Willingness-To-Pay for Functional Dairy Products and the Influence of Starting Point Bias: Empirical Evidence for Germany

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Abstract

This study employs stated preference data from a choice experiment to address two issues related to consumer demand for functional dairy products: (1) Consumers' preferences for functional dairy product attributes in Germany, and (2) are willingness-to-pay estimates obtained in the choice experiment affected by starting point bias? Based on a random parameter logit model, our results indicate that dairy products enriched with omega-3 fatty acids and bearing a health claim that is aimed at healthy blood vessels and healthy metabolism are highly valued. Furthermore, results reveal that willingness-to-pay is indeed susceptible to starting point bias. In a two-split sample approach, we find that varying the price levels displayed in the first choice set significantly affects respondents' willingness-to-pay for functional dairy products.

Keywords Functional food attributes, choice experiments, preference heterogeneity, willingness-to-pay, starting point bias

JEL code C25, D12

1. Introduction

The markets for functional foods[1] have been growing rapidly over the last two decades in the United States, Japan, and Europe (Chema et al. 2006). Estimates show that the market share of functional foods in Europe is expected to increase from less than 1% in 2000 to about 5% in 2013 (Menrad 2003). The functional food market in the United States which was valued at 16 billion U.S. $ in 2001, was projected to grow at 10-15% annually (Traurig 2003). This trend is mostly due to the fact that consumers in these countries are increasingly linking health and nutrition in their consumption and purchasing decisions.

Given the increasing significance of functional foods in dietary choices of consumers in industrialized countries, a number of studies have examined the consumers' acceptance and perceived health of functional foods (e.g., Chema et al. 2006; Peng et al. 2006; Urala and Lähteenmäki 2004). Although functional foods are increasingly gaining significance in Germany, there are only a few studies that have recently taken German consumers into account (Messina et al. 2008; Vassallo et al. 2009). However, Germany represents one of the most important countries within the functional food market in Europe with estimated value sales of 2.4 billion U.S. $ (Bech-Larsen and Scholderer 2007).

Our study therefore contributes to the literature by examining consumers' attitudes towards functional dairy products in Germany. Functional dairy products were chosen for investigation as they constitute one of the most important types of functional food. Specifically, sales for this functional product group increased from about 5 million U.S. $ in 1995 to over 419 million U.S. $ in 2000 (Menrad 2003). We use a choice experiment (CE) approach to investigate consumers' preferences and to examine whether willingness-to-pay (WTP) estimates are subject to starting point bias (SPB). SPB occurs when respondents are unsure about their true preferences for the good being valued. Consequently, they regard the

[1] Functional foods are foods fortified with ingredients capable of generating health benefits.

presented price as an approximate value of the good's real value and anchor their WTP in this value. That is, different starting points, or different price levels in the first choice set, yield different estimates, or different WTP estimates, which are biased toward the initial values (Tversky and Kahneman 1974). Many economic studies have attempted to investigate the influence of SPB in dichotomous choice contingent valuation methods (DC-CVM) (Chien, Huang, and Shaw 2005; Herriges and Shogren 1996; Veronesi, Alberini, and Cooper 2011). Results of these studies reveal that SPB significantly influences the derived WTP, and hence stated WTP estimates may vary as a function of the respondent's true preferences and the shown prices. In contrast to DC-CVMs which are known to be prone to starting point bias (SPB), it has been hypothesized that CEs are less susceptible to this bias. Both CEs and DC-CVMs are consistent with random utility theory, and hence DC-CVM can be seen as a special case of CE with only one choice set (Ladenburg and Olsen 2008). To date little work has examined the possible existence of SPB in CEs. Ladenburg and Olsen (2008) have tested whether preferences and WTP estimates are affected by SPB in CEs. They found that female respondents' preferences and WTP values are influenced by this bias, whereas male respondents' are not. However, they explored nonmarket goods. Carlsson and Martinsson (2008) examined SPB in a CE focusing on individuals' marginal WTP to reduce power outages. However, they did not find evidence for the presence of SPB.

In this study, we examine preferences for functional dairy products, which are market goods. Several levels of the characteristics of the functional dairy products used for the study are not yet on the market. It is therefore of interest to investigate consumers' behavior with regard to these hypothetical products. The present study contributes to the literature in two ways. First, a stated choice modeling approach is used to derive the economic values for functional dairy product attributes in Germany. A random parameter logit model is employed to investigate the existence of preference heterogeneity and to estimate implicit prices for the attributes. To the best of our knowledge, no previous attempt has been made to investigate the existence of unobserved heterogeneity for functional dairy product attributes among consumers in Germany. Given that the functional dairy market is growing continuously, the study was partly designed to provide a better understanding of consumers' preferences for functional dairy products and to derive some implications for the future development of these kinds of foods. Second, the results of the random parameter logit model are used to test whether WTP estimates are affected by SPB. We make a novel contribution to the examination of SPB in CEs insofar as food products are investigated which are not yet available on the market. To the author's knowledge there are only two studies that examine SPB in CEs (Ladenburg and Olsen 2008; Carlsson and Martinsson 2008). However, these studies focused on environmental goods and reduction of power outages.

The remainder of the paper is organized as follows. The next section presents the theoretical framework for CEs, while Section 3 focuses on the meaning of SPB in this technique. Section 4 describes the survey design and the procedure of SPB, followed by a presentation of the empirical results in Section 5. The final section sums up the main conclusions.

2. Theoretical Framework for Choice Experiments

The theoretical underpinnings of CEs are based on consumer theory developed by Lancaster (1966) and McFadden's random utility theory (1974). Lancaster's idea is that it is the attributes of the goods rather than the goods per se that determine the utility they provide. McFadden's random utility theory postulates that individual choice behavior is intrinsically probabilistic, hence random. For that reason, as shown in equation 1, the latent utility of an alternative *A* in a choice set *k* as perceived by consumer *n* is considered to be decomposable into two additively separable portions: a deterministic (explainable) component specified as a function of the attributes of the alternative $V(X_{An}, \beta)$, and a random (unexplainable) component ε_{An} representing unmeasured variation in preferences.

(1) $$U_{An} = V(X_{An}, \beta) + \varepsilon_{An}$$

The key assumption is that consumer *n* will choose alternative *A* if and only if this alternative generates at least as much utility as any other alternative *j* within the choice set *k*. The probability of consumer *n* choosing alternative *A* can then be specified as

(2) $$P(A) = \mathrm{Prob}\{V_{An} + \varepsilon_{An} \geq V_{jn} + \varepsilon_{jn}; A \neq j, \forall j \in k\}.$$

Discrete choice models are normally used to model the choices made by the decision makers from the CEs. The random parameter logit model has been developed to obviate the three limiting assumptions of the conventional logit model. It allows the taste parameters to vary randomly across decision makers, it does not exhibit restrictive forecasting substitution patterns (that is, no Independence of Irrelevant Alternatives assumption), and it permits correlation in unobserved factors over time[2] (Train 2003).

The random parameter logit model is based on the usual framework of random utility models presented above. As mentioned before, a consumer *n* faces a choice of selecting a preferred dairy product amongst a set of *j* dairy product profiles, representing different attributes and attribute levels in each of the *t* choice situations. In our case, the number of choice situations is constant per consumer and a linear utility function is assumed. A consumer, *n*, is assumed to consider the full set of offered dairy product profiles in choice situation *t* and to choose the alternative with the highest utility. The utility associated with each set of *j* alternatives as evaluated by each consumer *n* in choice situation *t* is represented in a discrete choice model by a utility expression of the general form,

(3) $$U_{jnt} = \beta_n X_{jnt} + \varepsilon_{jnt},$$

[2] This is particularly beneficial in our study since the data consist of repeated choices by individuals, which are likely to exhibit some degree of correlation in unobserved utility.

where X_{jnt} is a vector of observed variables, including dairy product attributes and socio-economic characteristics of consumers. The components β_n and ε_{jnt} are unobserved and are treated as stochastic influences. Taste coefficient vector β_n varies in the population with density f ($\beta_n|\theta$), where θ is a vector of parameters of a continuous population distribution. ε_{jnt} is assumed to be independent and identically distributed extreme value type 1. The emphasis in random parameter logit is moved from the estimation of β_n to the estimation of θ, the population parameters, which determine the behavior of β_n. Conditional on β_n the probability that consumer *n* chooses dairy product *A*, in choice situation *t*, is the conditional logit specification

(4) $$L_{Ant}(\beta_n) = \frac{e^{\beta_n X_{Ant}}}{\sum_{j=1}^{J} e^{\beta_n X_{jnt}}}.$$

Given that β_n is unknown to the analyst, the unconditional probability is usually employed. The unconditional probability is the integral of the conditional probability over all possible values of β_n, which depends on the parameters of the distribution of β_n. This integral takes the form

(5) $$P_{Ant}(\theta) = \int L_{Ant}(\beta_n) f(\beta_n | \theta) d\beta_n .$$

Such probability does not have a closed form, and hence we approximate the probability through simulation and maximize the simulated log-likelihood function.

As one of the attributes represents price, implicit prices, or WTP values of the different attributes can be estimated using random parameter logit estimates.

3. Starting Point Bias in Choice Experiments

In contrast to DC-CVM, the prices attached to the alternatives in CEs are shown simultaneously within each choice set and not just as a single alternative with a single price. If SPB is present in a CE, the prices used in the first choice set might influence the perception of the prices in the following choice sets. More specifically, respondents when uncertain about their assessment of the product being valued, anchor the value they place on this good on the price amounts proposed to them in the initial choice set. This may happen when the uncertain respondent interprets the price amount as an approximation of the good's true value. Ladenburg and Olsen (2008) hypothesize that varying the price levels displayed in an instructional choice set presented prior to the actual preference eliciting choice sets, significantly impacts respondents' preferences and WTP in a nonmarket CE. Using a two-split sample design they find evidence that only female respondents, when shown a low-priced instructional choice set, tend to express lower WTP than when shown a high-priced instructional choice set. Carlsson and Martinsson (2008) assume that adding a choice set with low costs and large attribute improvements as the first choice set in a sequence would make respondents state lower marginal WTP in the following choice sets. However, in a split-sample survey focusing on the reduction of power outages, they find no significant impact on the estimated marginal WTP, hence rejecting the presence of SPB.

A suitable framework for testing for SPB in CEs was developed by Ladenburg and Olsen (2008). They use an adjusted version of the model applied by Levitt and List (2007) in a laboratory experiment. In the model, a utility maximizing individual n is faced with a choice a related to a single action, $a \in (0, 1)$. The choice of action affects the individual's utility through two separate parts: a wealth part W_n and a moral part M_n. Consequently, focusing on our case in which individual n is faced with the choice between purchasing or not purchasing functional dairy products, the utility function for individual n is:

$$(6) \qquad U_n(a, v(f,p), c) = M_n(a, v(f,p), c) + W_n(a, v(f,p)).$$

Here v is the stake of the game, which in a CE is a joint function of the attributes (functional dairy product attributes f and price p) of the alternative related to action a. The cost of social norms is denoted by c. In a CE the wealth part W_n refers to the utility associated with the specific levels of the attributes represented by the alternative chosen in action *a*. The utility associated with the moral part M_n relates to the moral cost or benefit associated with action *a* and depends on *a*, *v* and *c*. Given this model, SPB might influence the moral utility part (Ladenburg and Olsen 2008). The prices shown in the first choice set might be perceived as cues of the true social value of the good. Hence, the prices may affect the individual to make socially correct choices (Cameron and Quiggin 1994), and thereby individuals' WTP values are influenced by the prices of the first choice set through the cost of social norms factor.

4. Survey Design and Procedure of Starting Point Bias

Since the mid-1990s functional foods have been launched in Europe. As it is widely known now, the term functional food is used to describe foods fortified with specific ingredients imparting certain health benefits. Functional foods are products that are marketed with health claims (HC) that state that a relationship exists between consumption of the food and health. In Europe, Germany belongs to the four biggest functional food markets. Hence, a CE survey was conducted in Germany investigating functional dairy products, as they constitute one of the most important types of functional foods. Three different dairy products were chosen for investigation: yoghurt, cream cheese, and ice cream. The calculation of the sample size followed the layout and description by Hensher, Rose, and Greene (2005) for choice data. A preliminary pilot study was conducted with 55 individuals to test the questionnaire. Data for the final survey were collected via a letter survey in November 2010. In accordance with Lancaster's attribute theory of value, two attributes, each with four levels were included in the design of the CE. An additional monetary attribute, purchase price, was selected to capture WTP for the attributes. The different purchase price levels considered were based on the existing market prices for functional dairy products and their conventional counterparts.

The attributes as well as the applied attribute levels are presented in table 1. Attributes and their levels were combined according to an experimental design to create choice sets. A full factorial design which includes all possible combinations of the attributes would yield 192 possible choice sets for yoghurt, cream cheese, and ice cream. Since it is not practically feasible to work with such a large number of choice sets, an orthogonal main effects design combined with a blocking strategy was generated, which resulted in 21 generic choice sets (7 choice sets per product). Each choice set consisted of three alternatives: a conventional non-functional food alternative offered to the basic price and two functional food alternatives. Beside the choice sets, the questionnaire covered socio-economic aspects as well as lifestyle issues, and attitude items related to functional foods and a healthy diet.

A two-split sample approach was employed to test whether the WTP estimates obtained from the random parameter logit model are sensitive to SPB. Each sample received a questionnaire that varied with respect to the first choice set. In sample A the first choice set was always the one with the highest price levels received from the orthogonal main effects design and in sample B the first choice set was always the one with the lowest price levels also obtained from the orthogonal main effects design. In all other aspects the questionnaires were kept identical in the two samples. Ideally, and in accordance with standard assumptions, the respondents' WTP should not be influenced by the set of prices in the first choice set. However, the prices applied in the first choice set might be perceived as signals of the true social values of the goods. Compared to sample A, it is expected that the lower-priced first choice set sample B has a lower moral utility part. Consequently, sample B would then have a lower WTP than sample A, and hence the presence of SPB in the data set would be established. In order to investigate if only female respondents are influenced by SPB as shown by Ladenburg and Olsen (2008), the following tests for SPB are carried out on an overall level, as well as on a gender-specific level.

A response rate of 49% was achieved, yielding a total of 655 and 654 useable questionnaires for samples A and B, respectively. Information on the socio-economic characteristics of both samples is presented in table 2. The two samples differ significantly only with respect to per capita income ($|t| = 1.67$, $p = 0.096$). In sample A the average per capita income is 1084€ a month, whereas sample B has a slightly higher average per capita income of 1145€ a month.

5. Empirical Results

Results of the random parameter logit model and associated WTP estimates are presented in the following section. Based on these results, differences in WTP are calculated to test whether WTP estimates are affected by SPB.

Random Parameter Logit

Random parameter logit models describing the elicited preferences for all three dairy products for samples A and B are presented in tables 3, 4, and 5[3]. As mentioned before, this type of model was chosen to avoid the restrictive IIA assumption, which was found to be violated in previous analyses and also to account for unobserved heterogeneity and repeated choices by individuals. The models are based on the pooled sample (referred to as the main model) as well as on gender-specific samples. Following Hensher, Rose, and Greene (2005) a likelihood-ratio test and a zero-based, asymptotic *t*-test for standard deviations were used to identify random parameters. From this, the attribute price was entered as random parameter in the random parameter logit estimations, while functional ingredients and health claims were selected to be fixed. Furthermore, price was assumed to have been drawn from a triangular distribution. The triangular distribution has the advantage of being bounded on either side, and hence overcomes the well-known long-tail problems of the log-normal

[3] Standard errors are not reported in the interest of brevity, but are available upon request.

distribution, which has been widely used in past studies for attributes with an explicit sign assumption such as price.

The model was estimated using NLOGIT software version 4.0 (Econometric Software, Inc. 2007), utilizing 1000 Halton draws for the simulations.

The results of all three dairy products reveal a strong statistical significance of the mean parameter estimates for omega-3 fatty acids, HC 1, HC 2, and price in both samples, in the main models, as well as in most of the gender-specific models. The models indicate preference for dairy products that are cheap, enriched with omega-3 fatty acids and bearing HC 2. The positive preference for omega-3 fatty acids seems plausible, as this ingredient is well-known to consumers. Dairy products that bear HC 1 are not preferred, as indicated by the negative parameter estimate which is significantly different from zero at the 1% level. The parameter estimates for oligosaccharides, bioactive peptides and HC 3 are partly significant for all three dairy products in both samples, in the main models, as well as in the gender-specific models, and reveal that bioactive peptides and HC 3 are not preferred. Looking at the non-functional alternatives, the results indicate preference for the non-functional ice cream alternative, as indicated by the positive and highly significant mean parameter estimates in both samples, in the main models, as well as in the gender-specific models. This may be attributed to the fact that ice cream represents a hedonic product and consumers do not want to eat hedonic products enriched with healthy ingredients. Furthermore, women of both samples and the pooled sample A prefer non-functional cream cheese, as indicated by the positive parameter estimates, which are significantly different from zero at the 1% level. The results also reveal that male respondents have a negative preference for non-functional yoghurt, although the negative parameter estimate is only significantly different from zero in sample B. This result appears plausible as functional yoghurt represents the most sold functional food in Germany and men seem to be more positive towards functional foods than women. Associated with the mean parameter estimate of the random price parameter is the derived standard deviation calculated over the R draws, revealing the amount of spread that exists around the sample population. The standard deviations are highly significant in terms of all three dairy products, indicating that the price parameter estimates are indeed heterogeneous in the population in both samples, in the main models as well as in the gender-specific models.

The derivation of the marginal rate of substitution between the attributes and the monetary parameter estimate (price in our analysis) provides an estimation of WTP for the attributes. The possibility of negative WTP estimates was allowed to account for negative preferences associated with some attribute levels that provide disutility. As suggested by Hensher and Greene (2003), the triangular distribution from which the random price parameter was drawn was constrained to derive behaviorally meaningful WTP values. The results of all three dairy products are reported in tables 3, 4, and 5. In accordance with the results from the random parameter logit model reported earlier, respondents show a positive WTP for omega-3 fatty acids and HC 2 and a negative WTP for HC 1 for all three dairy products in both samples, in the main models as well as in the gender-specific models. The negative WTP for HC 1 indicates significant aversion to this attribute. Furthermore, a positive WTP is associated with non-functional ice cream in both samples, in the main models as well as in the gender-specific models. Almost every model reveals that respondents have the highest positive WTP for omega-3 fatty acids. For ice cream, women show a higher positive WTP for the non-functional alternative than for omega-3 fatty acids in both samples. The same tendency is apparent in the main models. The results for women indicate that non-functional ice cream is valued at 0.56€ and 0.15€ more than functional ice cream for samples A and B, respectively.

Given potentially different scale parameters in the choice models, a direct comparison cannot be made with regard to the parameter estimates across models (Louviere, Hensher, and Swait

2000). However, WTP estimates can be directly compared, as the scale parameter cancels out in this calculation (Train 2003).

Differences in Willingness-To-Pay

The numerical differences in WTP estimates are presented in the far right columns of tables 3, 4, and 5. Looking at the positive WTP estimates of all three dairy products, sample A generally reveals a higher WTP for omega-3 fatty acids and HC 2 than sample B in the main models. The same tendency is apparent in the gender-specific models. These numerical differences suggest the presence of SPB. Furthermore, sample A shows a higher WTP than sample B for both non-functional cream cheese and non-functional ice cream in the main models as well as in the gender-specific models. When looking at HC 2, the differences in WTP for male respondents are much larger than it is the case for female respondents for all three dairy products. These numerical differences indicate that SPB does indeed cause male respondents to express lower WTP in sample B than in sample A. Noticeable gender-specific differences in WTP for other attribute levels besides HC 2 are also apparent when looking at cream cheese. The results for cream cheese reveal higher differences in WTP for male respondents than for female respondents for almost all attribute levels. Looking at the negative WTP estimates of HC 1, sample A reveals a higher negative WTP than sample B for all three dairy products, in the main models as well as in the gender-specific models.

In order to investigate whether the numerical differences are significant, an *F*-test is carried out for each of the WTP differences, testing the null hypothesis of identical WTP measures in the two samples. The results of the tests for yoghurt reveal that differences in WTP are statistically significant both in the main models and in most of the gender-specific models, as the *F*-tests reject the null hypothesis of equal WTP in the two samples. When looking at cream cheese and ice cream the results of the tests for identical WTP measures in the two samples also indicate that there are significant differences in WTP between the two samples in the main models, as well as in the gender-specific models. More specifically, with regard to the WTP for omega-3 fatty acids, HC 2, and the non-functional alternative, these findings indicate that WTP in sample A is indeed higher than in sample B. The results of the tests of all three dairy products suggest that both men and women are influenced by SPB, as almost every *F*-test rejects the null hypothesis.

6. Conclusions

This study employed a choice experiment approach to investigate consumers' preferences for functional dairy product attributes in Germany and to test whether willingness-to-pay estimates are affected by starting point bias.

The empirical results of the random parameter logit models provide a number of insights to understanding consumers' choice behavior. In the main models and in most of the gender-specific models, omega-3 fatty acids and health claim 2 (HC 2) were found to be the most preferred attributes whereas dairy products that bear health claim 1 (HC 1) are not preferred with regard to all three dairy products in both samples. A positive preference for omega-3 fatty acids may be attributed to the fact that this ingredient and its health related effects are well-known to the general public, and therefore consumers are familiar with it. In addition, a negative preference for functional ice cream was revealed as results indicate preference for the non-functional ice cream alternative in both samples, in the main models as well as in the gender-specific models. This is probably because ice cream represents a hedonic product and consumers normally prefer hedonic products without enriched ingredients. Furthermore, women of both samples and the pooled sample A prefer non-functional cream cheese. Quite interesting was the finding that male respondents have a negative preference for non-functional yoghurt, although the negative parameter estimate was only significant in sample

B. This result seems plausible because functional yoghurt has the highest market share of functional food in Germany, and men seem to be more positive towards functional foods than women. Furthermore, results of the random parameter logit models indicate significant preference heterogeneity among consumers with regard to purchase price.

Our findings suggest that consumers tend to accept rather functional yoghurt than functional ice cream. This is not surprising, as functional ice cream is not yet on the markets in Germany, whereas functional yoghurts have been available since the 1990s. However, as indicated previously, it might be that consumers do not accept functional ice cream because ice cream represents a hedonic product. In accordance with results from random parameter logit model a positive WTP for omega-3 fatty acids and HC 2 and a negative WTP for HC 1 were revealed for all three dairy products in both samples, in the main models as well as in the gender-specific models. The highest positive WTP in almost every model was associated with omega-3 fatty acids. Just in case of ice cream women revealed a higher positive WTP for the non-functional alternative than for omega-3 fatty acids in both samples. The same tendency was apparent in the main models.

In our study we find that WTP elicited in a CE is prone to SPB when looking at positive WTP values for all three dairy products. Hence, employing different sets of price levels in the first choice set resulted in significantly different WTP estimates in two otherwise identical choice set designs. More specifically, if the first choice set displayed high prices, respondents had a higher WTP than when a lower set of prices was offered in the first choice set. While Ladenburg and Olsen (2008) find that this effect is gender-specific with only female respondents being affected by SPB, we did not find evidence that only female respondents are susceptible to this bias. Actually, results of all three dairy products even indicate the contrary with male respondents being more influenced by SBP than female respondents when looking at HC 2.

Our findings suggest that SPB might be a general problem in CEs. Given that only few economic studies have attempted to investigate SPB in CEs and given that results are quite contradictory, future applications are needed. Being aware of this potential bias in CEs, the analyst is able to take precautions in order to reveal consumers' true WTP.

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Table 1 Attributes and attribute levels used in the CE survey

Attributes	Attribute levels		
Price[a]	Yoghurt	Cream cheese	Ice cream
	1. 1.29€/500g (basic[b])	1. 1.49€/200g (basic[b])	1. 3.19€/1000ml (basic[b])
	2. 1.49€/500g	2. 1.69€/200g	2. 3.49€/1000ml
	3. 1.79€/500g	3. 2.09€/200g	3. 3.99€/1000ml
	4. 2.09€/500g	4. 2.49€/200g	4. 4.49€/1000ml
Functional ingredient	1. Omega-3 fatty acids		
	2. Oligosaccharides		
	3. Bioactive peptides		
	4. Polyphenols		
Health claim	1. Supports healthy blood vessels. (HC 1)		
	2. Supports healthy blood vessels and healthy metabolism. (HC 2)		
	3. One property[c] (HC 3)		
	4. Two properties[d] (HC 4)		

[a]Exchange rate: 1 U.S. $ = 0.74€.
[b]The basic price represents the price of the conventional non-functional food alternative.
[c]a) Omega-3 fatty acids: Supports healthy blood triglyceride levels. b) Oligosaccharides: Supports healthy digestion. c) Bioactive peptides: Supports healthy blood pressure. d) Polyphenols: Protects body's cells against free radicals.
[d]a) Omega-3 fatty acids: Supports healthy blood vessels and healthy blood triglyceride levels. b) Oligosaccharides: Supports healthy blood vessels and healthy digestion. c) Bioactive peptides: Supports healthy blood vessels and healthy blood pressure. d) Polyphenols: Supports healthy blood vessels and protects body's cells against free radicals.

Table 2 Descriptive statistics for samples A and B

	Mean	Std. Dev.	Mean	Std. Dev.	Significance in *t*-test
	Sample A		Sample B		
Gender (1=female, 0=male)	0.57	0.50	0.54	0.50	NS
Age (years)	45.77	15.79	44.36	15.18	NS
Per capita income/month (€)[a]	1084.19	613.95	1145.36	674.25	$^{+}$
Education					
Basic[b] (1=yes, 0=no)	0.19	0.39	0.18	0.38	NS
Intermediate[c] (1=yes, 0=no)	0.53	0.50	0.53	0.50	NS
Advanced[d] (1=yes, 0=no)	0.25	0.44	0.27	0.44	NS

NS denotes no significant difference, single ($^{+}$) denotes a significant difference at 10% level.
[a]Exchange rate: 1 U.S. $ = 0.74€.
[b]Including: not graduated yet, no school degree, GCSE.
[c]Including: A-levels, professional training, master craftsman status.
[d]Including: university degree, PhD.

Table 3 Comparison of estimates obtained from random parameter logit model (yoghurt)

Parameter	Sample A		Sample B		ΔWTP
	Estimates	WTP[a] [95% CI]	Estimates	WTP [95% CI]	(WTP_A vs. WTP_B)[b]
Omega-3 fatty acids					
Pooled	0.359***	0.26 [-0.58 – 1.10]	0.273***	0.15 [-0.33 – 0.64]	0.11^{+++}
Men	0.408***	0.29 [-0.38 – 0.96]	0.314***	0.19 [-0.25 – 0.63]	0.10^{+++}
Women	0.324***	0.23 [-0.31 – 0.78]	0.230***	0.11 [-0.15 – 0.38]	0.12^{+++}
Oligosaccharides					
Pooled	0.005	0.00 [-0.01 – 0.02]	0.098**	0.05 [-0.12 – 0.23]	-0.05^{+++}
Men	-0.120*	-0.08 [-0.28 – 0.11]	0.038	0.02 [-0.03 – 0.08]	-0.10^{+++}
Women	0.099*	0.07 [-0.10 – 0.24]	0.157**	0.08 [-0.10 – 0.26]	-0.01^{+++}
Bioactive peptides					
Pooled	-0.086**	-0.06 [-0.26 – 0.14]	-0.162***	-0.09 [-0.38 – 0.20]	0.03^{+++}
Men	0.002	0.00 [0.00 – 0.01]	-0.092	-0.06 [-0.19 – 0.07]	0.06^{+++}
Women	-0.154***	-0.11 [-0.37 – 0.15]	-0.228***	-0.11 [-0.38 – 0.15]	0.00^{NS}
HC 1					
Pooled	-0.483***	-0.35 [-1.48 – 0.78]	-0.390***	-0.22 [-0.91 – 0.48]	-0.13^{+++}
Men	-0.462***	-0.33 [-1.09 – 0.43]	-0.358***	-0.22 [-0.72 – 0.29]	-0.11^{+++}
Women	-0.504***	-0.36 [-1.21 – 0.49]	-0.428***	-0.21 [-0.71 – 0.28]	-0.15^{+++}
HC 2					
Pooled	0.264***	0.19 [-0.42 – 0.81]	0.198***	0.11 [-0.24 – 0.46]	0.08^{+++}
Men	0.321***	0.23 [-0.30 – 0.76]	0.160**	0.10 [-0.13 – 0.32]	0.13^{+++}
Women	0.225***	0.16 [-0.22 – 0.54]	0.234***	0.12 [-0.15 – 0.39]	0.04^{+++}
HC 3[c]					
Pooled	-0.035	-0.03 [-0.11 – 0.06]	-0.021	-0.01 [-0.05 – 0.03]	-0.02^{+++}
Men	-0.098	-0.07 [-0.23 – 0.09]	-0.013	-0.01 [-0.03 – 0.01]	-0.06^{+++}
Women	0.011	0.01 [-0.01 – 0.03]	-0.030	-0.01 [-0.05 – 0.02]	0.02^{+++}
Non-functional alternative					
Pooled	0.001	0.00 [0.00 – 0.00]	0.007	0.00 [-0.01 – 0.02]	0.00^{+++}
Men	-0.093	-0.07 [-0.22 – 0.09]	-0.112*	-0.07 [-0.23 – 0.09]	0.00^{NS}
Women	0.069	0.05 [-0.07 – 0.17]	0.105*	0.05 [-0.07 – 0.17]	0.00^{++}
Price (in €)					
Pooled	-1.907***		-2.494***		
Men	-1.925***		-2.248***		
Women	-1.905***		-2.761***		
Derived standard deviation					
Pooled	1.907***		2.494***		
Men	1.925***		2.248***		
Women	1.905***		2.761***		
No. of choice sets	4670, 2009, 2661		4696, 2159, 2537		
Halton draws	1000		1000		
LL at start values	-4569.291, -1973.634, -2587.921		-4383.111, -2098.056, -2264.770		
Simulated LL	-4566.409, -1972.371, -2586.325		-4379.091, -2096.958, -2261.611		
Pseudo-R^2 adjusted	0.109, 0.105, 0.114		0.150, 0.114, 0.187		

Single (*), double (**), and triple (***) denote significant variables at 10%, 5%, and 1% levels, respectively.

[a]WTP in €.

[b]WTP_A vs. WTP_B denotes an *F*-test to test for equality of means for the two WTP measures . NS denotes no significant WTP differences, double ($^{++}$), and triple ($^{+++}$) denote significant WTP differences at 5%, and 1% levels, respectively.

[c]a) Omega-3 fatty acids: Supports healthy blood triglyceride levels. b) Oligosaccharides: Supports healthy digestion. c) Bioactive peptides: Supports healthy blood pressure. d) Polyphenols: Protects body's cells against free radicals.

Table 4 Comparison of estimates obtained from random parameter logit model (cream cheese)

Parameter	Sample A		Sample B		ΔWTP
	Estimates	WTP[a] [95% CI]	Estimates	WTP [95% CI]	(WTP_A vs. WTP_B)[b]
Omega-3 fatty acids					
Pooled	0.418***	0.31 [-0.68 – 1.30]	0.318***	0.17 [-0.38 – 0.72]	0.14^{+++}
Men	0.459***	0.36 [-0.47 – 1.19]	0.356***	0.21 [-0.27 – 0.69]	0.15^{+++}
Women	0.390***	0.26 [-0.35 – 0.88]	0.291***	0.14 [-0.17 – 0.45]	0.12^{+++}
Oligosaccharides					
Pooled	-0.066	-0.05 [-0.21 – 0.11]	0.060	0.03 [-0.07 – 0.14]	-0.08^{+++}
Men	-0.186***	-0.15 [-0.48 – 0.19]	-0.051	-0.03 [-0.10 – 0.04]	-0.12^{+++}
Women	0.035	0.02 [-0.03 – 0.08]	0.178***	0.08 [-0.11 – 0.27]	-0.06^{+++}
Bioactive peptides					
Pooled	-0.104**	-0.08 [-0.32 – 0.17]	-0.197***	-0.11 [-0.45 – 0.23]	0.03^{+++}
Men	0.009	0.01 [-0.01 – 0.02]	-0.122*	-0.07 [-0.24 – 0.09]	0.08^{+++}
Women	-0.206***	-0.14 [-0.47 – 0.19]	-0.279***	-0.13 [-0.43 – 0.17]	-0.01^{+++}
HC 1					
Pooled	-0.376***	-0.28 [-1.17 – 0.61]	-0.327***	-0.18 [-0.74 – 0.39]	-0.10^{+++}
Men	-0.361***	-0.28 [-0.94 – 0.37]	-0.310***	-0.18 [-0.60 – 0.24]	-0.10^{+++}
Women	-0.402***	-0.27 [-0.91 – 0.37]	-0.354***	-0.17 [-0.55 – 0.21]	-0.10^{+++}
HC 2					
Pooled	0.248***	0.18 [-0.40 – 0.77]	0.183***	0.10 [-0.22 – 0.42]	0.08^{+++}
Men	0.343***	0.27 [-0.35 – 0.89]	0.231***	0.14 [-0.18 – 0.45]	0.13^{+++}
Women	0.169***	0.11 [-0.15 – 0.38]	0.126*	0.06 [-0.07 – 0.19]	0.05^{+++}
HC 3[c]					
Pooled	-0.103**	-0.08 [-0.32 – 0.17]	-0.030	-0.02 [-0.07 – 0.04]	-0.06^{+++}
Men	-0.168**	-0.13 [-0.44 – 0.17]	-0.065	-0.04 [-0.13 – 0.05]	-0.09^{+++}
Women	-0.045	-0.03 [-0.10 – 0.04]	0.009	0.00 [-0.01 – 0.01]	-0.03^{+++}
Non-functional alternative					
Pooled	0.167***	0.12 [-0.27 – 0.52]	0.056	0.03 [-0.07 – 0.13]	0.09^{+++}
Men	0.017	0.01 [-0.02 – 0.04]	-0.068	-0.04 [-0.13 – 0.05]	0.05^{+++}
Women	0.276***	0.19 [-0.25 – 0.62]	0.153***	0.07 [-0.09 – 0.24]	0.12^{+++}
Price (in €)					
Pooled	-1.873***		-2.571***		
Men	-1.734***		-2.332***		
Women	-2.024***		-2.868***		
Derived standard deviation					
Pooled	1.873***		2.571***		
Men	1.734***		2.332***		
Women	2.024***		2.868***		
No. of choice sets	4705, 2042, 2663		4684, 2162, 2522		
Halton draws	1000		1000		
LL at start values	-4351.145, -1950.716, -2377.547		-4123.503, -1996.401, -2106.305		
Simulated LL	-4343.574, -1947.903, -2372.728		-4109.579, -1989.947, -2098.865		
Pseudo-R^2 adjusted	0.159, 0.130, 0.188		0.201, 0.160, 0.241		

Single (*), double (**), and triple (***) denote significant variables at 10%, 5%, and 1% levels, respectively.

[a]WTP in €.

[b]WTP_A vs. WTP_B denotes an *F*-test to test for equality of means for the two WTP measures . NS denotes no significant WTP differences, double ($^{++}$), and triple ($^{+++}$) denote significant WTP differences at 5%, and 1% levels, respectively.

[c]a) Omega-3 fatty acids: Supports healthy blood triglyceride levels. b) Oligosaccharides: Supports healthy digestion. c) Bioactive peptides: Supports healthy blood pressure. d) Polyphenols: Protects body's cells against free radicals.

Table 5 Comparison of estimates obtained from random parameter logit model (ice cream)

Parameter	Sample A		Sample B		ΔWTP
	Estimates	WTP[a] [95% CI]	Estimates	WTP [95% CI]	(WTP_A vs. WTP_B)[b]
Omega-3 fatty acids					
Pooled	0.429***	0.36 [-0.80 – 1.52]	0.233***	0.14 [-0.32 – 0.61]	0.22^{+++}
Men	0.451***	0.36 [-0.48 – 1.20]	0.255***	0.18 [-0.24 – 0.60]	0.18^{+++}
Women	0.415***	0.35 [-0.47 – 1.18]	0.224***	0.11 [-0.14 – 0.37]	0.24^{+++}
Oligosaccharides					
Pooled	-0.069	-0.06 [-0.24 – 0.13]	0.053	0.03 [-0.07 – 0.14]	-0.09^{+++}
Men	-0.155**	-0.13 [-0.41 – 0.16]	-0.023	-0.02 [-0.05 – 0.02]	-0.11^{+++}
Women	-0.005	0.00 [-0.01 – 0.01]	0.144*	0.07 [-0.09 – 0.24]	-0.07^{+++}
Bioactive peptides					
Pooled	-0.147***	-0.12 [-0.52 – 0.27]	-0.066	-0.04 [-0.17 – 0.09]	-0.08^{+++}
Men	-0.036	-0.03 [-0.10 – 0.04]	-0.027	-0.02 [-0.06 – 0.02]	-0.01^{+++}
Women	-0.239***	-0.20 [-0.68 – 0.27]	-0.116	-0.06 [-0.19 – 0.07]	-0.14^{+++}
HC 1					
Pooled	-0.374***	-0.32 [-1.33 – 0.70]	-0.299***	-0.18 [-0.78 – 0.41]	-0.14^{+++}
Men	-0.394***	-0.32 [-1.05 – 0.42]	-0.310***	-0.22 [-0.73 – 0.29]	-0.10^{+++}
Women	-0.349***	-0.30 [-1.00 – 0.40]	-0.292***	-0.15 [-0.49 – 0.19]	-0.15^{+++}
HC 2					
Pooled	0.221***	0.19 [-0.41 – 0.79]	0.130***	0.08 [-0.18 – 0.34]	0.11^{+++}
Men	0.353***	0.28 [-0.37 – 0.94]	0.184***	0.13 [-0.17 – 0.43]	0.15^{+++}
Women	0.102	0.09 [-0.12 – 0.29]	0.060	0.03 [-0.04 – 0.10]	0.06^{+++}
HC 3[c]					
Pooled	-0.073	-0.06 [-0.26 – 0.14]	-0.059	-0.04 [-0.15 – 0.08]	-0.02^{+++}
Men	-0.232***	-0.19 [-0.62 – 0.25]	-0.097	-0.07 [-0.23 – 0.09]	-0.12^{+++}
Women	0.058	0.05 [-0.07 – 0.16]	-0.017	-0.01 [-0.03 – 0.01]	0.06^{+++}
Non-functional alternative					
Pooled	0.495***	0.42 [-0.92 – 1.76]	0.245***	0.15 [-0.33 – 0.64]	0.27^{+++}
Men	0.289***	0.23 [-0.31 – 0.77]	0.171***	0.12 [-0.16 – 0.40]	0.11^{+++}
Women	0.658***	0.56 [-0.75 – 1.87]	0.296***	0.15 [-0.19 – 0.49)	0.41^{+++}
Price (in €)					
Pooled	-1.638***		-2.247***		
Men	-1.689***		-1.927***		
Women	-1.606***		-2.655***		
Derived standard deviation					
Pooled	1.638***		2.247***		
Men	1.689***		1.927***		
Women	1.606***		2.655***		
No. of choice sets	4717, 2043, 2674		4697, 2181, 2516		
Halton draws	1000		1000		
LL at start values	-3892.384, -1751.401, -2117.944		-3788.238, -1878.428, -1888.647		
Simulated LL	-3883.797, -1746.744, -2113.822		-3776.072, -1872.947, -1882.380		
Pseudo-R^2 adjusted	0.250, 0.220, 0.279		0.268, 0.217, 0.318		

Single (*), double (**), and triple (***) denote significant variables at 10%, 5%, and 1% levels, respectively.

[a]WTP in €.

[b]WTP_A vs. WTP_B denotes an *F*-test to test for equality of means for the two WTP measures . NS denotes no significant WTP differences, double ($^{++}$), and triple ($^{+++}$) denote significant WTP differences at 5%, and 1% levels, respectively.

[c]a) Omega-3 fatty acids: Supports healthy blood triglyceride levels. b) Oligosaccharides: Supports healthy digestion. c) Bioactive peptides: Supports healthy blood pressure. d) Polyphenols: Protects body's cells against free radicals.