes of functional foods (B=0.611; p<0.001) and about the relationship between nutrition and health (B=0.123; p<0.001) have a strong positive relationship with attitudes towards functional foods, with beliefs about nutrition and health having a strong significant positive connection with beliefs about the attributes of functional foods (B=0.167; p<0.001). There is also a weak but significant positive relationship between consumer purchase patterns and attitudes towards functional foods (B=0.080; p=0.047).

Regarding the factors influencing the aforementioned variables with an indirect effect on WTP (purchase patterns, beliefs about the attributes of functional foods and about nutrition and health) we can conclude that both subjective consumer knowledge and consumer background (education and subjective income level) have a strong significant positive effect on purchase patterns (B=0.500; p<0.001 and B=0.167; p<0.001, respectively) and on beliefs,

both about the attributes of functional foods (B=0.259; p<0.001 and B=246; p<0.001, respectively) and about nutrition and health (B=0.208; p<0.001 and B=0125; p=0.005, respectively). Finally, there is a significant (although weak) positive relationship between the consumer's health history and beliefs about the relationship of nutrition and health (B=0.075; p=0.050).

The variable "Attitudes towards functional foods" constitutes 56% of the total explained variance in willingness to pay more for functional foods. After the variables "Beliefs about nutrition and health" and "Beliefs about attributes of functional foods" were added, the explained variance rose by 23% (3% and 20% each). Consumer background constitutes 15%, while subjective consumer knowledge and information constitutes only 5% of the total explained variance. Consumers' purchase patterns and health history have little effect on the willingness to pay for functional foods, constituting only 1% of the explained variance.

4. Discussion

According to our results, as was hypothesised, WTP is primarily strongly positively influenced by consumer attitudes towards functional foods, which implies that as an individual's attitude towards functional foods improves, he or she is willing to pay a premium for the product. This result is in line with those of Bech-Larsen and Grunert (2003), Markosyan *et al.* (2007) and Munene (2006), among others. Unlike several previous research findings (e.g. Bower *et al.*, 2003; Gajdoš Kljusuric *et al.*, 2015; Nordström, 2012; Øvrum *et al.*, 2012; Teratanavat and Hooker, 2006), among consumer background variables, only education and subjective income level played a significant role in the model. The positive relationship between the background of the consumer and WTP means that higher education and income level will increase the willingness to pay for the 3 functional foods remaining in the model (foods enriched by vitamins or minerals and probiotic products with live flora). This result is in line with the findings of Teratanavat and Hooker (2006), and partly (for the income) confirms the results of Gajdoš Kljusuric *et al.* (2015) and Øvrum *et al.* (2012), but contradicts those of Munene (2006).

We found a significant positive relationship between consumer beliefs, both about the attributes of functional foods and about nutrition and health, and attitudes towards functional foods. This means that the more consumers believe in the attributes of functional foods or in the relationship between nutrition and health, the more positive attitudes they have towards and the more WTP they show for functional foods. The first relationship contradicts the results of Munene (2006) but the other confirms the findings of both Ares *et al.* (2008) and Munene (2006). Moreover, beliefs about nutrition and health have an indirect positive effect on the attitudes towards functional foods through beliefs about the attributes of functional foods. As expected, there is also a significant positive relationship between consumer purchase patterns and attitudes towards functional foods, which means that consumers who sometimes or often purchase functional foods have more positive attitudes towards functional foods and are willing to pay a premium for those products, in line with Teratanavat and Hooker (2006).

As we assumed, subjective consumer knowledge and information has a significant positive effect on purchase patterns and on beliefs about the attributes of functional foods and about nutrition and health, confirming the results of Di Pasquale *et al.* (2011), Bower *et al.* (2003), and partly Hu *et al.* (2011). Also, in line with Munene (2006) but unlike Ong *et al.* (2014) this variable does not influence directly consumer attitudes towards, and WTP for, functional foods. The positive relationship found between the background of the consumer and the purchase patterns means that higher education and subjective income level will

increase not only the WTP for the given functional food but the frequency of buying the 3 functional foods remaining in the model. Similarly, according to our findings, higher education and subjective income level are associated with stronger beliefs, both about the attributes of functional foods and about nutrition and health. In line with our assumption based on Munene's (2006) results, there is a significant positive relationship between the consumer's health history and beliefs about the relationship between nutrition and health, which indirectly positively influences the attitudes towards, and the WTP for, functional foods. Therefore consumers who suffer from chronic illnesses such as cancer, weakened immune system, diabetes, osteoporosis, chronic stress, gastrointestinal complaints, cardiovascular diseases, and high cholesterol tend to believe that nutrition has an effect on one's health, and they are willing to pay a premium for a functional yoghurt, likely in the hope they can improve their health condition. This also confirms the results of Asselin (2005), Bower *et al.* (2003), and Di Pasquale *et al.* (2011) but contradicts those of Teratanavat and Hooker (2006) who found no relationship between WTP and family history of cancer and revealed a negative relationship between WTP and family history of heart disease.

5. Conclusions

In the modified Munene model the strongest relationship was identified between the attitudes towards functional foods and the beliefs about their attributes. This means that the more consumers believe in the health protective effect of functional foods, the more positive attitudes they have towards those foods, and the more they are willing to pay a premium for them. The assumption that subjective knowledge and information about the health protective effect of products is essential has also been confirmed; this variable group had an effect on both the purchase patterns and the beliefs about the attributes of functional foods and about the relationship between nutrition and health. More than half of the variance in WTP explained by the model was attributed to the attitudes towards functional foods, one fifth to beliefs about the attributes of functional foods and 15% to the education and income of the consumer.

The aim of this paper was to develop a modified model based on the original Munene (2006) model incorporating factors determining WTP for functional foods, adjusted to a Hungarian sample. According to the authors' knowledge this model has not yet been tested outside the USA, therefore testing and modification of the original model contributes to an examination of its usability and provides an example of its fit it to another culture. Beside this, although a few research studies have already examined Hungarian consumers' WTP for functional foods a comprehensive model explaining its influencing factors has not yet been developed.

It is worth noting, however, that WTP was only assessed on one carrier product combined with one functional message, i.e. probiotic yoghurt. Although some studies have shown that other carriers and functional messages (and especially other combinations) are not as well received (see e.g. Siró *et al.*, 2008), and thus the generalization of present findings is limited, we can assume that while there must be differences in WTPs for other product types, the usability of the model is similar to the case of probiotic yoghurt. Another limitation is the geographic coverage of the research; therefore testing the model in international settings would also be interesting.

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