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**Consumer segmentation based on attitudes - Does information change it all?**

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***Selected Paper prepared for presentation at the 2017 Agricultural & Applied Economics  
Association Annual Meeting, Chicago, Illinois, July 30-August 1***

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## **Abstract**

This article assesses consumer segmentation based on attitudes and the influence on simulated purchase choice. In parallel, the effect of different information treatments is surveyed for different consumer segments. A strong preference for enhanced husbandry was expressed. Communicating the extrinsic production qualities of beef increased consumer acceptance of a husbandry labelling and extensive cattle production in particular. This finding was persistent even when analyzing different consumer segments. We found high consumer acceptance for several consumer segments, if consumers were adequately informed.

**Keywords:** Animal husbandry, Choice Experiment, Information, Hybrid Choice Models, Segmentation

## **Introduction**

Ethical food quality is getting more important for food purchase decisions, especially sustainable product traits and animal welfare are increasingly important to consumers (Dentoni et al. 2014; Grunert et al. 2014). Ethical food purchase decisions are often explained by corresponding ethical values or attitudes. Based on individual values and attitudes towards animal husbandry systems, different consumer segments have been identified in many countries (Janssen et al. 2016). So far, little is known, if and how additional information on animal husbandry systems can change consumer preferences and willingness-to-pay for products from different husbandry systems.

As public knowledge about the different concepts of animal welfare is limited (Vanhonacker and Verbeke 2014), the different husbandry systems have to be communicated substantially. This is quite a difficult task due to the multifaceted complexity of husbandry systems. Also, consumer motives and attitudes to buy ethically produced foods determine the purchase decision (Michaelidou and Hassan 2010).

The objective of the current contribution is to test if and how in-depth communication on animal husbandry systems influence purchase decisions of different consumer segments.

## Methodology

A consumer survey was conducted with 676 consumers in six food retail shops in three different cities of Germany. Consumers were randomly divided in four different groups for a communication exposure. Three different formats of in-depth communication namely, a leaflet (six pages, DIN A4), an image film (4 minutes) and a documentary film (4 minutes) were compiled together with a scientific working group for film and television. All information material included similar information about rearing systems for beef, especially suckler-cow-based beef. Accordingly, one group of consumers received the leaflet, the second group received the image film, and the third group was presented with the documentary film before the survey. The last group, served as a control group, which did not receive any information preceding the consumer survey. The computer-based survey was divided in a choice experiment and a personal interview. Within the choice experiment consumer preferences for different rearing systems (suckler-cow-based, pasture-based or barn-based production), organic or non-organic production, and price for 200g beef steak (1.98€; 3.98€; 5.98€; 7.98€) were elicited. This part of the survey was self-assisted to avoid an interviewer or social desirability bias. In the personal interviews, consumers were asked about socio-demographic characteristics, different purchase habits and attitudes. This part of the survey was a personal interview.

As a theoretical background for modelling consumer choices for ethically produced foods Random Utility Theory ((McFadden 1973) is applied, grounded in (Thurstone 1927) (1927). In this framework consumers are assumed to aim highest utility when choosing to buy different food products. The utility in turn, can be separated into different parts, which are constituted by the different attributes a (food) product entails (Lancaster 1966). As such, attributes of food products are used as arguments of the function. The utility  $U_{nsj}$  that individual  $n$  receives of alternative  $j$  perceived in choice situation  $s$ . The utility  $U_{nsj}$  is assumed to be partitioned into an observable component  $V_{nsj}$ , which can be split into a linear relationship of observed attribute levels  $x$  of each alternative  $j$  and  $\beta_{nk}$  representing the

marginal utility associated with attribute  $k$  for respondent  $n$ , and an unobservable component  $\varepsilon_{nsj}$  (Hensher, Rose, & Greene, 2015):

$$(1) U_{nsj} = V_{nsj} + \varepsilon_{nsj} = \beta_{nk}x_{nsjk} + \varepsilon_{nsj}$$

The probability that participant  $n$  in choice situation  $s$  will choose alternative  $j$  is given as the probability that outcome  $j$  will have the maximum utility:

$$(2) P_{nsj} = P(U_{nsj} > U_{nsi}, \forall i \neq j).$$

Several studies have shown the importance of considering consumer's taste heterogeneity; (Lusk, Roosen, and Fox 2003; van Loo et al. 2014). This is especially true for studies using panel data (Train 2009) – like the presented data set in which every participant was asked to make a choice several times. In such cases Mixed Logit Models (MLMs) are recommended as they account for a systematic taste variation and non-independence between observations associated with the same respondent (William Greene 2016; Hess and Beharry-Borg 2012). However, in a discrete choice model, such as the MLM, utilities may be determined by observed and unobserved variables. Explaining endogeneity in behavioral choice models is a high interest in the field of modelling choice ((Hess and Beharry-Borg 2012; Vij and Walker 2014); (Vij and Walker 2014). Integrating latent variables, like attitudes or underlying values, seems to be a promising approach t(Bechtold and Abdulai 2014)o uncover behavioral structures within mixed logit choice data (Paulssen et al. 2014).

In order to explain and describe consumers heterogeneity with attitudes stated, the choice experiment data were linked with data from the questionnaire. Like (Bechtold and Abdulai 2014) principal component analyses (PCA) were conducted to reduce the attitudinal statements to the most important latent components. This data transformation reduces the number of variables to the principal components, which account for as much data variability as possible (Field, 2009). PCAs were conducted for each of the four data sets – in dependence of the communication treatment. The principal components uncovered were basis to conduct latent class modelling. For each derived class,

a Mixed Logit Model (MLM) was calculated to assess consumers' preferences, resulting in a Latent Class Mixed Logit Model (LCMLM). Within, the generic attributes (price, organic, suckler-based rearing, pasture-based husbandry) were modeled as random components. Price was best fitted under a lognormal distribution, whereas organic, suckler cow-based husbandry and pasture-based husbandry were estimated under a normal distribution. The no-buy option and the status-quo product were modelled as an alternative specific constant (ASC) and have been estimated as fixed alternatives. According to (Cooper, John Rose, and Crase 2012) a hybrid coding scheme was used to embody the nested structure of the choice task (Hensher, J.M Rose, and W. A. Greene 2015). Hence, effects coding was used for the No-Buy option, dummy coding for the generic attributes, setting the 'conventional' and 'barn-based' production as a reference.

Accordingly, utility is modelled by the existence of latent classes:

$$(3) U_{nsj|c} = V_{nsj|c} + \varepsilon_{nsj|c} = \beta_{nk|c} x_{nsjk} + \varepsilon_{nsj|c}$$

$U_{nsj|c}$  is the utility that individual  $n$  in consumer class  $c$  receives of good  $j$  perceived in choice situation  $s$ . Given the theoretical background, the following utility expressions were basis to estimate ethical beef choices in separate models for each communication treatment and for each class:

$$(4) U_{1,2} = \beta_{o1,2} Organic + \beta_{p1,2} Pasture + \beta_{s1,2} Suckler + \beta_{pr1,2} Price + \varepsilon_{1,2}$$

$$(5) U_3 = ASC_{Basic} + \varepsilon_{Basic}$$

$$(6) U_4 = ASC_{NoBuy} + \varepsilon_{NoBuy}$$

All models were calculated with 1000 Halton sequences.

## Results

Without informing consumers about the different systems of beef production, consumers greatly valued organic and pasture based production. Informing consumers about practices of suckler-cow rearing as an ethical alternative to conventional rearing without outdoor access led to a high preference for suckler-cow rearing in all consumer groups that received communication material. Organic production and the labelling pasture based became less important within the informed consumer groups. Over all information treatment groups, the price was not of highest relevance (Risius and Hamm 2017).

**Table 1: Coefficients (and p-values) of HCM models of the control group**

	Class 1	Class 2	Class 3
<u>Utility function</u>			
Extensive suckler cow husbandry	0.421 0.062	-1.824 0.016	0.436 0.000
Organic production	1.867 0.000	-0.713 0.019	n.s.
Pasture-based husbandry	n.s.	n.s.	0.634 0.000
Price	n.s.	n.s.	-0.364 0.000
Conventional, barn-based husbandry	-2.928 0.000	n.s.	-5.705 0.000
No-Buy Alternative	-0.964 0.000	1.703 0.007	-2.247 0.000
<u>Latent structures</u>			
Latent class probability (in %)	0.492	0.111	0.397
Constant	n.s.	-1.771 0.000	*
Consideration of animal and plant breedings	0.530 0.018	n.s.	*
Price-Performance	0.545 0.069	n.s.	*
Societal norms	n.s.	-0.725 0.023	*
<u>Model fit</u>			
N	1512		
Log-Likelihood	-1316.86		
Pseudo-R <sup>2</sup>	0.371		
Halton draws	1000		

\*Reference: Fixation to 0.



n.s.= Not significant (p-Wert>0.1)

**Table 2: Coefficients (and p-values) of HCM models of the image film group**

	Class 1	Class 2	Class 3
<i>Utility function</i>			
Extensive suckler cow husbandry	0.868 0.000	n.s.	1.364 0.000
Organic production	0.831 0.000	n.s.	0.328 0.005
Pasture-based husbandry	0.296 0.003	n.s.	n.s.
Price	-0.176 0.000	-0.624 0.000	-0.439 0.000
Conventional, barn-based husbandry	-4.790 0.000	-2.088 0.000	-5.657 0.000
No-Buy Alternative	-3.669 0.000	-6.276 0.000	-0.805 0.000
<i>Latent structures</i>			
Latent class probability (in %)	0.641	0.070	0.289
Constant	0.793 0.000	-2.305 0.000	*
Consideration of animal and plant breedings	n.s.	-1.067 0.0034	*
Price-Performance	n.s.	n.s.	*
Societal norms	n.s.	-0.694 0.032	*
<i>Model fit</i>			
N	1530		
Log-Likelihood	-1343.77		
Pseudo-R <sup>2</sup>	0,370		
Halton draws	1000		

\*Reference: Fixation to 0.  
n.s.= Not significant (p-Wert>0.1)

With regard to consumer segmentation according to choice data and attitudes, three different segments could be identified for the control group and the group, which received the image film. In the control group the three uncovered segments represented 49%, 11% and 39% of consumers. Whereas the first class preferred the organic label most, the third group preferred pasture-based production most. As such, the segmentation helped to identify different apparent target groups for beef in the control group. The segmentation for the group of consumers, who received the imagefilm, represented 64%, 7%, and 29% of consumers respectively. Comparing the preference

structure of the segmentation for the control group and for the image film, a change in preference structure was apparent. Over the identified classes, a higher preference towards suckler cow rearing and lower preference for organic production was revealed. Additionally, the size of segments which preferred suckler cow rearing increased. In the two bigger classes, class 1 and class 3, suckler cow rearing was the most decisive attribute. In the first segment, however, it was almost equally preferred like organic, whereas in the third segment, the preference for suckler cow rearing substantially higher than organic.

For the group of consumers, who received the documentary film or the leaflet, no meaningful segmentation was possible.

### **Discussion**

Even though a change in preference structure through the communication material was expected, results about the differences in the consumer segmentation based on attitudinal statements were striking. One conclusion is that the in-depth communication material was able to change and harmonize consumer preferences to the degree, that attitudes were changed. Further, it can be deduced that rational, clear communication might be more efficient in communicating production qualities of ethically produced food than emotional communication towards aligning consumer preferences.

It needs to be reflected whether more effort is needed towards studying information transmission of ethical product qualities, instead of classifying target groups to find the right market niche based on attitudinal statements.

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