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Organic- and Animal Welfare-labelled Eggs: Competing for the Same Consumers?

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Abstract

To understand the market for sustainable foods, it is important to allow for heterogeneous preferences. However, most studies of consumer preferences for sustainable foods only investigate average consumer preferences. They do not take into account that some consumer segments attempt to purchase as much sustainable food as possible, others are almost indifferent to the notion of sustainable food, and still others consider sustainable food a complete hoax. The aim of this study is to explore the preferences for various types of premium eggs across three consumer segments. We conduct a choice experiment including 900 Norwegian consumers and perform a behavioural segmentation based on the frequency of organic food purchase. We find that the segment purchasing the most organic food is, as expected, willing to pay a significant premium for organic eggs over eggs displaying only enhanced animal welfare. However, most consumers, who only occasionally purchase organic products, are unwilling to pay more for organic eggs than for enhanced animal welfare eggs, suggesting diminishing marginal utility for additional attributes. We find that a third consumer segment attempts to avoid organic eggs, even when they cost the same as other eggs. Our findings suggest that organic products will be unsuccessful in acquiring a larger share of the market as long as most consumers are unwilling to pay a premium for organic products with all their

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cost increasing sustainable attributes over products that have only a single sustainable attribute, in our case enhanced animal welfare.

Keywords: *Animal welfare*; *choice experiments*; *egg attributes*; *mixed logit*; *organic food*; *segmentation*; *willingness to pay*.

JEL classifications: *D12, D83, Q18*.

1. Introduction

Food products are increasingly differentiated using credence attributes such as organic and animal welfare, and a segment of consumers is generally willing to pay high price premiums for products with these attributes. One product for which organic and animal welfare labels are available in many stores is eggs. Comparing production standards, organic eggs involve the same or better levels of animal welfare than eggs labelled free range or other animal welfare labels (European Commission, 1999, 2007, 2008; DANÆG, 2015; The British Egg Industry Council, 2015). In addition, organic eggs have a set of other cost-increasing standards also intended to improve the sustainability of the product, such as organic fodder. In this paper, we focus on the market potential for organic- and animal welfare-labelled eggs in different consumer segments. Our results show that most consumers display positive attitudes toward organic eggs, but are generally unwilling to pay a premium for organic eggs over animal welfare-labelled eggs.

When it comes to improving production standards, policy-makers can choose between regulations or labelling. On 1 January 2012, the European Union (EU) Directive 1999/74/EC (European Commission, 1999) became effective. This directive prohibits conventional small battery cages for hens and allows for larger 'enriched cages'. The new cages must allow at least 750 cm^2 per hen, with each cage furnished with a roost, bedding and a claw-shortening device. This lifts the lower limit for animal welfare in egg production, but leaves scope for even better production conditions. However, despite support from both governments and numerous organisations over many years, food produced under organic or enhanced animal welfare standards has reached only a limited niche market (European Commission, 2013). This paper aims to provide governments, organisations and producers interested in organic- and animal welfare-labelled eggs with better insights into consumer preferences, consumer segment sizes and consumer segment characteristics.

Many consumer studies concerning the choice of sustainable food have found that their respondents assign positive values to animal wellbeing and organic production (see, e.g. Olesen *et al*., 2010; Dentoni *et al*., 2011; Gracia *et al*., 2011; Lagerkvist and Hess, 2011; Norwood and Lusk, 2011a,b; Toma *et al*., 2011; Kehlbacher *et al*., 2012; Vecchio and Annunziata, 2012; Grimsrud *et al*., 2013). While organic food is mainly purchased for health and safety reasons (Padel and Foster, 2005; Lusk and Briggeman, 2009; Napolitano *et al*., 2010), ethical concerns are most important for food produced with enhanced animal welfare standards (Harper and Makatouni, 2002). Moreover, access to information and personal responsibility are the main cues identifying the propensity to consume animal welfare labelled products (Harper and Henson, 2001; Meehan *et al*., 2002; Toma *et al*., 2012).

In general, the motivations for purchasing products with enhanced animal welfare attributes closely relate to consumer socio-demographic characteristics, knowledge of

animal welfare issues, and trust in information about rearing systems and attitudes (Toma *et al*., 2012). For example, existing findings show that pro-animal welfare behaviour positively relates to education, occupation and income (Gracia *et al*., 2009; Lagerkvist and Hess, 2011; Toma *et al*., 2011). However, recent animal welfare reviews underline that lifestyles, beliefs, awareness and values towards animal and animal wellbeing can more accurately explain the pro-welfare behaviour of consumers than their socio-demographic attributes (Vanhonacker *et al*., 2009; Toma *et al*., 2012; Vanhonacker and Verbeke, 2014).

It is common to use consumer segmentation to identify the behaviour, motivations and attitudes of certain consumer groups (Nie and Zepeda, 2011). This is fundamental for the positioning of sustainable food and for creating efficient information campaigns (Verain *et al*., 2015). In their literature review of consumer studies on animal welfare, Vanhonacker and Verbeke (2014) argue that analysis carried out only on a full sample may obscure the existence of a consumer segment highly sensitive to sustainable food products. Furthermore, they call for additional studies concerning the segmentation of consumer behaviour and willingness to pay (WTP) for such products. Some of the existing segmentation studies for animal welfare include Vanhonacker and Verbeke (2009), who investigated purchase frequencies for animal-friendly poultry products, and Vanhonacker *et al*. (2007), who examined the importance consumers assign to animal welfare issues. They also include Gracia and Zeballos (2011), who investigated the consumer concerns and attitudes toward meat with higher welfare standards and Van Loo *et al*. (2014), who examined consumer tastes and WTP for welfare labels for chicken breast meat.

The Norwegian government has a target for organic production and consumption of 15% of all food by 2020. They aim to reach this target by supporting organic producers and thereby improving the availability and reducing the price gap between conventional and organic food products (Ministry of Agriculture and Food, 2009). However, they are still far from reaching their targets and the interest from consumers seems less than anticipated (Vittersø and Tangeland, 2015). One can question whether the policy-makers have taken the complaints from the segment most eager for organic food to represent the view of the whole population, and whether they have taken account of the growing number of products carrying other types of sustainability labels competing for the sustainability concerned consumers. Eggs are the most successful organic product in Norway with a market share of 7%, while the overall market share for organic food is only 1.45% (Norwegian Agriculture Agency, 2015). In the egg market, organic is competing against animal welfare labelled products, while in other markets organic is also competing against food labelled as local, fair trade or sustainable.

In this paper, we investigate the preferences of Norwegian consumers for eggs from organic, Friland, free-range and battery systems. We perform segmentation based upon organic food purchase frequency to examine how preferences differ among consumer groups according to sustainable food choice. This approach allows us to identify preferences and buying motivations starting from consumers' stated sustainable consumption (Vanhonacker and Verbeke, 2009; Verain *et al*., 2015). We describe three consumer groups defined by different purchasing behaviour, and investigate their preferences for organic- and animal welfare-labelled eggs. We collect the data in an online survey of Norwegian consumers.

The remainder of the paper proceeds as follows. In section 2, we provide a brief review of the recent literature on consumer preferences for eggs. In section 3, we

describe our choice experiment. In section 4, we present and discuss the results. Section 5 provides some concluding remarks.

2. Background

2.1. Egg terminology

Eggs are especially suitable for the study of consumer attitudes and behaviour relating to organic and animal welfare because consumers can select eggs based upon different levels of animal wellbeing; see the meta-analysis in Lagerkvist and Hess (2011). The Norwegian animal welfare-ranked hierarchy for eggs is as follows: (i) the battery system (hens living in cages), (ii) the free-range system (hens can move freely indoors, either in aviaries or on the floor), (iii) the Friland system (hens can move freely both indoors and outdoors), and (iv) organic systems (the same animal welfare standard as Friland, but with organic feed) (Freedom Food, 2014).

In Norway, 'free-range eggs' is the commonly used term for eggs laid by indoor free-range hens, corresponding to the 'barn system' in EU regulations (European Commission, 2003). In contrast, in the EU, the term 'free-range eggs' applies when hens have continuous daytime access to open-air runs. In this paper, we use the Norwegian hierarchy, where the common term for barn eggs in Norway is free-range eggs, which may provide more positive animal welfare connotations than the conventional EU term. For organic eggs, Norway follows EU regulations (European Commission, 2008), that is, organic hens must have access to outdoor areas. Each hen should have at least 6 m^2 of area indoors and 4 m^2 outdoors in which to move freely, and all feed must be organic.

2.2. Consumer studies on eggs

Several studies have investigated consumer preferences for egg attributes. Freshness, visual characteristics, origin and price are commonly among the most important information purchasers seek when buying eggs; animal welfare issues are generally less relevant (Kvakkestad *et al.*, 2011; Mesías *et al.*, 2011; Vecchio and Annunziata, 2012). In contrast, consumer concern for animal welfare in egg production is evident from a 2005 survey, where EU citizens considered laying hens as having the most need for improved living conditions among all farmed animals, with most respondents willing to pay extra for eggs from animal welfare production systems (European Commission, 2005).

Two studies have segmented the UK egg market. In the first, Gerhardy and Ness (1995) grouped participants into five segments, based on the value they ascribed to egg attributes such as freshness, method of production, origin and price. In the second study, Fearne and Lavelle (1996) segmented UK egg consumers into four groups based on price sensitivity and animal welfare concerns. Both studies found similar segments typified by distinct preferences towards price and eggs production methods. However, the dimensions of the consumer groups are not analogous. For instance, while most participants of the first study had the highest utility for free-range eggs, the second study identified only a small segment preferring free-range eggs. This indicates that segmenting consumers is not straightforward or necessarily robust.

Gracia *et al.* (2014) found that Spanish consumers were willing to pay a premium for animal welfare-friendly systems and the proximity of farms when buying eggs.

Moreover, they identified that local and organic characteristics were complements for consumers preferring origin attributes. In a Danish study, Baltzer (2004) found that egg purchasers were willing to pay most for eggs from organic farms, followed by barn, free-range and cage systems. Andersen (2011) also found that the WTP for free-range eggs was lower than that for barn eggs, meaning that purchasers thus preferred the barn eggs.

Using a calibrated auction-conjoint valuation method, Norwood and Lusk (2011b) found that US consumers considered animal welfare conditions as an important attribute for eggs. Consumers were willing to pay most for organic eggs, followed by free range, aviary, barn and last, cage eggs. In another US study, Heng *et al.* (2013) confirmed that purchasers were willing to pay extra for eggs from organic farms, outdoor access and cage-free housing. Moreover, consumers paid more attention to animal living conditions than to environmental concerns in the choice of eggs. Performing a meta-analysis of nine earlier studies, Lagerkvist and Hess (2011) found that the WTP for laying hen wellbeing attributes increased with consumer income and decreased with consumer age. Further, French and German consumers were willing to pay most for hen welfare, Danish purchasers the least.

Regarding label understanding and knowledge, most EU consumers (51%) could not easily identity eggs from animal welfare systems when making their purchases in 2005 (European Commission, 2005). In an Italian study, Vecchio and Annunziata (2012) found that 67% of their subjects were very unfamiliar with the alphanumeric code displayed on eggshells or the egg carton, while only 11% understand this information relating to the rearing system. Consistent with these findings, other studies on animal welfare have suggested that stakeholders should invest in both information campaigns and labelling systems concerning animal living conditions in order to justify the price premium for producers and to help consumers make informed choices (Napolitano *et al.*, 2010; Olesen *et al.*, 2010; Toma *et al.*, 2012; Vecchio and Annunziata, 2012). Moreover, education programmes, with the aim of enhancing consumer awareness, can help to reach new consumer segments (Vanhonacker and Verbeke, 2014).

2.3. Segmenting consumers according to organic food purchase

When explaining sustainable food consumption, researchers can take into account several variables, such as sociodemographic, values, beliefs, attitudes, lifestyles or behaviour (Kihlberg and Risvik, 2007; Vanhonacker and Verbeke, 2009; Paul and Rana, 2012; Lund *et al.*, 2013; Andersen and Lund, 2014; Nasir and Karakaya, 2014; Verain *et al.*, 2016). In their review on sustainable consumption segmentation, Verain *et al.* (2012) found that behavioural variables (e.g. buying behaviour, consumption frequency, green purchase intention) are efficient in categorising consumer segments with respect to different levels of sustainable consumption. Studies including the buying frequency of organic foods as segmentation variable detected significant differences among consumers' groups concerning attitudes, motivations and willingness to pay for organic food (Vanhonacker and Verbeke, 2009; Bartels and van den Berg, 2011; Mesías Díaz *et al.*, 2012; von Meyer-Höfer *et al.*, 2015; Verain *et al.*, 2015).

Most of the studies about sustainable purchase behaviour found a 'green', a 'potential green' and a 'non-green' segment (Verain *et al.*, 2012). The 'green' segment is associated with consumers who are frequent buyers of organic, show a higher involvement with environment, greater concern for animal welfare and their health and

higher willingness to pay for organic products (Chryssohoidis and Krystallis, 2005; Honkanen and Olsen, 2009; Bartels and van den Berg, 2011; Mesías Díaz *et al*., 2012; Pino *et al*., 2012; Nasir and Karakaya, 2014). The segment of 'potential green' consumers is characterised by occasional organic buyers who display concerns for environment and health, but are quite price sensitive (Gil *et al*., 2000; Chryssohoidis and Krystallis, 2005; D'Souza *et al*., 2006; Pino *et al*., 2012). 'Non-green' purchasers express the lowest concerns for the environment and negative attitudes towards sustainable consumption (Gil *et al*., 2000; Verain *et al*., 2015). Verain *et al*. (2012) conclude their review stating that most researches identified the three groups. However, the number or the typology of segments may differ depending on segmenting or profiling variables, different countries and/or methods used.

3. Data and Estimation

3.1. Sample

We conducted a choice experiment as part of a Norwegian web survey in June and July 2013. The sample consists of 948 Norwegian consumers, recruited from TNS Gallup's Norwegian online survey panel. The summer send out resulted in a response rate of about 40%, which is on the low side for this kind of online panel in Norway. All the participants stated that they were the main purchasers of food in the household.

We segmented the participants into three groups based on how often they purchased organic products with the aim to describe three modalities of sustainable consumption. The overall sample is representative when it comes to gender and education, but the lowest level of income is underrepresented and the age group 54–70 years is overrepresented.[2] Section 4 provides details about the socioeconomic characteristics of the full sample and the three consumer segment samples.

3.2. Description of the choice experiment

In the choice experiment, we used four attributes to describe the eggs: production method, the number of eggs per carton, the price per egg in Norwegian kroner (NOK), and the size of the eggs. We choose attributes based on the results of an in-store survey, which showed that animal welfare, number of eggs per carton and size were among the most important characteristics for Norwegian egg consumers (Schjøll *et al*., 2013). The price presented was per carton because that is how consumers commonly relate to egg prices. The price per carton is the number of eggs in each carton multiplied by the price per egg. Table 1 presents the attribute levels.

Before respondents made any choices, we provided information about the four different production systems used for the hens laying the eggs. Table 2 presents this information.

Figure 1 presents the choice experiment. Each respondent's task was to perform a full ranking of the four egg cartons. Each respondent undertook four such rankings.

[2]The underrepresentation of low incomes is not uncommon in web-surveys, while the lack of age representatively we think can be a result of the summer send out. At the time of the survey, the school holidays had started and we seem to lack people in the age groups most likely to have children living at home.

Table 1
Attributes and levels in the choice experiment

Production method	Eggs per carton	Price per egg in NOK	Size of egg
Battery	6	1.5	Medium
Free-range	12	2.0	Large
Friland		2.5	
Organic		3.0	
		3.5	
		4.0	
		4.5	
		5.0	

Table 2
Information given to the respondents before the choice experiment. Translated from Norwegian

Organic and Friland production of eggs have slightly different animal welfare rules than the regular production of eggs. For example, there may be up to 9 hens per square meter in regular production, while it may be only six hens per square meter in organic and Friland production. In addition, in organic and Friland systems, hens can move in outdoor spaces with a density of only four hens per square meter, when the weather is fine.

On the following screens, we ask you to choose among four types of egg cartons. The egg cartons vary with price, size and system of production (regular, free-range, organic or Friland production).

- Regular production means that hens living in cages produce the eggs. From January 2012, these cages have become larger (but unchanged in surface area per hen), and cages must be furnished (roost, bedding, and a claw-shortening device) to improve conditions for the hens.
- Eggs from free-range systems are produced by hens that move freely indoors.
- Organic eggs come from hens that move freely indoors, have a little more space than free-range hens, have outdoor access, and in addition, the fodder is organic.
- Eggs from Friland hens are produced under the same animal welfare rules as organic eggs, but the hens are not fed with organic fodder.

To obtain as much information as possible in a cost efficient way, we employed a choice experiment with full ranking of the four alternatives in each choice set. This gives more complete preference information from each choice set than if each respondent was only asked to state his or her preferred alternative.

Following earlier ranking choice experiments, including Mueller *et al.* (2010) and Eckert *et al.* (2012), we constructed the choice experiment without a no-choice alternative. However, whereas several of the earlier studies include a follow up question asking whether the respondent would actually purchase the preferred alternative, our study did not. Therefore, we can estimate WTP for product attributes, but not total WTP for a specific type of egg. It should here be noted that survey participants tend to overstate their WTP (List and Gallet, 2001; Alfnes and Rickertsen, 2003; Lusk and Shogren, 2007), especially when products with normative attributes are involved. Furthermore, many studies have concluded that choice experiments are not able to incorporate the complexity of the market and therefore are not able to accurately predict real market shares for food products (e.g. Chang *et al.*, 2009; Resano-Ezcaray *et al.*,

Rank the four egg cartons, A, B, C and D, from the most preferred carton to the least preferred carton. A ranking of 1 denotes your most preferred egg carton and 4 is the least preferred egg carton. Check one circle on each line.

A		B		C		D	
							
1	○	1	○	1	○	1	○
2	○	2	○	2	○	2	○
3	○	3	○	3	○	3	○
4	○	4	○	4	○	4	○

Figure 1. Choice experiment with ranking of four different egg cartons. Translated from Norwegian

2010; Hudson *et al*., 2012). These two weaknesses are of course not limited to choice experiments, but are common problems for more or less all survey and lab methods used to elicit consumer preferences.

We use the choice experiment for what it is best suited for, exploring preferences for attributes in different segments by studying the impact that different attributes have upon choice, and not to accurately predict demand in a complex market (Hensher *et al*., 2007, p. 176).

3.3. Design

The design has $4 \times 2 \times 8 \times 2 = 128$ possible combinations of attributes and levels from which we created 24 choice sets using the SAS %ChoicEff macro (Kuhfeld, 2010). During the web survey, we randomly drew four of these choice sets for each respondent, giving each respondent a unique combination of choice sets.

3.4. Estimation method

A generalisation of McFadden's conditional logit model to full ranking data was proposed by Beggs *et al*. (1981) and further developed by Hausman and Ruud (1987) under the name of rank-ordered logit model. NLOGIT 5.0 (Greene, 2012) allows a ranking specification for most types of logit models.

We estimated a rank-ordered mixed logit model with the following random utility function:

$$U_{ijt} = \beta_{1i}Battery_{ijt} + \beta_{2i}Friland_{ijt} + \beta_{3i}Organic_{ijt} + \beta_{4i}Twelve_{ijt} + \beta_{5i}Large_{ijt} + \beta_{6}Price_{ijt} + \varepsilon_{ijt}$$

where U_{ijt} is the utility per egg for individual i when choosing egg carton j in choice situation t. *Battery, Friland,* and *Organic* refer to the battery, Friland and organic production methods, respectively. The variable *Twelve* refers to a carton of 12 eggs, while *Large* refers to large-sized eggs. The price used in the estimation is per egg and measured in NOK. The exogenous production and size variables are dummy variables.

We estimate the utility function with NLOGIT 5.0 (Greene, 2012) using a mixed logit specification for ranked data with 1,000 Halton draws, a panel structure, and freely correlated random parameters. All non-price parameters are random, following the standard normal distribution (Train, 1999). The base alternative is an egg in a carton of six medium-sized free-range eggs. The marginal WTP for the product attributes are estimated by dividing the production method and the two size parameters from the mixed logit by the negative of the price parameter. Standard errors needed for the estimation of WTP confidence internals are estimated using the delta method.

3.5. Segmentation

Personality characteristics, food lifestyles, and purchase behaviour are efficient segmentation variables to identify diversified sustainable consumers' groups (Verain *et al*., 2012). The most common technique for segmenting consumers is by socio-demographics or based on their answers on general food questions. The latter approach was used in two recent studies by Lund *et al*. (2013) and Andersen and Lund (2014). Lund *et al*. (2013) find six consumer segments, where three of them are positive towards organic food, and only one is really skeptical. In a follow-up paper by Andersen and Lund (2014), these six attitude-based segments are used to analyse purchases of organic food. They find a close relationship between attitudes towards organic food and consumption of organic food.

In this study, we perform a segmentation based upon the stated buying frequency of organic food (Vanhonacker and Verbeke, 2009; Bartels and van den Berg, 2011; Mesías Díaz *et al*., 2012; von Meyer-Höfer *et al*., 2015; Verain *et al*., 2015). This segmenting variable is strongly correlated to positive attitudes towards environment, health concerns, and higher willingness to pay for organic and ethics products (Verain *et al*., 2012; Andersen and Lund, 2014).

We asked how often participants bought organic food ('Always/often', 'Sometimes', 'Never', and 'Don't know'). We used this organic purchase frequency question to group the respondents into three behavioural segments, which we then included in the analysis below. This allowed us to investigate the preferences for organic- and animal welfare-labelled eggs in three different segments based on different stated purchasing behaviour. People answering 'Don't know' to the segmentation question were excluded from the analysis of the segments.

To explore the attitudes of the three behavioural segments, we asked the participants to state how important a series of attributes are in their choice of food, using a 6-point scale from 1 = 'not important' to 6 = 'very important'. We performed a principal component analysis (PCA) on the attributes using the PCA function in the R package FactoMineR (Lê *et al*., 2008; Husson *et al*., 2010; R Core Team, 2015). We included the purchase frequency of organic food as a supplementary categorical variable with three categories ('Always/often', 'Sometimes', and 'Never'). This allowed us to identify how stated importance of these food attributes is related to the three categories of purchasing behaviour used for the segmentation.

4. Results and Discussion

Table 3 provides an overview of the descriptive statistics for the sample and the three segments, based on organic food purchase frequency. While most participants responded that they sometimes purchase organic food (63.6%), only 17.84% state that they are a typical organic buyer and 16.68% that they never purchase organic food. The 'Always/often' and 'Never' segments display statistically significant differences for age, gender and education (the *P*-values from *t*-tests with a 95% confidence interval are 0.03, <0.01, and 0.03, respectively). These suggest that consumers who typically buy organic food are on average younger, more likely to be female, and possess a higher education level than non-organic food buyers.

Table 4 provides the estimation results from the mixed logit model of the 'Full sample' and the 'Always/often', 'Sometimes', and 'Never' organic segments. All coefficient estimates are relative to the base alternative, namely, an egg in a carton of six medium-sized free-range eggs. In the 'Full sample' model, all of the estimated coefficients are statistically significant.

The negative values of the estimates for *ORGANIC*, *FRILAND,* and *BATTERY* in the full sample indicate that the utility of organic, Friland, and battery eggs are lower than eggs from free-range rearing systems, the base alternative in the estimation. However, the statistically significant standard deviations indicate heterogeneous preferences within the 'Full sample'. *BATTERY* eggs are the least preferred in the full sample, while *ORGANIC* eggs are the second-most preferred after free-range eggs. The number of eggs per carton (*TWELVE*) and egg size (*LARGE*) also increase utility per egg in the full sample. The larger the egg, the more grams of egg per egg, so it is reasonable to prefer larger eggs. For the number of eggs per carton, the positive parameter

Table 3

Socio-demographic characteristics of the full sample and consumer segments*

Socio-demographic characteristics	Norwegian population† (%)	Full sample (%)	Always/ often (%)	Sometimes (%)	Never (%)
Age					
20–36 years	34	20	25	20	15
37–53 years	37	30	30	31	31
54–70 years	29	50	45	49	54
Gender					
Female	50	52	65	53	38
Education level					
High school or lower	70	70	64	71	73
More than high school	30	30	36	29	27
Household income					
<NOK 399,999	44	12	15	11	14
NOK 400,000–999,999	49	60	52	63	58
≥NOK 1,000,000	7	16	18	15	19
No response	–	11	14	10	8
N	5,109,056	948	170	603	159

Notes: *Participants who answered 'Do not know' to the question about organic food purchase frequency were excluded from the segmentation.

†***Source****:* Statistics Norway (2013, 2014a,b).

Table 4
Estimated coefficients for the mixed logit model with free-range eggs as the base alternative

	Full sample	Always/often	Sometimes	Never
Variable	Coefficient (SE)			
Means of parameters in utility function				
ORGANIC	−0.12***	4.86***	−0.47***	−2.77***
	(0.02)	(0.58)	(0.14)	(0.05)
FRILAND	−0.21***	1.44***	−0.46***	−0.81***
	(0.02)	(0.39)	(0.12)	(0.05)
BATTERY	−4.44***	−8.50***	−4.54***	−2.72***
	(0.18)	(1.09)	(0.24)	(0.09)
TWELVE	0.11***	0.31	0.09	0.25***
	(0.02)	(0.23)	(0.07)	(0.05)
LARGE	0.06***	0.01	0.04	0.26***
	(0.02)	(0.17)	(0.05)	(0.05)
PRICE	−0.67***	−0.55***	−0.73***	−0.71***
	(0.01)	(0.07)	(0.02)	(0.02)
Standard deviations of random parameters				
ORGANIC	3.57***	5.60***	2.72***	3.09***
	(0.02)	(0.61)	(0.12)	(0.06)
FRILAND	2.37***	4.42***	2.19***	1.78***
	(0.02)	(0.50)	(0.11)	(0.05)
BATTERY	3.97***	5.52***	3.95***	4.55***
	(0.13)	(0.85)	(0.23)	(0.09)
TWELVE	1.17***	1.12***	1.25***	1.18***
	(0.01)	(0.25)	(0.07)	(0.03)
LARGE	0.38***	0.57**	0.35***	0.64***
	(0.13)	(0.26)	(0.99)	(0.01)
Number of participants	948	170 (18%)	603 (64%)	159 (18%)
Number of observations	3,792	680	2,412	636
Log likelihood	−8,167.05	−943.15	−5,273.99	−1,470.30
Log likelihood (0)	−11,936.07	−2,099.54	−7,577.34	−2,015.21
AIC	16,376.1	1,928.3	10,590.0	2,982.6
AIC/*N*	4.319	2.836	4.391	4.690
BIC	16,507.2	2,023.3	10,711.5	3,076.2
BIC/*N*	4.353	2.975	4.441	4.837

Note: ** and *** denote significance at the 5% and 1% level, respectively.

estimate for the larger cartons means that consumers prefer cartons with 12 eggs compared to cartons with six eggs when the price per egg is the same. In stores, the per egg price of 12-egg cartons is usually lower than six-egg cartons, and consumers may be accustomed to thinking of the larger cartons as a better bargain than the smaller cartons. Furthermore, the habit of buying 12-egg cartons, as detected in a Norwegian in-store survey (Schjøll *et al.*, 2013), may affect the choices of some participants.

Focusing on the three segments, we can see that the preferences differ quite substantially. While the 'Always/often' organic segment displays the highest utility for

ORGANIC eggs, the 'Never' group rates organic eggs as the least preferred. The lowest utility for the 'Always/often' and 'Sometimes' segments is associated with *BATTERY* eggs. On the whole, 'Sometimes' and 'Never' groups exhibit negative utility for *ORGANIC*, *FRILAND*, and *BATTERY* systems when compared with the free-range systems. The *TWELVE* and *LARGE* attributes are positive and statistically significant for the utility function of the 'Never' segment. The negative and statistically significant estimate for *PRICE* implies that an increase in the price per egg reduces consumer utility across all three segments. It is also worth noting that the statistically significant standard deviations indicate that there are variations in preferences also within the segments.

Table 5 presents the average marginal WTP for *ORGANIC*, *FRILAND*, and *BATTERY* eggs relative to free-range eggs. The table also presents the markups for eggs sold in 12 egg cartons relative to six egg cartons, and for large eggs relative to medium eggs. We calculate the WTP by dividing the mean estimated coefficient for *ORGANIC*, *FRILAND*, *BATTERY, TWELVE*, and *LARGE* in the utility function by the (negative) *PRICE* parameter. Confidence intervals are estimated with the delta method.

As noted in the discussion of choice experiments in section 3.2, survey participants usually display low sensitivity to price differences when normative attributes such as animal welfare, sustainability, and fair trade are included in the study. As a result, WTP estimates from surveys are usually large compared to what can be expected in the market, and our numbers seem to fall in line with these typical findings. The focus on the credence attributes was possibly strengthened by our focus on these attributes in the presentation of egg types in the information accompanying the choice experiment (see Table 2). Therefore, we mainly draw conclusions based on the qualitative differences between the WTP for the different egg types in the three segments, and do not suggest that this represents the price premiums possible in the market. With this warning, we now discuss the WTP results.

By calculating the marginal WTP, we obtain results from the different samples that are on the same monetary scale. This allows us to compare the preferences across samples. We note that the 95% confidence intervals for the mean WTP for the three

Table 5

Marginal WTP estimates with free-range eggs as the base alternative (NOK per egg)

	Full sample	Always/often	Sometimes	Never
Variable	Coefficient (95% confidence interval)			
ORGANIC	−0.17***	8.77***	−0.63***	−3.91***
	(−0.23, −0.12)	(6.41, 11.11)	(−1.00, −0.27)	(−4.22, −3.61)
FRILAND	−0.31***	2.60***	−0.63***	−1.14***
	(−0.37, −0.25)	(1.15, 4.05)	(−0.93, −0.33)	(−1.30, −0.99)
BATTERY	−6.58***	−15.31***	−6.18***	−3.84***
	(−7.08, −6.08)	(−19.89, −10.74)	(−6.77, −5.58)	(−4.17, −3.51)
TWELVE	0.17***	0.56	0.13	0.36***
	(0.12, 0.22)	(−0.27, 1.40)	(−0.07, 0.32)	(0.22, 0.50)
LARGE	0.09***	0.01	0.05	0.37***
	(0.05, 0.14)	(−0.57, 0.59)	(−0.08, 0.18)	(0.24, 0.50)

Note: ***Denotes significance at the 1% level.

production attributes are not overlapping between the three segments, indicating different preferences between the three segments.

The relative ranking of the alternatives within each sample is unchanged from the preference space (Table 4) to WTP space (Table 5). On average, consumers prefer free-range eggs most and rank battery eggs lowest. We can see that the 'Always/often' segment prefers organic eggs whereas the 'Never' segment attempts to avoid them. Worth noting from the WTP results are the large differences between the 'Always/often' segment and the remaining segments with respect to how important the production method is relative to the price. The difference in WTP for the 'Always/often' segment between the best and worst alternative is almost four times larger than that for the 'Sometimes' segment, and more than six times larger than the same differences for the 'Never' segment. The 'Always/often' segment is therefore clearly willing to put money behind their preferences for what they consider the best production practices, while this is a more questionable commitment for the other consumer segments.

The average ordering of the egg types with free-range on top differ from other studies on consumer preferences for egg attributes, but are similar to two recent poultry studies. Norwood and Lusk (2011b) found that US consumers are willing to pay the highest price for organic eggs, followed in order by aviary free-range (Friland in Norway), barn (free-range in Norway), and cage (battery) eggs. Baltzer (2004) concluded that Danish consumers are willing to pay extra for eggs from organic (+58%), barn (+43%), and free-range (+15%) systems, compared with eggs from cage systems. In contrast to the previous egg studies, two recent studies focusing on animal welfare and organic attributes in eggs (Gracia *et al.*, 2014) and poultry meat (Van Loo *et al.*, 2014) are more in line with our results. They both found that consumers assign higher values to 'free-range' claims than organic claims. Our results, showing that most purchasers are unwilling to pay a premium for organic eggs, are also consistent with the findings of Vittersø and Tangeland (2015), who observed that from 2000 to 2013, trust in and perceptions of organic food by Norwegian consumers became less favourable.

To better understand the attitudes and beliefs of the survey respondents, we asked the participants to evaluate the importance of 15 attributes during food choice. The possible responses ranged on a six-point scale from 1 = 'Not important' to 6 = 'Very important'. The PCA on these attributes allowed us to test the underlying preferences in the three segments (Table 6). 'Taste' and 'Shelf life' were not included in this analysis because they did not provide an acceptable level of explanation (communalities < 0.5) (Hair *et al.*, 2006). The remaining 13 food attributes were specified in the PCA as active variables and the three segments ('Always/often', 'Sometimes', and 'Never') as modalities of a supplementary categorical variable that is the 'Frequency of organic purchase'.[3]

The four components associated with an eigenvalue higher than 1 explained the 66.74% of the variance on the responses. 'Component 1' (37.16% of the explained variance) is mostly defined by sustainability and health related attributes, such as 'Environmentally friendly', 'Animal welfare', and 'Vitamin content'. The 'Always/

[3]In addition, a two-step cluster analysis was performed using the 13 attributes as segmenting variables. It showed that a three clusters solution fit the data. The cluster sizes were of 14.9%, 50.1%, and 35.0% from the most to the least sustainable, respectively. A Chi-Squared test of independence ($P < 0.01$) between clusters and segments confirmed that the *a priori* segmentation based on the purchase frequency of organic food gives an effective indication for clusters based on attitudes.

Table 6
Principal component analysis on the attributes' importance during food choice for the three segments

	Component 1	Component 2	Component 3	Component 4
Active variables	Correlation coefficients			
Environmentally friendly	**0.81**	−0.29	0.10	−0.21
Animal welfare	**0.78**	−0.27	0.06	−0.26
Vitamin content	**0.73**	0.06	0.33	−0.13
Pesticides/medicine residues	**0.73**	−0.15	0.14	−0.08
Conditions for workers	**0.73**	−0.23	−0.13	0.17
Short travel	**0.70**	−0.16	−0.35	0.35
Healthiness	**0.70**	0.05	0.35	−0.18
Country of origin	**0.61**	−0.14	−0.36	0.46
Freshness	0.47	**0.52**	−0.03	−0.13
Smell	0.40	**0.65**	−0.15	−0.09
Looks	0.35	**0.71**	−0.17	−0.10
Price	−0.10	0.10	**0.71**	0.43
Former experience with product	0.28	0.31	0.19	**0.62**
Supplementary categorical variable	Estimates of category coordinates			
Frequency of organic purchase				
Always/often	1.30***	−0.63***	−0.07	−0.45***
Sometimes	−0.06	0.06**	0.06**	0.11***
Never	−1.17***	0.44***	−0.17**	0.05

Notes: ** and *** denote significance at the 5% and 1% level, respectively. Correlation coefficients higher than 0.5 are in bold.

often' segment is positively correlated to this dimension and statistically significant: the average coordinate of the individuals in this category is greater than zero on the axis. This indicates that the individuals in the 'Always/often' segment have a greater mean for the attributes positively correlated to 'Component 1' than the general average (Husson *et al.*, 2010). The 'Never' segment is negatively correlated to this dimension, instead. 'Component 2' (12.23% of the explained variance), described by 'Smell', 'Looks', and 'Freshness', is positively correlated to the 'Never' category and negatively associated with the 'Always/often' respondents. The 'Sometimes' group has a positive correlation on 'Component 2' which is intermediate with respect to the other two categories. The 'Sometimes' segment is positively correlated with 'Component 3' (8.71% of the explained variance) that is associated with price, while the 'Never' group shows a negative connection. 'Former experience' with the product describes the best 'Component 4' (8.63% of the explained variance). The 'Sometimes' category is positively correlated to this component, while the 'Always/often' category is negatively linked.

Overall, our 'Always/often', 'Sometimes', and 'Never' segments show similarities with the 'green', 'potential green', and 'non-green' consumers identified and described by Verain *et al.* (2012), respectively. From our results, we find that consumers who typically buy organic food are the most interested in problems relating to the environment and animal welfare. They prefer the organic and Friland eggs and are willing to pay the highest price for these two types of eggs. These results are largely consistent

with other studies concerning the attitudes of organic food buyers (Padel and Foster, 2005; Nie and Zepeda, 2011; Paul and Rana, 2012). The largest consumer segment, namely, the 'Sometimes' segment, who is generally caring most for the price and former experience with the product, prefers eggs from free-range systems. They are willing to pay the same price for organic and Friland eggs, NOK 0.63 less than for a free-range egg.

Norwegian consumers who never purchase organic food do not seem to be interested at all in buying organic eggs. In fact, they are willing to pay less for organic eggs than for all other types of eggs. They also declare that they are not very price sensitive, as we can see from the statistically significant negative correlation with 'Component 3'. However, as seen in Table 5, they are the segment with the lowest spread in WTP for production attributes, indicating that they care less about ethic credence attributes such as animal welfare than about price. It would appear that Norwegians who do not purchase organic food have not generally accepted its positive claims, and hence, rank organic eggs last in the choice experiment. Perhaps, they believe that the benefits of organic products have been oversold, leaving them with a negative view of organic products.

5. Conclusions

Organic production and animal welfare are ethical credence attributes characterising food products. Understanding consumer preferences for these attributes is useful for stakeholders promoting the consumption of sustainable food. However, while preferences for sustainable food have been widely examined for average consumers, few studies focus on these for consumer segments. A methodology that adds additional information on sustainable behaviour is segmentation of consumers based on purchase frequency of organic food products. This technique is efficient for describing different modalities of sustainable consumption and is strongly related to segmentation based on attitudes.

Using a choice experiment and behavioural segmentation based on the stated consumption of organic products, we investigated egg production preferences across three consumer segments. Our results show significant differences between the segments. The largest segment that sometimes buys organic products, prefers eggs that carry some kind of claim over battery eggs, but the differences between the premium eggs, though statistically significant, are modest in economic terms. Free-range eggs seem to fulfill this segment's desire for eggs with a better animal welfare than a battery-produced egg. As price is likely to be more important in real stores than in a survey, battery eggs will be the natural choice for some of the price-sensitive consumers in this segment.

The segment that declares that they always or often purchase organic products indicate that they are not very price sensitive and will choose those eggs which they consider involve the best production method. Organic eggs, costing more to produce because of their strict regulations on factors such as feed, will likely be appreciated by customers in this segment. These consumers strictly prefer organic eggs to other types of eggs, and have a high WTP to pay for organic. However, this segment comprises just one-sixth of the participants, thereby limiting organic eggs to a niche market. It is also worth noting that the Always/often segment size is more than three times the market share of organic eggs in Norway. A likely explanation of the difference between segment size and market share is that some participants misrepresent their

organic purchases and that the segment is in fact smaller than the results of the survey suggest. The more price-sensitive consumers in this segment are likely to buy free-range or Friland eggs, as these yield some of the same benefits as organic eggs but at a lower price.

The third consumer segment we studied is those that say they never purchase organic food. In fact, our results indicate that they display negative attitudes to organic eggs, strictly preferring free-range and Friland eggs. This segment is also the one that cares least about production method and most about factors such as the size of the eggs and the cartons. Hence, low-priced battery eggs are likely to satisfy this market segment, while costly organic eggs are unlikely to find any customers here.

The overall impression of our results is that there is a segment of consumers willing to pay a substantial premium for organic eggs, but this segment is limited in size. Most of our Norwegian consumers do not seem to appreciate the value added of organic eggs, such as the use of organic feed. Alternatively, the results suggest that most consumers have diminishing marginal utility for added attributes. This would mean that they prefer a labelled product, but it is not important which label it is as long as they are not purchasing an inferior alternative. In both cases, the egg type providing consumers with the feeling of purchasing a premium product at the lowest price is likely to gain most of the market, together with the existing price leader, namely, battery eggs.

References

Alfnes, F. and Rickertsen, K. 'European consumers' willingness to pay for US beef in experimental auction markets', *American Journal of Agricultural Economics*, Vol. 85, (2003) pp. 396–405.

Andersen, L. M. 'Animal welfare and eggs: Cheap talk or money on the counter?', *Journal of Agricultural Economics*, Vol. 62, (2011) pp. 565–584.

Andersen, L. M. and Lund, T. B. 'Digging deeper: How do different types of organic consumers influence the increasing organic market share?', *British Food Journal*, Vol. 116, (2014) pp. 16–29.

Baltzer, K. 'Consumers' willingness to pay for food quality: The case of eggs', *Acta Agriculturae Scandinavica, Section C – Food Economics*, Vol. 1, (2004) pp. 78–90.

Bartels, J. and van den Berg, I. 'Fresh fruit and vegetables and the added value of antioxidants', *British Food Journal*, Vol. 113, (2011) pp. 1339–1352.

Beggs, S., Cardell, S. and Hausman, J. 'Assessing the potential demand for electric cars', *Journal of Econometrics*, Vol. 16, (1981) pp. 1–19.

Chang, J. B., Lusk, J. L. and Norwood, F. B. 'How closely do hypothetical surveys and laboratory experiments predict field behavior?', *American Journal of Agricultural Economics*, Vol. 91, (2009) pp. 518–534.

Chryssohoidis, G. M. and Krystallis, A. 'Organic consumers' personal values research: Testing and validating the list of values (LOV) scale and implementing a value-based segmentation task', *Food Quality and Preference*, Vol. 16, (2005) pp. 585–599.

DANÆG. (2015). Eggs from free-range hens. Available at: http://www.danaeg.dk/Products/Frilandsaeg.aspx/ (last accessed 27 January 2015).

Dentoni, D., Tonsor, G., Calantone, R. and Peterson, H. C. '"Animal welfare" practices along the food chain: How does negative and positive information affect consumers?', *Journal of Food Products Marketing*, Vol. 17, (2011) pp. 279–302.

D'Souza, C., Taghian, M. and Lamb, P. 'An empirical study on the influence of environmental labels on consumers', *Corporate Communications: An International Journal*, Vol. 11, (2006) pp. 162–173.

Eckert, C., Louviere, J. J. and Islam, T. 'Seeing the forest despite the trees: Brand effects on choice uncertainty', *International Journal of Research in Marketing*, Vol. 29, (2012) pp. 256–264.

European Commission. 'Council Directive 1999/74/EC of 19 July 1999 laying down minimum standards for the protection of laying hens', *Official Journal of the European Communities*, L 203/53 (1999) pp. 53–57.

European Commission. 'Commission Regulation (EC) No. 2295/2003 of 23 December 2003 introducing detailed rules for implementing Council Regulation (EEC) No. 1907/90 on certain marketing standards for eggs', *Official Journal of the European Union*, L 340/16 (2003) pp. 5–20.

European Commission. 'Attitude of consumers towards the welfare of farmed animals', *Special Eurobarometer*, Vol. 229, (2005) pp. 1–56.

European Commission. 'Council Regulation (EC) No. 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No. 2092/91', *Official Journal of the European Union*, L 189 (2007) pp. 1–23.

European Commission. 'Commission Regulation (EC) No. 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control', *Official Journal of the European Union*, L 250/1 (2008) pp. 1–84.

European Commission. Organic Food and Drink – Consultation on EU Rules (2013). Available at: http://ec.europa.eu/news/agriculture/130116_en.htm/ (last accessed 27 January 2015).

Fearne, A. and Lavelle, D. 'Segmenting the UK egg market: Results of a survey of consumer attitudes and perceptions', *British Food Journal*, Vol. 98, (1996) pp. 7–12.

Freedom Food. *Shopping Guide for Eggs* (2014). Available at: http://www.freedomfood.co.uk/wheretobuy/egg-guide/ (last accessed 14 October 2014).

Gerhardy, H. and Ness, M. R. 'Consumer preferences for eggs using conjoint analysis', *World's Poultry Science Journal*, Vol. 51, (1995) pp. 203–214.

Gil, J. M., Gracia, A. and Sánchez, M. 'Market segmentation and willingness to pay for organic products in Spain', *International Food and Agribusiness Management Review*, Vol. 3, (2000) pp. 207–226.

Gracia, A. and Zeballos, G. 'Animal welfare concern and attitudes towards more animal welfare friendly meat products: Characterization and segmentation', *Informacion Tecnica Economica Agraria*, Vol. 107, (2011) pp. 33–47.

Gracia, A., Loureiro, M. L. and Nayga, R. M., Jr. Valuing Animal Welfare Labels with Experimental Auctions: What Do We Learn from Consumers?, Contributed Paper for presentation at the International Association of Agricultural Economists Conference (Beijing, 16–22 August 2009).

Gracia, A., Loureiro, M. L. and Nayga, R. M., Jr. 'Are valuations from non-hypothetical choice experiments different from those of experimental auctions?', *American Journal of Agricultural Economics*, Vol. 92, (2011) pp. 1358–1373.

Gracia, A., Barreiro-Hurlé, J. and Galán, B. L. 'Are local and organic claims complements or substitutes? A consumer preferences study for eggs', *Journal of Agricultural Economics*, Vol. 65, (2014) pp. 49–67.

Greene, H. W. *NLOGIT Version 5 Reference Guide* (New York, NY: Econometric Software Inc, 2012).

Grimsrud, K., Nielsen, H. M., Navrud, S. and Olesen, I. 'Households' willingness-to-pay for improved fish welfare in breeding programs for farmed Atlantic salmon', *Aquaculture*, Vol. 372–375, (2013) pp. 19–27.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. and Tatham, R. L. *Multivariate Data Analysis* (Upper Saddle River, NJ: Pearson Prentice Hall, 2006).

Harper, G. and Henson, S. *Consumer Concerns about Animal Welfare and the Impact on Food Choice*, Final report (EU FAIR CT98-3678), 2001. Available at: http://ec.europa.eu/food/animal/welfare/eu_fair_project_en.pdf/ (last accessed 27 January 2015).

Harper, G. C. and Makatouni, A. 'Consumer perception of organic food production and farm animal welfare', *British Food Journal*, Vol. 104, (2002) pp. 287–299.

Hausman, J. and Ruud, P. 'Specifying and testing econometric models for rank-ordered data', *Journal of Econometrics*, Vol. 34, (1987) pp. 83–104.

Heng, J., Peterson, H. H. and Li, X. 'Consumer attitudes toward farm-animal welfare: The case of laying hens', *Journal of Agricultural and Resource Economics*, Vol. 38, (2013) pp. 418–434.

Hensher, D., Rose, J. M. and Greene, W. H. *Applied Choice Analysis: A Primer* (Cambridge, UK: Cambridge University Press, 2007).

Honkanen, P. and Olsen, S. O. 'Environmental and animal welfare issues in food choice: The case of farmed fish', *British Food Journal*, Vol. 111, (2009) pp. 293–309.

Hudson, D., Gallardo, R. K. and Hanson, T. R. 'A comparison of choice experiments and actual grocery store behavior: An empirical application to seafood products', *Journal of Agricultural and Applied Economics*, Vol. 44, (2012) pp. 49–62.

Husson, F., Lê, S. and Pagès, J. *Exploratory Multivariate Analysis by Example Using R* (Boca Raton, FL: CRC Press, 2010).

Kehlbacher, A., Bennett, R. and Balcombe, K. 'Measuring the consumer benefits of improving farm animal welfare to inform welfare labelling', *Food Policy*, Vol. 37, (2012) pp. 627–633.

Kihlberg, I. and Risvik, E. 'Consumers of organic foods – value segments and liking of bread', *Food Quality and Preference*, Vol. 18, (2007) pp. 471–481.

Kuhfeld, W. F. *Marketing Research Methods in SAS: Experimental Design, Choice, Conjoint, and Graphical Techniques* (Cary, NC: SAS Institute Inc, 2010).

Kvakkestad, V., Refsgaard, K. and Berglann, H. *Citizen and Consumer Attitudes to Food and Food Production in Norway*, Discussion Paper No. 2011-2 (Norwegian Agricultural Economics Research Institute, Oslo, NO, 2011). Available at: http://www.nilf.no/publikasjoner/Discussion_Papers/2011/dp-2011-02.pdf/ (last accessed 16 October 2014).

Lagerkvist, C. J. and Hess, S. 'A meta-analysis of consumer willingness to pay for farm animal welfare', *European Review of Agricultural Economics*, Vol. 38, (2011) pp. 55–78.

Lê, S., Josse, J. and Husson, F. 'FactoMineR: An R package for multivariate analysis', *Journal of Statistical Software*, Vol. 25, (2008) pp. 1–18.

List, J. A. and Gallet, C. A. 'What experimental protocol influence disparities between actual and hypothetical stated values?', *Environmental and Resource Economics*, Vol. 20, (2001) pp. 241–254.

Lund, T. B., Andersen, L. M. and Jensen, O. D. K. 'The emergence of diverse organic consumers: Does a mature market undermine the search for alternative products?', *Sociologia Ruralis*, Vol. 53, (2013) pp. 454–478.

Lusk, J. L. and Briggeman, B. 'Food values', *American Journal of Agricultural Economics*, Vol. 91, (2009) pp. 184–196.

Lusk, J. L. and Shogren, J. *Experimental Auctions – Methods and Applications in Economic and Marketing Research* (Cambridge, UK: Cambridge University Press, 2007).

Meehan, H., Cowan, C. and McIntrye, B. *Food Choice and Consumer Concerns about Animal Welfare in Ireland*, Final Report (Project RMIS No. 4543), 2002. Available at: http://www.bak.teagasc.ie/research/reports/foodprocessing/4543/eopr-4543.pdf/ (last accessed 27 January 2015).

Mesías Díaz, F. J., Martínez-Carrasco Pleite, F., Martínez Paz, J. M. and Gaspar García, P. 'Consumer knowledge, consumption, and willingness to pay for organic tomatoes', *British Food Journal*, Vol. 114, (2012) pp. 318–334.

Mesías, F. J., Martínez-Carrasco, F., Martínez, J. M. and Gaspar, P. 'Functional and organic eggs as an alternative to conventional production: A conjoint analysis of consumers' preferences', *Journal of the Science of Food and Agriculture*, Vol. 91, (2011) pp. 532–538.

von Meyer-Höfer, M., von der Wense, V. and Spiller, A. 'Characterising convinced sustainable food consumers', *British Food Journal*, Vol. 117, (2015) pp. 1082–1104.

Ministry of Agriculture and Food. Economical, agronomic - organic! Action plan in order to reach the 15% organic production and consumption in 2020. (Oslo, NO: Ministry of

Agriculture and Food, 2009). Available at: https://www.regjeringen.no/globalassets/upload/lmd/vedlegg/brosjyrer_veiledere_rapporter/handlingsplan_okologisk_200109.pdf/ (last accessed 23 November 2015).
Mueller, S., Lockshin, L. and Louviere, J. J. 'What you see may not be what you get: Asking consumers what matters may not reflect what they choose', *Marketing Letters*, Vol. 21, (2010) pp. 335–350.
Napolitano, F., Girolami, A. and Braghieri, A. 'Consumer liking and willingness to pay for high welfare animal-based products', *Trends in Food Science and Technology*, Vol. 21, (2010) pp. 537–543.
Nasir, V. A. and Karakaya, F. 'Consumer segments in organic foods market', *Journal of Consumer Marketing*, Vol. 31, (2014) pp. 263–277.
Nie, C. and Zepeda, L. 'Lifestyle segmentation of US food shoppers to examine organic and local food consumption', *Appetite*, Vol. 57, (2011) pp. 28–37.
Norwegian Agriculture Agency. Production and sales of organic agricultural products. Report No. 7/2015 (Norwegian Agriculture Agency, Oslo, NO, 2015). Available at: https://www.slf.dep.no/no/miljo-og-okologisk/okologisk-landbruk/om-okologisk-landbruk/publikasjoner/_attachment/48581?_ts=14fcbdedac0&download=true/ (last accessed 24 November 2015).
Norwood, F. B. and Lusk, J. L. *Compassion, by the Pound. The Economics of Farm Animal Welfare* (New York, NY: Oxford University Press, 2011a).
Norwood, F. B. and Lusk, J. L. 'A calibrated auction-conjoint valuation method: Valuing pork and eggs produced under differing animal welfare conditions', *Journal of Environmental Economics and Management*, Vol. 62, (2011b) pp. 80–94.
Olesen, I., Alfnes, F., Røra, M. and Kolstad, K. 'Consumer willingness to pay for organic and welfare labelled salmon', *Livestock Science*, Vol. 127, (2010) pp. 218–226.
Padel, S. and Foster, C. 'Exploring the gap between attitudes and behaviour', *British Food Journal*, Vol. 107, (2005) pp. 606–625.
Paul, J. and Rana, J. 'Consumer behavior and purchase intention for organic food', *Journal of Consumer Marketing*, Vol. 29, (2012) pp. 412–422.
Pino, A., Peluso, A. M. and Guido, G. 'Determinants of regular and occasional consumers' intentions to buy organic food', *Journal of Consumer Affairs*, Vol. 46, (2012) pp. 157–169.
R Core Team. *R: A Language and Environment for Statistical Computing* (Vienna, AT: R Foundation for Statistical Computing, 2015).
Resano-Ezcaray, H., Sanjuán-López, A. I. and Albisu-Aguado, L. M. 'Combining stated and revealed preferences on typical food products: The case of dry-cured ham in Spain', *Journal of Agricultural Economics*, Vol. 61, (2010) pp. 480–498.
Schjøll, A., Borgen, S. O. and Alfnes, F. *Consumer Preference for Animal Welfare When Buying Eggs*. Professional Report No. 1-2013 (National Institute for Consumer Research, Oslo, NO, 2013).
Statistics Norway. *Households, by Type of Household and Size of After-Tax Income (C)*, Table 10707 (Statistics Norway: Oslo, NO, 2013).
Statistics Norway. *Persons 16 Years and Older, by Sex, Age and Level of Education. Numbers and Per cent (C)*, Table 08921 (Statistics Norway: Oslo, NO, 2014a).
Statistics Norway. *Population, by Sex and One-Year Age Groups. 1 January (M)*, Table 07459 (Statistics Norway: Oslo, NO, 2014b).
The British Egg Industry Council. Egg Code. How Your Egg Is Labeled (2015). Available at: http://www.lioneggfarms.co.uk/information/egg-codes/ (last accessed 27 January 2015).
Toma, L., McVittie, A., Hubbard, C. and Stott, A. 'A structural equation model of the factors influencing British consumers' behavior towards animal welfare', *Journal of Food Products Marketing*, Vol. 17, (2011) pp. 261–278.
Toma, L., Stott, A. W., Revoredo-Giha, C. and Kupieh-Teahan, B. 'Consumers and animal welfare. A comparison between European Union countries', *Appetite*, Vol. 58, (2012) pp. 597–607.

Train, K. 'Mixed logit models for recreation demand', in J. A. Herriges and C. L. Kling (eds.), *Valuing Recreation and the Environment: Revealed Preference Methods on Theory and Practice* (Cheltenham, UK: Edward Elgar, 1999, pp. 33–64).

Van Loo, E. J., Caputo, V., Nayga, R. M., Jr. and Verbeke, W. 'Consumers' valuation of sustainability labels on meat', *Food Policy*, Vol. 49, (2014) pp. 137–150.

Vanhonacker, F. and Verbeke, W. 'Buying higher welfare poultry products? Profiling Flemish consumers who do and do not', *Poultry Science*, Vol. 88, (2009) pp. 2702–2711.

Vanhonacker, F. and Verbeke, W. 'Public and consumer policies for higher welfare food products: Challenges and opportunities', *Journal of Agricultural and Environmental Ethics*, Vol. 27, (2014) pp. 153–171.

Vanhonacker, F., Verbeke, W., Van Poucke, E. and Tuyttens, F. A. M. 'Segmentation based on consumers' perceived importance and attitude toward farm animal welfare', *International Journal of Sociology of Agriculture and Food*, Vol. 15, (2007) pp. 91–107.

Vanhonacker, F., Verbeke, W., Van Poucke, E., Buijs, S. and Tuyttens, F. A. M. 'Societal concern related to stocking density, pen size and group size in farm animal production', *Livestock Science*, Vol. 123, (2009) pp. 16–22.

Vecchio, R. and Annunziata, A. 'Italian consumer awareness of layer hens' welfare standards: A cluster analysis', *International Journal of Consumer Studies*, Vol. 36, (2012) pp. 647–655.

Verain, M. C., Bartels, J., Dagevos, H., Sijtsema, S. J., Onwezen, M. C. and Antonides, G. 'Segments of sustainable food consumers: A literature review', *International Journal of Consumer Studies*, Vol. 36, (2012) pp. 123–132.

Verain, M. C., Dagevos, H. and Antonides, G. 'Sustainable food consumption. Product choice or curtailment?', *Appetite*, Vol. 91, (2015) pp. 375–384.

Verain, M. C., Sijtsema, S. J. and Antonides, G. 'Consumer segmentation based on food-category attribute importance: The relation with healthiness and sustainability perceptions', *Food Quality and Preference*, Vol. 48, (2016) pp. 99–106.

Vittersø, G. and Tangeland, T. 'The role of consumers in transitions towards sustainable food consumption. The case of organic food in Norway', *Journal of Cleaner Production*, Vol. 92, (2015) pp. 91–99.