Substitutes or Complements? Consumers' Preferences and Willingness to Pay for Animal Welfare, Organic, Local and Low Fat Food Attributes

Faical Akaichi
Land Economy Environment and society
Scotland Rural College
Edinburgh, Scotland, UK
(faical.akaichi@sruc.ac.uk)

Klaus Glenk
Land Economy Environment and society
Scotland Rural College
Edinburgh, Scotland, UK

Cesar Revoredo-Giha
Land Economy Environment and society
Scotland Rural College
Edinburgh, Scotland, UK
(faical.akaichi@sruc.ac.uk)

Contributed Paper prepared for presentation at the 90th Annual Conference of the Agricultural Economics Society, University of Warwick, England

4 - 6 April 2016

Substitutes or Complements? Consumers' Preferences and Willingness to Pay for Animal Welfare, Organic, Local and Low Fat Food Attributes

Abstract

A choice experiment was carried out in Scotland to assess consumers' preferences and willingness to pay (WTP) for four popular food attributes (i.e. animal welfare, organic, local and low fat attributes) and determine whether these attributes are independent, complement or substitutes. The results showed that the majority of consumers have positive preferences and are willing to pay a price premium for the four attributes. Furthermore, the results from the interactions between attributes showed that labelling organic pork as local could significantly increase its demand. The results also show that the co-existence of animal welfare and organic/local/low fat labels is likely to generate a discounting effect on consumers' total premium for these bundles of food attributes (i.e. these attributes are perceived by consumers as overlapping). Organic and local attributes were found to be independent.

1. Introduction

Modern agricultural practices have increased the efficiency of food production, which has been reflected in lower prices for consumers. However, that increase in efficiency might have been to the detriment of ethical issues such as the way animals are treated in the production process, particularly in more intensive production systems. As a result of the increasing deterioration of animals' welfare, animal advocacy groups have pressured policy makers to outlaw certain production practices (e.g., battery cages, gestation crates) and force farmers to use alternative production systems that are perceived to provide high animal welfare. In response to this pressure, many governments adopted action Plans for the protection and welfare of animals. Furthermore, farmers who voluntarily adopted animal-friendly production standards were able to have their products labelled as animal-friendly to inform consumers that they were purchasing produce of high animal welfare standards.

Regardless of the approach used to address the issue of animal wellbeing (i.e. regulations or labelling), there is an increasing interest in industry and academia to identify the best techniques and procedures to improve animal health and welfare. Since, improving animal welfare is expected to result in higher production costs, a large number of studies have been conducted to find out whether consumers (i.e. the last user of animal-friendly foods) are interested in and willing to pay a price premium for animal-friendly products (e.g. Carlsson et al., 2007a; Chang et al., 2010; Glass et al., 2005; Honkanen and Ottar Olsen, 2009; Kehlbacher et al., 2012; Lagerkvist and Hess, 2011; Liljenstolpe, 2008; Mayfield et al., 2007; Norwood and Lusk, 2011; Toma et al., 2011; Vanhonacker et al., 2010). The findings from these studies agreed on the fact that there is a large segment of consumers who are concerned about farm animal welfare and are willing to pay a price premium for animal-friendly food products. Furthermore, labelling food products as animal-

friendly has been found to be an effective strategy to differentiate them from conventional products and increase their consumption.

Although a massive research effort has been devoted to understand consumer preferences and willingness to pay for animal-friendly food products, a major question that remains minimally addressed is whether consumers treat animal welfare and other food attributes (e.g. organic, local, healthy etc.) as related and, if so, whether they are substitutes or complements. In fact, firms engaged in product differentiation should not only identify the attributes that are attractive to consumers, but also carefully evaluate whether there is any potential conflict between the chosen attributes. This study attempts to fill this gap by examining the interaction effects between animal welfare and other popular food attributes (i.e. organic, locality of the product, fat content and price) on a single product, fresh pork. The results presented in this paper should constitute useful information for producers, processors, retailers and policy makers alike.

The remaining of this article is organized as follows. It proceeds with a description of the economic methods used to collect and analyse the data. The results of the study are then presented and discussed in a subsequent section. The last section of the article focuses more on the main implications of our key findings.

2. Methodology

2.1. Choice experiment

A choice experiment was conducted in Edinburgh in April 2014. In total, 120 real consumers (each participant was required to be the main responsible for the purchase of food products in the household) were recruited from the city of Edinburgh and its metropolitan areas. Participants were randomly assigned to 12 experimental sessions. Each participant was allowed to participate in only one session of approximately one hour and was paid a £35 participation fee. A summary of participants' socio-demographic and economic characteristics is displayed in Table 1.

Table 1: Socio-demographic characteristics of participants

Characteristics	Groups	(%)
Gender	Female	59
	Male	41
Age	Under 25	3
	25-34	36
	35-44	15
	45-54	13
	55-64	23
	6over 64	10
Education	Did not complete secondary school	5
	Secondary school graduate or GED	30
	Some post-secondary school training	18
	Bachelor's degree	16
	Graduate or professional degree	31
Working status	Full-time employed	56
	Part-time employed	14
	Self-employed	4
	Full-time education	1
	Retired	20
	Looking after household/family	3
	Unemployed	2
Annual household income (£)	Less than 10.000	4
	10.000 - 24.999	24
	25.000 – 39.999	42
	40.000 - 59.999	21
	60.000 – 99.999	8
	More than 100.000	1

Respondents were first asked to participate in a choice task. Then, they were required to complete a questionnaire about their attitudes toward ethical food attributes and their socio-demographic characteristics. In the choice task, respondent were successively provided with 8 different choice sets and were repeatedly asked to choose between four different alternatives of fresh pork (300g) and a "no choice" alternative. Each alternative was a combination of different levels of five attributes: animal welfare (High animal welfare/No label), organic (Organic/Not organic), Locality of the product (Local/Not local), fat content (Low fat/No label) and the price (£3.19, £3.79, £4.49, £5.29). The price levels were chosen so they cover the range of the retail prices of fresh pork in Scottish retail stores. Participants were told that apart from these attributes the fresh pork would be

identical in appearance. A cheap talk script, similar to the one implemented by Cummings and Taylor (1999), was used to incentivize participants to reveal their actual preferences.

Given all the attributes' levels a full factorial design of 64 (2*2*2*2*4) profiles was created. To be able to estimate all the main and two-way interactions effects, we followed the optimal design approach proposed by Street and Burgess (2007). The most efficient design in 32 choice sets (blocked in four blocks of 8 choice sets each) was obtained using the following generators: (00000, 00111, 10102, 01110). The design was found to be 96.29% efficient. Since it is not realistic to force participants to choose one of the provided options of fresh pork, we included a "no choice" option (i.e., fifth option) in each choice set. An illustration of a choice set is presented in Figure 1.

Figure 1: an example of a choice set used in the choice experiment

Choice set 3.2			Identification number:		
Attributes	**OPTION 1**	**OPTION 2**	**OPTION 3**	**OPTION 4**	**OPTION 5**
Animal Welfare:	Animal friendly	No label	Animal friendly	No label	
Organic:	Not organic	Not organic	Organic	Organic	
Local:	Not local	Local	Local	Not local	None of them
Fat content:	Low fat	No label	No label	Low fat	
Price:	£4.49	£3.79	£5.29	£4.49	
	☐	☐	☐	☐	☐
Please mark the option you would choose.					

2.2. Choice model: Random Parameter Logit (RPL)

The conditional logit model (McFadden 1974) is the Work horse model for analyzing discrete choice data. While widely used this model has several well-known limitations: (1) it does not account for preference heterogeneity among respondents and (2) it assumes that the alternatives included in any choice sets are independent, which can lead to unrealistic predictions. The RPL model solves these limitations extends the standard conditional logit model by allowing one or more of the parameters in the model to be randomly distributed and the unobserved factors to be correlated over time (McFadden and Train 2000).

Utility-maximizing individual i who is confronted with a set of j alternatives at a given choice occasion *t*, should choose the alternative that yields the highest utility. The utility function takes the form:

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} \quad (1)$$

where V_{ijt} is the deterministic component and ε_{ijt} is the random component. ε_{ijt} is assumed to have an *iid* extreme value distribution. Assuming that the deterministic component of utility is linear-in-parameter, equation (1) can be written as:

$$U_{ijt} = \beta_i' X_{ijt} + \varepsilon_{ijt} \quad (2)$$

where X_{ijt} is a vector of explanatory variables that are observed by the analyst and include the food attributes (i.e. animal welfare, Organic, locality, fat content and Price) as well as the socio-economic characteristics of the respondent (e.g. Gender, education, income and age). $\beta_i$denotes the *K*×1 vector of utility parameters corresponding to *K* choice characteristics. The subscript *i* on β_i indicates that β_i are individual-specific parameters. In the RPL, β_i are considered as draws from the population distribution $f(\beta|\Omega)$ where Ω are

the fixed parameters of the distribution such as the mean and the variance. For a given value of β_i, the conditional probability that individual i makes a choice j is:

$$P(j|X_{it},\beta) = \prod_{t=1}^{T}\left[\frac{\exp(\beta_i' X_{ijt})}{\sum_{k=1}^{J}\exp(\beta_i' X_{ikt})}\right] \quad (3)$$

The unconditional choice probability is the expected value of the logit probability over all possible values of β, that is, integrated over these values and weighted by the density of β. So the unconditional probability is:

$$P(j|X_{it},\Omega) = \int_{\beta} P(j|X_{it},\beta)\, f(\beta|\Omega)\, d\beta \quad (4)$$

This expression does not have a closed form solution and is therefore approximated through simulation methods. In particular, draws of β_{ir} are taken from the distribution $f(\beta|\Omega)$ for $\mathrm{r} = 1, \ldots, \mathrm{R}$, and the resulting probabilities are then averaged. The simulated log-likelihood (SLL) for all respondents, which is estimated via maximum likelihood procedures, is calculated as:

$$SLL = \sum_{i=1}^{I}\sum_{t=1}^{T} ln\left(\frac{1}{R}\sum_{r=1}^{R}\frac{\exp(\beta_{ir} X_{ijt})}{\sum_{k=1}^{J}\exp(\beta_{ir} X_{ikt})}\right) \quad (5)$$

For this estimation, the parameters for animal welfare, Organic, locality and fat content are assumed to be distributed normally. The price should enter the utility negatively, which can be imposed by specifying the parameter on negative price as log-normally distributed. In this way, the price coefficient can therefore be interpreted as the marginal utility of money. Furthermore, the heterogeneity around the mean of the random parameters can be partially due to the correlation between the different attributes and not only the interaction between attributes and socio-demographic variables. Assuming that the attributes considered in a choice experiment are uncorrelated was found to bias the

results for the heterogeneity in mean (Hensher et al (2005). To get around this problem, we allowed the error components in different choice situations from a given individual to be correlated.

In choice experiment, the standard approach to calculate WTP data consists in computing the ratio of the attribute coefficient to the price coefficient (with a negative sign). Therefore, the WTP from an RPL is given by the ratio of two randomly distributed terms.

$$WTP_{non-price\ attribute} = -\frac{\beta_{non-price\ attribute}}{\beta_{price}} \quad (6)$$

Depending on the choice of the coefficients' distributions, this can lead to heavily-skewed WTP distributions (e.g. very large WTP values) that may not even have defined moments. A common approach to dealing with this potential problem is to specify the price coefficient to be fixed. Nonetheless, it is often unreasonable to assume that all individuals have the same preferences for price (Meijer and Rouwendal 2006). Train and Weeks (2005) suggest another way to get around this problem that consists in estimating the RPL in WTP space rather than in preference space. This involves estimating the distribution of willingness to pay directly by re-formulating the model in such a way that the coefficients represent the WTP measures. In the reformulated models, the a priori assumptions about the distributions of the parameters are made on the WTP rather than the attribute coefficients.

The model in preference space is:

$$\begin{aligned} U = {} & \beta_{price}Price + \beta_{None}None + \beta_{AW}AW + \beta_{Organic}Organic + \beta_{Local}Local \\ & + \beta_{Fat}Fat + \beta_{AW*Organic}AW * Organic + \beta_{AW*Local}AW * Local \\ & + \beta_{AW*Fat}AW * Fat + \beta_{Organic*Local}Organic * Local \\ & + \beta_{Organic*Fat}Organic * Fat + \beta_{Local*Fat}Local * Fat + \varepsilon \quad (7) \end{aligned}$$

The model in WTP space consists in rewriting equation (7) as:

$$U = \beta_{price}\left[Price + \frac{\beta_{None}}{\beta_{price}}None + \frac{\beta_{AW}}{\beta_{price}}AW + \frac{\beta_{Organic}}{\beta_{price}}Organic + \frac{\beta_{Local}}{\beta_{price}}Local\right.$$
$$+ \frac{\beta_{Fat}}{\beta_{price}}Fat + \frac{\beta_{AW*Organic}}{\beta_{price}}AW * Organic + \frac{\beta_{AW*Local}}{\beta_{price}}AW * Local$$
$$+ \frac{\beta_{AW*Fat}}{\beta_{price}}AW * Fat + \frac{\beta_{Organic*Local}}{\beta_{price}}Organic * Local$$
$$\left. + \frac{\beta_{Organic*Fat}}{\beta_{price}}Organic * Fat + \frac{\beta_{Local*Fat}}{\beta_{price}}Local * Fat\right] + \varepsilon \qquad (8)$$

Equation (8) can be rewritten as:

$$U = \beta_{price}[Price + \theta_1 None + \theta_2 AW + \theta_3 Organic + \theta_4 Local + \theta_5 Fat + \theta_6 AW$$
$$* Organic + \theta_7 AW * Local + \theta_8 AW * Fat + \theta_9 Organic * Local$$
$$+ \theta_{10} Organic * Fat + \theta_{11} Local * Fat]$$
$$+ \varepsilon \qquad (9)$$

$\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6, \theta_7, \theta_8, \theta_9, \theta_{10}, \theta_{11}$ are the WTP estimates. In the estimation the variables “Animal welfare”, “Organic”, “Locality” and “Fat content” were effect coded (see table 2). The price was entered as a continuous variable. The variable None was coded as dummy (it takes the value 1for option 5 and 0 otherwise.).

Table 2: effect coding of the attributes

Attribute	Level	Code
Animal welfare	Animal friendly	1
	No label	-1
Organic	Organic	1
	No label	-1
Locality	Local	1
	No label	-1
Fat content	Low fat	1
	No label	-1

3. Results and discussion

Before presenting and discussing the results from the estimation of the RPL model in preference and willingness to pay space, we will first present a description of participants' attitudes toward animal welfare and related issues.

3.1. Consumers' attitudes towards animal welfare

The analysis of the information collected in the questionnaire showed that 58% of participants revealed to be concerned about farm animal welfare. Seventy five per cent of participants revealed to have purchased animal-friendly foods (especially free-range eggs) and the main reasons for doing so are: "animal-friendly foods come from happier animal", "buying animal-friendly foods can help farmers who treat their animal better" and "animal-friendly foods are better quality products". Twenty five per cent of participants reported to have never purchased animal-friendly foods for the following reasons: "animal-friendly foods are too expensive", "I can't differentiate them from the rest of foods in the same category", "I don't know what are animal-friendly foods" and "I don't think purchasing and consuming animal friendly foods will significantly improve animal welfare".

Regarding consumers' knowledge about animal welfare attribute and labelling, 41% of participants were found to be fairly aware about the conditions of animal farming. Nonetheless, 51% (8%) of participants revealed to know little (nothing) about animal

welfare. Furthermore, our findings showed that 79% (25%) of participants would like (wouldn't like) to be more informed about the conditions under which animals are farmed. When participants were asked to identify the sources they would use if they were looking for information about farm animal welfare, 80% (42%) of them mentioned product's label (internet and television). To ensure high animal welfare, a clear majority of participants indicated that it is important that farm animals: "receive ample food and water" (95% of participants), "receive treatment from injury and disease" (94%), "are provided shelter at a comfortable temperature" (94%), "are allowed to exercise outside" (91%), "are allowed to exhibit normal behaviour" (77%), "be not genetically modified" (66%), and "are protected from being harmed by other animals" (63%).

Participants indicated that, for them, the best ways to identify animal-friendly foods in real market are: labels on the package (69% of participants), the use of grading or scoring system such as five "stars" for the product with high animal welfare and one "star" for the basic product (68%), and additional information written on the product's package (56%). These results show that labelling animal-friendly foods and providing consumers with additional information on the superiority of these foods in terms of animal welfare may incentivise them to pay a price premium for foods identified as animal friendly.

As regards the best way of addressing the problem of animal welfare, 53% of participants indicated that the government has to ban animal production systems that do not guarantee high welfare levels for farm animal even when such a policy leads to an increase in animal product prices. Nonetheless, 31% of participants said that the government should, first, ask the citizens, through a referendum, whether they want animal production systems that do not guarantee high welfare levels for farm animal to be banned. If the majority of citizens opt for the ban, then the government can decide to outlaw production practices that do not guarantee high animal wellbeing. Interestingly, only 16% of participants indicated that the government should not interfere, animal products

from all production systems should be available in the market and consumers should have the freedom to buy and consume animal products with high or low level of animal welfare.

Finally, we found that 92%, 71%, 50%, and 47% of participants indicated that the stakeholders that can best ensure that food products are produced in an animal welfare-friendly way are farmers, the government, food processing industry, animal protection organizations, respectively. Interestingly, 72% of participants revealed to believe that farmers should be financially compensated for any higher production costs linked to farming animals under more welfare-friendly conditions. In the next section, we will see whether participants are willing to pay a price premium for farm animal welfare to compensate farmers the higher production cost they face when improving their animals' welfare.

3.2. Consumers' preferences and willingness to pay for animal welfare and other food attributes

The results from the estimation of the RPL model in preference and WTP space are displayed in Table 2. All the estimations were conducted using Biogeme 2.4, with 7000 Halton draws to simulate random parameters (1000 draws to estimate participants' WTP). The RPL models show significant improvement in fit when tested against the same model estimated considering only the constant.

The parameters corresponding to the five attributes (i.e. animal welfare, organic, locality, fat content and price) were modelled as random parameters. The no-choice option parameter (NONE) was modelled as a fixed parameter. The mean estimate of the variable "NONE" is negative and highly significant. This implies that participants in the choice experiment tended to highly prefer one of the real products as opposed to the "no-choice" option. On the other hand, the estimated standard deviation was also statistically significant, suggesting that there was some variation in such preference across

participants. The results also show that the means of the coefficients, corresponding to the five attributes, are statistically significant and with the expected sign.

The mean part-worth utility estimate for animal welfare, organic and locality is positive and significant. This indicate that animal-friendly fresh pork is more likely to be chosen than a fresh pork not labelled as animal friendly. It also indicate that consumers' preferences for organic (local) fresh pork are higher than their preferences for non-organic (non-local) fresh pork. The significant standard deviation estimates for these three attributes, on the other hand, suggest that the preference for these attributes were highly heterogeneous among the sampled consumers. Regarding consumers' WTP, the results show that participants were willing to pay price premiums for animal-friendly, organic and local fresh pork of £0.97, £0.38 and £0.69, respectively. It is noteworthy here, that the price premium for organic pork that consumers reported to be willing to pay is 50% lower than the retail premium.

Interestingly, empirical evidence from a recent study showed that animals raised in organic farms were found to enjoy a significant higher level of animal welfare than those raised in non-organic farms (D'Eath, 2014). Therefore, since consumers were found to be willing to pay a price premium for animal-friendly pork, it is likely that labelling organic pork as animal friendly could increase its demand. Nonetheless, the negative and significant coefficient of the interaction between animal welfare and organic show that consumers discount the total premium for pork that is labelled as organic and animal friendly by £0.08. Therefore, the total premium that consumers revealed to be willing to pay is £1.27 (0.968 + 0.377 – 0.077 = 1.268).

Table 3: estimates of consumers' part-worth utilities and willingness to pay

	Marginal utilities		Willingness to pay	
Random Parameters				
Animal welfare (AW)	2.410	***	0.968	***
Organic	0.958	***	0.377	***
Local	1.870	***	0.692	***
Fat	2.310	***	0.654	***
Price	-2.634	***	------	
AW*Organic	-0.178		-0.077	***
AW*Local	-0.497	**	-0.145	***
AW*Fat	-0.810	***	-0.135	***
Organic*Local	0.085		0.084	***
Organic*Fat	-0.018		-0.022	
Local*Fat	-0.697	**	-0.165	***
Non-random parameter				
None	-13.500	***	-4.240	***
Standard deviations				
Animal welfare (AW)	1.450	***	0.579	***
Organic	0.748	***	-0.028	
Local	-0.815	***	-0.024	**
Fat	0.002		-0.534	***
Price	0.287	**	-----	
AW*Organic	-1.090	***	-0.215	***
AW*Local	-0.867	***	0.009	
AW*Fat	-1.090	***	-0.206	***
Organic*Local	-0.170		-0.079	***
Organic*Fat	-0.324		0.032	***
Local*Fat	-0.221		-0.155	***
Constant Log-likelihood	-1514.686		-1514.686	
Final Log-likelihood	-785.664		-773.308	

(***) and (**) denote statistical significance at 1% and (5%) level, respectively

The results on consumers' WTP show that consumers were willing to pay less for the organic attribute than for the local attribute. This finding is very consistent with those in recent literature, which has suggested that consumers reported to be willing to pay higher price premium for locally produced food products than for their organic counterparts (Loureiro and Hine 2002; Hu, Woods, and Bastin 2009; James, Rickard, and Rossman 2009; Meas et al, 2014). More empirical evidence are needed to assess whether there is a general turning away from organic toward local food as a result of perceiving local foods

as environmentally friendly and are cheaper compared with organic foods (Adams and Salois 2010; Meas et al, 2014). Furthermore, the interaction term between organic and the attribute local was found to be positive and significant. This implies that consumers in Scotland perceive organic and local as complementary food attributes. This result is interesting because it shows that the demand for organic pork produced and sold in Scotland could be increased if it is labelled as local. In fact, consumers' price premium for organic pork could increase from £0.38 to £1.15 (0.377 + 0.692 - 0.084 = 1.153).

Significant and negative interaction was found for the co-presence of animal welfare and local labels. This implies that participants in the experiment perceived the values of the two attributes to be overlapping, probably because they think that the pigs raised in Scotland enjoy higher animal health and welfare compared with pigs kept in non-local farms. The results of the estimated WTP show that the co-existence of labels "animal-friendly" and local generated a discounting effect of £0.15. Therefore consumers' price premium for 300g of pork labelled as animal friendly and local is £1.51 (0.968 + 0.692 – 0.145 = 1.515). This result shows the importance of taking into account the interactions between food attributes when estimating consumers' WTP. Otherwise, the estimated WTP and, hence, the results from posterior analyses (e.g. cost benefit analysis) will severally biased.

The results also show that Scottish consumers are more likely to choose fresh pork with lower fat content and are willing to pay a price premium of £0.65 if the fresh pork is labelled as having a low amount of fat. More interestingly, the results show that the interactions between the attributes fat content and animal welfare and fat content and local are significant and negative. This implies that consumers seems to perceive the values of the attributes animal welfare and low fat and local and low fat as overlapping when they are presented simultaneously. This could be explained by the fact that consumers are expecting animal-friendly and local pork to have lower fat content in comparison with

conventional pork, hence, the overlapping effect. Nonetheless, this result doesn't imply that promoting the fat content of ethical pork is a strategy to avoid, but it suggests that we should be aware that total consumers' price premium for animal-friendly pork and local pork labelled as having low fat content will be discounted by £0.14 and £0.02, respectively. For example, consumers' price premium for animal-friendly pork labelled as having low fat content is equal to £1.49 (0.968 + 0.654 – 0.135 = 1.487).

4. Conclusion

The preliminary results of the studies have several implication. First, the positive preferences shown by the majority of consumers toward animal welfare, organic, local and low fat attributes is a positive signal that can be passed upstream to meat producers and other stakeholders who are interested in the production and retailing of meat with these attributes. Second, the significantly higher consumers' price premium for animal welfare, local and low fat attributes compared with retail price premium implies that there is still a margin for increasing retail prices and, hence, prices to producers. Third, the significantly lower consumers' price premium for the organic attribute compared to the actual retail price premium implies that more efforts are needed across the whole supply chain to ultimately reduce retail prices of organic meat.

Fourth, the complementarity between the attributes organic and local implies that organic meat producers who are selling their products in the Scottish market can increase the demand for their products by labelling them as local. Fifth, the substitution relationship between local and animal welfare, low fat and animal welfare and local and low fat attributes implies that labelling animal-friendly pork as local or labelling fresh pork with low fat as animal friendly or local is a strategy that should be used with caution. In fact, the substitution effect implies that co-existence of labels for these attributes generates a discounting effect of consumers' total WTP. Therefore, the total willingness to pay should be calculated and compared to the total cost. Then a decision should be made on the most

beneficial way of labelling ethical pork. Finally, the absence of interaction between organic and local implies that labelling organic meat produced is Scotland as local is an appropriate strategy to increase its demand. In fact, since organic and local attributes are seen as independent, consumers' total premium for organic meat labelled as local is equal to the sum of their individual premiums for these attributes when considered separately.

Reference

Adams, D. C., & Adams, A. E. (2011). De-placing local at the farmers' market: consumer conceptions of local foods. *Journal of Rural Social Sciences*, *26*(2), 74.

Carlsson, F., Frykblom, P., & Lagerkvist, C. J. (2007). Consumer willingness to pay for farm animal welfare: mobile abattoirs versus transportation to slaughter. *European Review of Agricultural Economics*, *34*(3), 321-344.

Chang, J. B., Lusk, J. L., & Norwood, F. B. (2010). The price of happy hens: A hedonic analysis of retail egg prices. *Journal of Agricultural and Resource Economics*, 406-423.

Cummings, R. G., & Taylor, L. O. (1999). Unbiased value estimates for environmental goods: a cheap talk design for the contingent valuation method. *The American Economic Review*, *89*(3), 649-665.

D'Eath, R. B., G. Arnott, S. P., Turner, T., Jensen, H. P., Lahrmann, M. E., Busch, Jarkko K. Niemi, A. B. Lawrence, and Peter Sandøe. (2014). Injurious tail biting in pigs: how can it be controlled in existing systems without tail docking?. *animal*, *8*(09), 1479-1497.

Glass, C. A., Hutchinson, W. G., & Beattie, V. E. (2005). Measuring the value to the public of pig welfare improvements: a contingent valuation approach. *Animal Welfare*, *14*(1), 61-69.

Honkanen, P., & Ottar Olsen, S. (2009). Environmental and animal welfare issues in food choice: the case of farmed fish. *British Food Journal*, *111*(3), 293-309.

James, J. S., Rickard, B. J., & Rossman, W. J. (2009). Product differentiation and market segmentation in applesauce: Using a choice experiment to assess the value of organic, local, and nutrition attributes. *Agricultural & Resource Economics Review*, *38*(3), 357.

Kehlbacher, A., Bennett, R., & Balcombe, K. (2012). Measuring the consumer benefits of improving farm animal welfare to inform welfare labelling. *Food Policy*, *37*(6), 627-633.

Lagerkvist, C. J., & Hess, S. (2011). A meta-analysis of consumer willingness to pay for farm animal welfare. *European Review of Agricultural Economics*, *38*(1), 55-78.

Liljenstolpe, C. (2008). Evaluating animal welfare with choice experiments: an application to Swedish pig production. *Agribusiness*, *24*(1), 67-84.

Loureiro, M. L., & Hine, S. (2002). Discovering niche markets: A comparison of consumer willingness to pay for local (Colorado grown), organic, and GMO-free products. *Journal of Agricultural and Applied Economics*, *34*(03), 477-487.

Mayfield, L. E., Bennett, R. M., Tranter, R. B., & Wooldridge, M. J. (2007). Consumption of welfare-friendly food products in Great Britain, Italy and Sweden, and how it may be influenced by consumer attitudes to, and behaviour towards, animal welfare attributes. *International Journal of Sociology of Agriculture and Food*, *15*(3), 59-73.

McFadden, D., & Train, K. (2000). Mixed MNL models for discrete response. *Journal of applied Econometrics*, *15*(5), 447-470.

Meas, T., Hu, W., Batte, M. T., Woods, T. A., & Ernst, S. (2015). Substitutes or Complements? Consumer Preference for Local and Organic Food Attributes. *American Journal of Agricultural Economics*, *97*(4), 1044-1071.

Meijer, E., & Rouwendal, J. (2006). Measuring welfare effects in models with random coefficients. *Journal of Applied Econometrics*, *21*(2), 227-244.

Norwood, F. B. and Lusk, J. L. (2011a), Compassion, by the Pound: The Economics of Farm Animal Welfare. *OUP Catalogue*.

Street, D. J., & Burgess, L. (2007). *The construction of optimal stated choice experiments: theory and methods* (Vol. 647). John Wiley & Sons.

Mayfield, L. E., Bennett, R. M., Tranter, R. B., & Wooldridge, M. J. (2007). Consumption of welfare-friendly food products in Great Britain, Italy and Sweden, and how it may be influenced by consumer attitudes to, and behaviour towards, animal welfare attributes. *International Journal of Sociology of Agriculture and Food*, *15*(3), 59-73.

Train, K., & Weeks, M. (2005). *Discrete choice models in preference space and willingness-to-pay space* (pp. 1-16). Springer Netherlands.

Vanhonacker, F., Van Poucke, E., Tuyttens, F., & Verbeke, W. (2010). Citizens' views on farm animal welfare and related information provision: Exploratory insights from Flanders, Belgium. *Journal of Agricultural and Environmental Ethics*, *23*(6), 551-569.