Do consumers' preferences change when on vacation? A willingness to pay study on apples and honey

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Abstract

Ways of increasing the market for local produce beyond the local residents within the local community, could include the following two potential solutions: 1) an expansion out to a more national/global market, which though would be costly in terms of transportation costs or 2) getting national/global consumers into the local market, e.g. as tourists. The objective of the present paper is to investigate the tourism's potential in the promotion of locally produced food products, within the perspective of context dependency and consumers' preferences for local produce. Firstly, people are asked to state their preferences for locally produced apples and honey, respectively. Secondly, we illustrate how preferences towards local produce depend on the situation, in which the consumers are placed. Applying a CE we find that for honey, the consumers' willingness to pay for local produce displays a considerable variation across respondents, suggesting that there could be a potential segmentation of respondents and their willingness to pay, which could imply the market to be highly niched. This is further investigated by applying a discrete mixture model. The findings from the DM model suggests that the market for the two characteristics local and Danish produce in both honey and apples and within both a daily and a holiday context is segmented into two groups - one group (2/3) who do not have particular high preferences towards neither Danish nor local produce and another group (1/3), who do have rather large preferences for both characteristics.

1. Introduction

As part of the efforts to sustain economic activity on family farms in rural areas, the European Union attempts to establish incentives either for producers to add value to agricultural activities through the development of local food systems, providing high-value products, or through engagement in agro-tourism (Clements, 2004). Potential means to market high-value foods include the use of protected geographical indications (PDO, PGI) at the EU-level (such that no other region or country in the EU are allowed to market products with the protected geographical indication), regional products at the national level (where no other regions in the country are allowed to use a specified geographical indication), and local products, which are linked to the culture and history of a specific local area. Claims are made that local food systems potentially lead to local economic gains (because they promote local jobs, help local business gaining market access and allowing for fairly direct communication between producers and consumers), but also environmental benefits due to reduced 'food miles' (European Union - Committee of the Regions, 2011, Marsden & Smith, 2005, Marsden et al., 2000).

If local food systems are going to be successful as a tool to increase value-added services in agricultural products, it is crucial that there is a consumer interest in such services and furthermore that they are willing to pay for the attributes that are associated with such services. Moreover, it is also of importance that this willingness to pay is present in a substantial share of the market, to make the production beneficial for the farmers. Although this issue has not been the object of extensive research, the scientific literature in the field shows some evidence for a positive consumer interest in local products (see e.g. Giraud et al. 2005; Hébert 2011; Darby et al., 2006, Darby et al. 2008; Yue & Tong 2009; Carpio & Isengildina-Massa 2009, Loureiro & Hine, 2002, Loureiro & McCluskey, 2000, Carlsson et al., 2007, Batte et al., 2007, Stefani et al., 2006). The increased interest for such products can be explained by factors such as an increased environmental concern (Lusk et al., 2007; Anderson et al., 1998), increasing concern regarding animal welfare (Morris, 2009; Barnes et al., 2009), food safety (Banterle & Stranieri, 2008; Mørkbak et al. 2011), and food quality (Mørkbak et al. 2010). Furthermore, issues like supporting the local producers and the local community in general have also had an important impact on the increased interest (Carpio & Isengildina-Massa 2009).

As to increase the demand for local produce, Carpio & Isengildina-Massa (2009) and Yue & Tong (2009) suggest that better marketing strategies are to be applied in order to increase the awareness of the local consumers towards the local products. Another way of increasing the market for local produce beyond the local residents within the local community, could include the following two potential solutions: 1) an expansion out to a more national/global market, which though would be costly in terms of transportation costs or 2) getting national/global consumers into the local market, e.g. as tourists. In the present paper the latter issue is examined.

If consumer behaviour is different in a tourist context than in an everyday context, the behaviour is subject to context dependency. Context dependency of choice behavior has become the focus of a

large literature in psychology, marketing and economics over the past three decades (Swait et al., 2002), but with respect to context effects and consumers preferences for local products – the issue is to the authors' knowledge unexplored.

The objective of the present paper is to investigate tourism's potential in the promotion of locally produced food products, within the perspective of context dependency and consumers' preferences for local produce. We examine two dimensions of context dependency. Firstly, we place people in a situation where they are asked to state their preferences for locally produced apples and honey, respectively. Thereby, we are able to investigate to what extent preferences for local produce is product dependent. Secondly, we illustrate how preferences towards local produce depend on the situation, in which the consumers are placed. In particular, choice experiments (CE) are used to elicit consumer preferences for different quality attributes (taste, texture, colour, origin, etc.) within the two different product categories in two different context settings – consumers in a daily shopping situation and consumers on holiday. A split sample design was used in order to evaluate the different context effects.

The paper is organized as follows: Section 2 provides a short overview of relevant literature. Section 3 describes the method and material used, while section 4 presents the theory of choice experiments. The results are presented in section 5, while the discussion of results and concluding remarks follows in Section 6.

2. Literature review - local food production, context dependency and vacation

This section provides a brief review of some of the existing literature on consumer valuation of local food production, the effect of context dependency and finally a connection between context dependency and consumer behavior when on vacation is drawn.

Preferences for local foods

As described above, local food production has become an increasingly important issue from consumers' point of view. Because of this, several studies have examined consumers' preferences for a number of products and their dependence on local production, and this section provides an overview of some of the literature in the field. For a more extensive overview see e.g. Giraud et al. (2005) and Hébert (2011).

Using contingent valuations surveys, Giraud et al. (2005) estimated price premiums for local specialty food products in three larger cities in the state of New England, US. In all three cities they found that consumers' were willing to pay a small price premium for locally produced products, and that this premium increases with the base price of the good. Darby et al. (2008) examined US consumers preferences for location of production for strawberries, varying the location attribute from neighboring farm, or within state, to within US (and finally left blank) using a choice experiment. Their results showed that respondents did not distinguish between strawberries produced at a neighboring farm and strawberries produced within the state (of Ohio), but that they clearly preferred such strawberries over strawberries produced within the US, suggesting that the

state boundary acts as a natural point of geographic delineation for a 'local' production in the minds of the consumers (Darby et al. 2008). Yue & Tong (2009) also uses a CE (with real economic incentives) to investigate consumers' preferences for locally produced tomatoes. Both in the hypothetical and in the non-hypothetical setting they found a positive WTP for locally produced tomatoes, though a reduction in WTP in the magnitude of 9% was found in the non-hypothetical setting. Carpio & Isengildina-Massa (2009) uses a contingent valuation framework to evaluate South Carolina consumers WTP for locally produced produce and for locally produced animal products (they refer to local production as within state production). Their results showed that consumers on average were willing to pay a price premium of 27% for local produce and 22% for local animal products respectively.

In conclusion – all studies found positive price premiums for locally produced products, and all studies also concluded that niche markets for such products would exist and benefit the local community economically, but as we will argue below these results might be context specific and due to samples being local (within state for the US surveys), respondents might be biased in such a way that they do not reveal their 'true' preferences for a local product, but rather showing their support to local producers within their own community.

Context dependency

The traditional expected utility theory dating back to Von Neumann & Morgenstern (1944) was based on the assumption of an expected utility function that was linear in probability but potentially non-linear in outcome. Also, utility was assumed to be independent of context and decision process. These assumptions have increasingly been questioned. In particular, the field of psychology has offered explanations for why choice behavior frequently has been inconsistent with expected utility theory. In prospect theory, it was found that people's choices typically were affected by reference points and that small probabilities were given too high weights while large probabilities were given too low weights (Kahneman & Tversky 1979; Levy, 2003; Lloyd, 2003; Nelson, 2001). Furthermore, as put forward by Tversky and Kahneman (1991) and subsequently analyzed in a number of stated preferences papers (Borger & Fosgerau al. 2008; Hu et al. 2006), the marginal utility was typically a decreasing function of the size of gains as well as losses, which was not consistent with von Neumann & Morgenstern's expected utility function. A closely related explanation, originating from the field of psychology, was the importance of *context*, where context refers to the current and historical setting in which a choice was offered (McFadden, 1999). The context was found to be particularly important when respondents were asked to state their preferences for uncertain alternatives because respondents would have to draw their own inferences about attributes. Bulte et al. (2005) examined the effect on consumer WTP of varying the causes of environmental problems. They found that respondents had a significantly higher WTP for solving problems that were caused by humans than when the problems were caused by nature. A similar argument has been put forward in relation to understanding why consumers seem to accept a higher level of Campylobacter risk in animal products from outdoor raised animals than from animals kept indoors (ICROFS 2008). Similarly, Bosworth et al. (2010) examined if WTP depended on whether health risk reductions were obtained using prevention or treatment mechanisms. They found that

marginal utility associated with avoided deaths to be almost twice as high for prevention policies as for treatment policies. They also found significant heterogeneity with respect to disease type, the group targeted by the policy, and respondent characteristics.

Vacation as a context

To the authors' knowledge the existing literature on consumer behavior in home versus vacation contexts is very sparse – only one study was found. Dolnicar & Grun (2009) examined the differences in consumer behavior with respect to environmental friendly purchasing habits in such two contexts. They hypothesize that individuals would engage in different environmentally friendly behaviours in different contexts. Dolnicar & Grun (2009) used an internet questionnaire survey to investigate this hypothesis and fitted a latent class model to the stated behaviour reported in the questionnaire. Their results did not show a clear support for the hypothesis put forth – a significant proportion of the respondents did not change their behaviour very much between the two contexts, supporting the context independence hypothesis, however, the majority of the respondents did though tend to engage in less pro-environmental behaviour in the vacation context than in the everyday context, supporting the hypothesis of context dependency. They explain their result by arguing that respondents felt more morally obliged to carry out pro-environmental behaviour at home. A majority (733 respondents, or 92%) indicated that they felt more morally obliged at home, while only 64 (8%) respondents indicated the same feeling during vacation. They further suggest that one of the main reasons for these results could be that consumers feel that vacation time is supposed to be worry-free and because of this behaves in a less environmental friendly way.

3. Method and data

We analyze consumers' willingness to pay for different product characteristics (including geographic origin) for two different commodities (honey and apples) in two different contexts (everyday versus vacation). Data for the willingness to pay study were generated through questionnaire-based hypothetical choice experiments. The method was found to be particularly suitable because one of the primary focuses of the research questions was on the relative weighting of the characteristics in apples and honey, respectively. The Internet questionnaire requests participants to make choices between different local food products versus “non-local” products. Furthermore, the hypothetical choice experiments have been conducted in sessions with participants (virtually) placed in different contexts – including an everyday purchasing situation as well as a holiday context. By varying the products (e.g. with respect to type of production, type of product, region of origin, sensory attributes etc) in different contexts in the hypothetical setting, it is possible to generate data on the willingness to pay for different products in the different contexts – everyday context as well as a holiday context. A split sample design was used to examine these context effects. The characteristics and their levels are shown below in table 1.

Table 1: The characteristics and their levels in the CEs.

Characteristics	Levels
Type of production	Conventional, Organic
Origin	Locally produce (Danish), Danish produce, European produce (not Danish), Produced outside Europe
Colour of apples (apple survey only)	Red, Green, Yellow, Mix of colours
Taste of apples (apple survey only)	Sweet and crunchy, Sweet and mealy, Sour and crunchy, Sour and mealy
Type of honey (honey survey only)	Clover, Heather, Rape, Mix
Price (DKK)	Apples (1 kg.): 7, 15, 25, 45 Honey (1 jar of 450 g): 25, 28, 33, 40, 48, 55, 65, 80

Note: DKK 10 ~ EUR 1.34

The experimental design used is a D-efficient Bayesian updated fractional factorial design resulting in 12 different choice sets in total. The updated design is based on results from a pilot study with 104 respondents, and the software Ngene was used to generate the alternatives and the choice sets (Rose et al. 2009). The 12 choice sets consist of two generic alternatives plus a status quo alternative, the later representing a base jar of honey (conventional mix honey produced outside EU to a price of DKK 25) or a base bag of apples (Conventional mixed colour of sour and mealy apples produced outside EU to a price of DKK 7). Respondents were presented with 12 choice sets concerning honey followed by 12 choice sets regarding apples. The respondents were sampled from a pre-recruited internet panel in June and August 2010. A split sample design was used with a total of 1301 respondents replying to the questionnaires, of which 3 were identified as protesters[1], thus leaving an effective sample of 1298 respondents for the analysis (608 in the daily context sample and 690 respondents in the holiday context sample). The socio-demographic distribution with respect to gender, age, and household income of the samples are presented below and compared with the distribution of the Danish population.

[1] Protesters were identified using a follow-up question given to respondents who chose the zero-cost opt-out alternative in all 12 choice sets. Those stating reasons such as “I don't want to pay for better products”, “I don't believe that the changes shown will take place”, or “I don't know” were classified as protesters and excluded from the analysis in line with Morrison et al. (2000) and Meyerhoff and Liebe (2006).

Table 2: Socio-demographic distribution of the samples and the Danish population.

	Daily context	Holiday context	STAT Denmark			Chi-tests (P-values)		
	Freq	Freq	Percent	Exp. (daily context)	Exp. (Holiday context)	Daily context	Holiday context	Daily vs. Holiday
Total	608	690						
Gender								
Women	320	353	50.99	310	352	0.4189	0.9302	0.4674
Men	288	337	49.01	298	338			
Age								
18-19	4	12	2.91	18	20			
20-24	28	40	7.00	43	48			
25-29	70	70	7.65	47	53			
30-39	136	200	18.13	110	125	7.02E-25	4.07E-30	< 0.0001
40-49	174	155	18.86	115	130			
50-61	142	166	20.93	127	144			
62-	54	47	24.52	149	169			
Household income (in DKK)								
200,000	48	62	27.09	165	187			
200,000-299,999	43	47	19.20	117	133			
300,000-399,999	93	79	13.47	82	93	2.10E-59	3.89E-82	0.0256
400,000-499,999	78	84	9.12	55	63			
500,000-599,999	78	76	9.17	56	63			
600,000 or more	268	342	21.95	133	151			

Note: The χ – tests in the final 3 columns represent tests of the sample frequencies relative to the frequencies in the Danish population and across samples

Table 2 shows the socio-demographic distribution of the respondents in the samples with respect to gender, age, and household income. The characteristics of the respondents were compared with those of the Danish population in 2010. The results demonstrated an overrepresentation of the middle aged and those with high income. However, when the daily context sample and the holiday context sample are compared (chi-tests presented in the outer right column), the samples were more or less similar in their socio-demographic distributions[2].

4. Econometric analysis of choice experiments

The underlying theory of CE is based on Lancaster's Consumer Theory (LCT) (Lancaster, 1966) and Random Utility Theory (RUT) (Luce, 1959; McFadden, 1974). In LCT, consumer preferences

[2] Age and income were included as explanatory variables in all models in order to control for possible impact of the imperfect randomization (data not shown). Inclusion of these variables had no significant impact on the estimated coefficients of the remaining variables.

were defined in relation to bundles of characteristics and the demand for goods was a derived demand. Consumption was the activity of extracting characteristics from goods (Gravelle & Rees 1992). The experiments consist of 12 choice sets each. In the analysis, we apply a standard random utility model (McFadden 1974), where the utility of alternative *j* for individual *i* in choice set *k* is specified as

$$V_{ijk} = v_{ijk} + \varepsilon_{ijk} = \beta_i \; a_{jk} + \varepsilon_{ijk}, \tag{1}$$

where *a* is a vector of attributes, β is the corresponding parameter, and ε_{ijk} is an error term. If the error terms are iid extreme value distributed with variance $\pi^2/(6\mu^2)$, the standard logit model choice probability that individual *i* chooses alternative *j* is

$$P_{ijk} = \frac{\exp(\mu \;\; v_{ijk})}{\sum_{h \in k} \exp(\mu \;\; v_{ih})}, \tag{2}$$

where μ is a scale parameter that is inversely proportional to the error variance. The coefficients (β) in the econometric models are usually expressed in their scaled form ($\beta = \mu\beta^*$), where the scale parameter μ and the "original" coefficients β^* are confounded. Hence, the estimated parameter β indicates the effect of each observed variable relative to the variance of the unobserved factors (Train 2003).

In the analysis, we estimate random parameter models where we assume that all non-price attributes are normally distributed, thereby allowing consumers to place positive as well as negative values on the non-price attributes and the alternative specific constant. Focus group interviews indicated that such heterogeneity could be expected. The price coefficient is assumed to be fixed, since this allows straight forward calculations of the distribution of WTP.

Moreover, we examine whether the true distributions of some of the coefficients are better explained by using more flexible distributions, which do not necessarily match a convenient mathematical form (see e.g. Wedel et al. 1999; Hess et al. 2007). By applying Discrete Mixture (DM) models we can avoid the issue of predefined statistical distributions as in the mixed logit case, but some may argue that the DM model is less flexible than the mixed logit model, since the number of possible values for the taste coefficients is finite (this issue should though be expected to decrease as the number of points used increases). An illustration of an example where more flexible distributions are needed would e.g. be in the case where a mass of the respondents is located around zero, while the remaining part of the respondents either are located around a strictly positive value or a strictly negative value.

Following Hess et al. (2007), in the DM setting, we divide the β's into two sets of parameters, one set, β, which represents the deterministic part of β, which we treat either as fixed or as continuous

distributed parameters and β, which is a set of *N* random parameters, all discrete distributed. The later set of parameters, β, have m_n mass points, $\beta_n^l, l = 1, \dots, m_n$ and an associated probability of π_n^l. Moreover the following two constraints are imposed on the probability π_n^l :

$$0 \leq \pi_n^l \leq 1, n = 1, \dots., N; l = 1, \dots, m_n \quad (3)$$

and

$$\sum_{l=1}^{m_n} \pi_n^l = 1, \; n = 1, \dots., N \quad (4)$$

In the present case we allow some of the coefficients to follow a discrete distribution with two mass points, thus the coefficients take two different values: β_n^1 (Mean1) with a probability of π_n^1, and β_n^2 (Mean2) with a probability of π_n^2 (=1-π_n^1).

As the utility function is assumed to be linear in cost, the marginal WTP for the attribute is the ratio between the parameter of the attribute and the cost parameter in the utility function (2), such that[3]:

$$WTP = -\frac{\text{Attribute parameter}}{\text{Cost parameter}} \quad (5)$$

We have used the software package Biogeme (Bierlaire 2003) to estimate the econometric models. In all models we control for individual level heterogeneity through the use of a panel specification capturing the repeated choice nature of the data. The models are estimated with simulated maximum likelihood using Halton draws with 300 replications; see Train (2003) for details on simulated maximum likelihood and Halton draws.

5. Results

The main effect models of the four samples differing with respect to products and contexts are shown in table 3 below.

[3] The standard errors of the WTP are estimated using the Delta method (Greene 2003).

Table 3: Random Parameter Logit (RPL) model estimates for all four subsamples.

		Honey (daily context)		Honey (holiday context)		Apples (daily context)		Apples (holiday context)	
		Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Organic produce	Mean	1.140	0.103	1.170	0.094	0.723	0.076	0.561	0.056
	Std. Dev.	1.790	0.125	1.650	0.125	0.998	0.090	0.799	0.085
Danish produce	Mean	2.260	0.188	2.250	0.165	2.010	0.104	1.800	0.093
	Std. Dev.	3.400	0.241	3.060	0.202	1.110	0.101	0.807	0.077
Local produce within Denmark	Mean	1.150	0.175	1.470	0.165	2.180	0.104	2.220	0.100
	Std. Dev.	3.100	0.195	2.960	0.208	0.482	0.151	0.333	0.132
EU produce – outside Denmark	Mean	0.593	0.102	0.517	0.095	0.957	0.066	0.920	0.063
	Std. Dev.	1.040	0.149	1.100	0.139	0.168	0.083	0.119	0.065
Green coloured apples	Mean					-0.327	0.074	-0.336	0.068
	Std. Dev.					0.618	0.095	0.471	0.122
Yellow coloured apples	Mean					-0.431	0.066	-0.376	0.050
	Std. Dev.					0.201	0.155	0.151	0.068
Red coloured apples	Mean					0.072	0.055	0.136	0.051
	Std. Dev.					0.260	0.082	0.063	0.144
Sweet and crunchy apples	Mean					3.400	0.158	3.600	0.158
	Std. Dev.					2.200	0.149	2.400	0.148
Sweet and mealy apples	Mean					0.085	0.065	0.309	0.066
	Std. Dev.					0.475	0.111	0.487	0.098
Sour and crunchy apples	Mean					2.640	0.146	2.700	0.122
	Std. Dev.					2.020	0.123	1.860	0.111
Clover honey	Mean	-0.664	0.101	-0.556	0.090				
	Std. Dev.	1.200	0.190	1.140	0.157				
Heather honey	Mean	0.396	0.101	0.602	0.098				
	Std. Dev.	1.330	0.133	1.120	0.165				
Rape honey	Mean	-0.374	0.086	-0.343	0.080				
	Std. Dev.	0.731	0.164	0.515	0.328				
ASC (alt 3)	Mean	-1.520	0.125	-1.570	0.118	-0.998	0.124	-1.010	0.128
	Std. Dev.	1.620	0.200	1.660	0.137	1.920	0.113	2.080	0.109
Price	Mean	-0.105	0.004	-0.105	0.004	-0.099	0.004	-0.097	0.004
N		7296		8280		7296		8280	
LL		-5180		-5878		-5796		-6649	
Pseudo R2		0.352		0.352		0.274		0.267	

The pseudo-R^2 of between 0.27 and 0.35 indicates that the models provide a good fit to the data (Louviere et al., 2000).

The marginal utility estimates are all significantly different from zero, except the red colour and the sweet and mealy attributes for apples, which suggests that consumers on average have significant preferences for or against the presented characteristics in all surveys.

Next – we examine the potential differences in the WTP estimates. The presented WTP are measured relative to the reference level defined in the apple case as a bag of mixed colour apples, conventional produced outside EU, which are sour and mealy and in the honey case as a jar of 450 g mixed-flower honey, which were conventionally produced outside EU. The estimated value for the ASC refers to the value the respondents place on the third alternative – the 'base apples/honey' holding all attributes equal. The WTP results of the main effect model are presented in Table 4.

Table 4: Overview of WTP estimates from four different split samples.

		Honey (daily context)	Honey (Holiday context)		Apples (daily context)	Apples (Holiday context)	
		WTP (Var(WTP))	WTP (Var(WTP))	T-test (t-values)	WTP (Var(WTP))	WTP (Var(WTP))	T-test (t-values)
Organic produce	Mean	10.86 (1.03)	11.14 (0.83)	-0.209	7.33 (0.60)	5.80 (0.31)	1.596
	Std. Dev.	17.05 (1.42)	15.71 (2.17)	0.704	10.11 (1.02)	8.26 (0.92)	1.329
Danish produce	Mean	21.52 (3.13)	21.43 (2.51)	0.040	20.36 (0.92)	18.61 (0.70)	1.377
	Std. Dev.	32.38 (9.20)	29.14 (2.96)	0.929	11.25 (1.19)	8.35 (0.82)	2.044
Local produce within Denmark	Mean	10.95 (2.85)	14.00 (2.54)	-1.314	22.09 (1.01)	22.96 (0.88)	-0.634
	Std. Dev.	29.52 (3.30)	28.19 (3.45)	0.513	4.88 (2.39)	3.44 (1.88)	0.697
EU produce – outside Denmark	Mean	5.65 (1.08)	4.92 (0.91)	0.513	9.70 (0.47)	9.51 (0.40)	0.194
	Std. Dev.	9.90 (2.05)	10.48 (2.20)	-0.277	1.70 (0.71)	1.23 (0.44)	0.439
Green coloured apples	Mean				-3.31 (0.52)	-3.47 (0.45)	0.164
	Std. Dev.				6.26 (1.06)	4.87 (1.62)	0.850
Yellow coloured apples	Mean				-4.37 (0.47)	-3.89 (0.29)	-0.546
	Std. Dev.				2.04 (2.49)	1.56 (0.50)	0.275
Red coloured apples	Mean				0.73 (0.31)	1.41 (0.28)	-0.877
	Std. Dev.				2.63 (0.70)	0.65 (2.21)	1.164
Sweet and crunchy apples	Mean				34.45 (2.18)	37.23 (2.37)	-1.303
	Std. Dev.				22.29 (3.92)	24.82 (4.10)	-0.893
Sweet and mealy apples	Mean				0.86 (0.45)	3.20 (0.52)	-2.369
	Std. Dev.				4.81 (1.34)	5.04 (1.10)	-0.143
Sour and crunchy apples	Mean				26.75 (1.94)	27.92 (1.35)	-0.647
	Std. Dev.				20.47 (2.72)	19.23 (2.26)	0.551
Clover honey	Mean	-6.32 (0.96)	-5.30 (0.76)	-0.784			
	Std. Dev.	11.43 (3.32)	10.86 (2.13)	0.245			
Heather honey	Mean	3.77 (0.92)	5.73 (0.81)	-1.490			
	Std. Dev.	12.67 (1.41)	10.67 (2.27)	1.043			
Rape honey	Mean	-3.56 (0.65)	-3.27 (0.54)	-0.271			
	Std. Dev.	6.96 (2.51)	4.90 (9.70)	0.589			
ASC (alt 3)	Mean	-14.48 (1.13)	-14.95 (1.08)	0.320	-10.11 (1.46)	-10.44 (1.53)	0.193
	Std. Dev.	15.43 (3.61)	15.81 (2.41)	-0.155	19.45 (1.44)	21.51 (1.20)	-1.267

Note: DKK 10 ~ EUR 1.34. Var(WTP) has been estimated using the Delta method (Greene 2003).

More specifically, if we take a closer look at the apple survey, the results show that consumers prefer locally produced apples over Danish produced apples (the difference is though not significant), over apples produce within an EU country, and finally over apples produced outside the EU. But what is more important from the consumers' point of view is how the apples taste. Here apples which are sweet and crunchy are clearly preferred over any other type of apples, followed by apples which are sour and crunchy. Apples which are mealy are not preferred at all. Furthermore – as expected, organically produced apples contribute with a positive value to consumer preferences compared to conventional production, whereas the colour of the apples are of minor importance (though red and mixed coloured apples are preferred over green and yellow apples).

With respect to the honey survey, where the purchasing situation were in a daily context, the results show that whether or not the product is locally produced is of less importance, as long as the honey product is produced in Denmark, although a locally produced product is preferred over any products produced outside Denmark. Also as expected, an organically produced honey product is preferred over a conventionally produced product. With respect to type of honey, heather honey is preferred over any of the other types of honey, whereas both clover and rape honey is less preferred than a mixed-flower honey.

Changing the context of which the consumers are to imagine in the hypothetical choice experiments, from the daily context to a holiday context, the importance of a locally produced honey product becomes larger (though not statistically significant). One potential explanation of this might be that when consumers are on vacation, they are more willing to try new and locally produced products than when they are in more daily context shopping situations. The same does not go for the consumers when purchasing apples. Here the WTP estimates are almost identical.

Finally, when examining the heterogeneity in the samples – the standard deviation, the results show that a large degree of heterogeneity is observed with respect to both the domestic (Danish) characteristic and the local characteristics, respectively – especially in the honey survey. This potentially suggests that a rather large proportion of the respondents have either substantially lower WTP or larger WTP than the estimated mean, which again could imply the market to be highly niched. This is further investigated by applying a DM model for all four samples, where we allow the parameters of both Danish produce and local produce to follow a discrete distribution with two mass points, so that potential spikes/groups of respondents will be identified.

Table 5: RPL and DM model estimates for all four subsamples.

		Honey (daily context)		Honey (holiday context)		Apples (daily context)		Apples (holiday context)	
		Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Organic produce	Mean	1.310	0.101	1.310	0.097	0.763	0.075	0.687	0.062
	Std. Dev.	1.930	0.099	1.850	0.092	1.330	0.081	1.070	0.069
Danish produce	Mean1	0.675	0.136	0.478	0.224	1.310	0.133	1.090	0.138
	π^1	0.677	0.026	0.596	0.040	0.684	0.040	0.622	0.053
	Mean2	6.180	0.238	5.570	0.246	4.260	0.234	3.410	0.202
	π^2	0.323	0.026	0.404	0.040	0.316	0.040	0.378	0.053
Local produce within Denmark	Mean1	0.068	0.140	-0.002	0.169	2.030	0.122	1.900	0.117
	π^1	0.687	0.024	0.666	0.028	0.837	0.046	0.823	0.053
	Mean2	5.310	0.228	5.090	0.227	4.800	0.403	4.260	0.369
	π^2	0.313	0.024	0.334	0.028	0.163	0.046	0.177	0.053
EU produce - outside Denmark	Mean	0.676	0.102	0.559	0.097	1.100	0.076	0.956	0.067
	Std. Dev.	1.380	0.125	1.530	0.117	0.095	0.122	0.032	0.099
Green coloured apples	Mean					-0.359	0.083	-0.346	0.075
	Std. Dev.					0.970	0.096	0.880	0.086
Yellow coloured apples	Mean					-0.534	0.071	-0.477	0.062
	Std. Dev.					0.318	0.138	0.056	0.130
Red coloured apples	Mean					0.097	0.070	0.178	0.063
	Std. Dev.					0.119	0.159	0.096	0.187
Sweet and crunchy apples	Mean					3.770	0.165	3.890	0.158
	Std. Dev.					2.300	0.145	2.460	0.130
Sweet and mealy apples	Mean					0.242	0.080	0.366	0.071
	Std. Dev.					0.958	0.110	0.886	0.094
Sour and crunchy apples	Mean					3.010	0.144	2.810	0.126
	Std. Dev.					2.090	0.127	2.010	0.111
Clover honey	Mean	-0.771	0.105	-0.730	0.096				
	Std. Dev.	1.230	0.138	1.170	0.121				
Heather honey	Mean	0.352	0.101	0.518	0.092				
	Std. Dev.	1.520	0.115	1.330	0.106				
Rape honey	Mean	-0.392	0.090	-0.422	0.082				
	Std. Dev.	0.936	0.114	0.821	0.108				
ASC (alt 3)	Mean	-1.710	0.137	-1.760	0.128	-0.605	0.133	-0.701	0.127
	Std. Dev.	1.780	0.114	1.800	0.107	1.990	0.144	1.900	0.104
Price	Mean	-0.109	0.004	-0.112	0.004	-0.106	0.004	-0.100	0.003
N		7296		8280		7296		8280	
LL		-5124		-5836		-5760		-6673	
Pseudo R2		0.358		0.356		0.278		0.263	

As the results in table 5 show, there is indeed two different segments of consumers with different preferences with respect to domestic and local produce. More specifically, with regards to Danish produce, the results show that for both products and in both contexts, there is a segment of

consumers who have considerably lower preferences for a product being produced in Denmark, while the other segment of consumers have rather large preferences for this. The size of the segments is determined by the estimated probability π_n^l of belonging to the specific segment. For the honey product between 60% and 68% of the consumers in the Holiday and Daily contexts surveys, respectively, belong to the segment with lower preferences. With respect to the apple product the picture is more or less the same, with a majority group of consumers being in a segment with lower preferences and a minority group of 32% in the Daily context survey and 38% in the Holiday context survey belonging to the segment with larger preferences.

Looking at the other variable where we applied a discrete mixture distribution, the local produce attribute, the results are in line with the results from the previous attribute, Danish produce, with the little tweak that for the honey product, within both contexts, there is a majority of consumers 67%-69%, who are not willing to pay anything extra for a local product. Finally, we note that as one moves from the RPL models (table 3) to the DM models (table 5) we observe an improvement in the range of 36-56 log-likelihood units for three out of four models, at the expense of fitting four additional parameters. This lead to a likelihood ratio test statistic in the range of 72-112 against the χ^2 critical value of 9.49 ($\chi^2_{4;0.05}$), suggesting that the DM models significantly provides a better fit with the data.

Going a step further and examining the WTP estimates obtained under the DM model in table 6, the comparison between the different contexts show that both with respect to Danish produce and with respect to locally produced products, the WTP decline from the Daily context to the Holiday context, though this declines only is significant for the WTP for Danish produce of honey in the high preference segment group.

Table 6: Overview of WTP estimates obtained from the DM model for four different split samples. Comparison between daily and holiday contexts for both the honey and apple surveys using T-tests.

		Honey			Apples		
		Daily context	Holiday context	T-test (t-values)	Daily context	Holiday context	T-test (t-values)
		WTP (Var(WTP))	WTP (Var(WTP))		WTP (Var(WTP))	WTP (Var(WTP))	
Organic produce	Mean	12.02	11.70	0.238	7.20	6.89	0.319
		(0.99)	(0.83)		(0.53)	(0.40)	
	Std. Dev.	17.71	16.52	0.974	12.55	10.73	1.396
		(0.84)	(0.65)		(0.96)	(0.73)	
Danish produce	Mean1	6.19	4.27	0.818	12.36	10.93	0.811
		(1.50)	(4.04)		(1.35)	(1.74)	
	Mean2	56.70	49.73	2.271	40.19	34.20	1.858
		(4.38)	(5.02)		(4.88)	(5.50)	
Local produce within Denmark	Mean1	0.62	-0.02	0.325	19.15	19.06	0.059
		(1.64)	(2.28)		(1.24)	(1.33)	
	Mean2	48.72	45.45	1.142	45.28	42.73	0.469
		(3.91)	(4.29)		(15.46)	(14.26)	
EU produce - outside Denmark	Mean	6.20	4.99	0.916	10.38	9.59	0.813
		(0.95)	(0.80)		(0.50)	(0.45)	
	Std. Dev.	12.66	13.66	-0.593	0.90	0.32	0.376
		(1.22)	(1.62)		(1.32)	(0.99)	
Green coloured apples	Mean				-3.39	-3.47	0.080
					(0.57)	(0.52)	
	Std. Dev.				9.15	8.83	0.246
					(0.84)	(0.90)	
Yellow coloured apples	Mean				-5.04	-4.78	-0.278
					(0.44)	(0.39)	
	Std. Dev.				3.00	0.56	1.318
					(1.72)	(1.70)	
Red coloured apples	Mean				0.92	1.79	-0.944
					(0.44)	(0.41)	
	Std. Dev.				1.12	0.96	0.067
					(2.25)	(3.53)	
Sweet and crunchy apples	Mean				35.57	39.02	-1.944
					(1.50)	(1.66)	
	Std. Dev.				21.70	24.67	-1.186
					(3.17)	(3.13)	
Sweet and mealy apples	Mean				2.28	3.67	-1.310
					(0.58)	(0.54)	
	Std. Dev.				9.04	8.89	0.103
					(1.04)	(1.10)	
Sour and crunchy apples	Mean				28.40	28.18	0.132
					(1.37)	(1.19)	
	Std. Dev.				19.72	20.16	-0.231
					(1.62)	(2.06)	
Clover honey	Mean	-7.07	-6.52	-0.421			
		(0.98)	(0.76)				
	Std. Dev.	11.28	10.45	0.487			
		(1.51)	(1.45)				
Heather honey	Mean	3.23	4.63	-1.133			
		(0.85)	(0.66)				
	Std. Dev.	13.94	11.88	1.192			
		(1.73)	(1.29)				
Rape honey	Mean	-3.60	-3.77	0.162			
		(0.63)	(0.49)				
	Std. Dev.	8.59	7.33	0.843			
		(1.31)	(0.92)				
ASC (alt 3)	Mean	-15.69	-15.71	0.018	-5.71	-7.03	0.765
		(1.14)	(0.94)		(1.48)	(1.52)	
	Std. Dev.	16.33	16.07	0.140	18.77	19.06	-0.141
		(1.85)	(1.55)		(2.97)	(1.07)	

Note: DKK 10 ~ EUR 1.34. Var(WTP) has been estimated using the Delta method (Greene 2003).

What is more interesting is the comparison between WTP for Danish produce and local produce within the same contexts. Here the results show that for the honey product, the WTP for local produce does not exceed the WTP for Danish produce, neither in the daily context nor in the holiday context. The results from the apple survey are rather different. Here the WTP for local produce does exceed the WTP for Danish produce both at in the daily context and in the holiday context. These results suggest that in this specific case, a market for local produce does exist, even though it only holds for apples and as a niche market.

Table 7: Comparison of mean WTP of Danish and local produce within each survey.

	Honey - Danish vs local				Apples - Danish vs local			
	Daily		Holiday		Daily		Holiday	
	Mean1	Mean2	Mean1	Mean2	Mean1	Mean2	Mean1	Mean2
ΔWTP	5.57	7.98	4.29	4.29	-6.79	-5.09	-8.12	-8.53
T-test (t-value)	3.144	2.771	1.705	1.405	-4.220	-1.130	-4.638	-1.918

6. Discussion and Conclusion

Adding value to food products through local food systems are claimed to provide a range of benefits to the local communities, but consumers' interest and willingness to pay is an important prerequisite for such benefits to be realized. The present study confirms findings from previous studies that consumers exhibit a willingness to pay for locally produced foods, in this specific study in relation to the demand for apples and honey, respectively.

Increasing sales of local products to tourists is considered as one way to expand the market for such products. If marketing of local products aims at tourists, it is important to take into account the context dependency in the demand behaviour, i.e. whether the consumers' willingness to pay differ between a vacation setting and an everyday setting. The study finds a slightly (though not significantly) larger willingness to pay for locally produced honey and apples in the tourist setting than in the everyday setting, with the largest being for the honey products. We argue that this could be due to consumers being friendlier towards trying and buying new products when on vacation.

For honey, the consumers' willingness to pay for local produce displays a considerable variation across respondents, suggesting that a significant share of the respondents do not have a positive willingness to pay, but also that a substantial share of the respondents have an above-average willingness to pay. On the other hand, the variation in willingness to pay for locally produced apples is more moderate. This is further investigated by applying a discrete mixture model, identifying two mass points for the attributes Danish and local produce. The findings from the DM model suggest that the market for these two characteristics in both honey and apples and within both a daily and a holiday context is segmented into two groups - one group (the majority) who do

not have particular high preferences towards neither Danish produce nor local produce and another group (1/3), who do have rather large preferences for both characteristics. Moreover the results of the DM model showed that within each single context the preferences for local produce only exceed preferences for Danish produce for the apple product. This suggests that the likelihood of a high-end niche market for distinguished local products is considered to be higher for apples than for honey.

In addition to these findings, the study also yields useful rankings of quality attributes in the two products. For apples, taste and texture are the most important characteristics, followed by the place of production (Danish or locally produced), and as a third rank organic produce. The corresponding analysis for honey finds the place of production (and especially whether the honey is produced in Denmark or not) to be the most important characteristic. These results suggest that local production is of importance to the consumers, but at the same time that the consumers' valuation of local production is product dependent.

Finally, as the results also show locally produced products cannot support an increased awareness in the minds of the consumers by just being ‘local’. They also have to have high standards within other quality characteristics such as taste in the case of apples and organic production in the case of honey, otherwise locally produced products will be outweighed by non-local products exhibiting those characteristics.

Overall our results point towards the existence of a market for locally produced food products, although the consumers' distinction between 'Danish' and 'local' products does not appear to be very clear for the honey product. Furthermore, the results suggest that consumers' preference for local products does not seem to be heavily context dependent in terms of a daily context versus a holiday context.

A few remarks could be directed towards the approach of analysis. The analysis has been based on Internet-based choice experiments, where respondents did not face any consequences of their stated choices (for example that they would have to actually realize their choice), implying an overall risk of hypothetical bias in the responses. Whereas such hypothetical bias may lead to an over-estimation of the willingness to pay for different characteristics, it is considered less likely that it will influence the consumers' ranking of the considered quality characteristics. So whereas we are confident in the ranking of willingness to pay for individual characteristics, some caution regarding the absolute value of the WTP estimates should be warranted. Furthermore, it should be noted that the virtual setting framing the choice experiments also included the vacation versus everyday settings that respondents were asked to consider when stating their choices. A potential risk might be that some respondents' capacity to imagine the difference between these settings is imperfect, and that this imposes some uncertainty to the difference between choices in the two settings, which has also implications for the resulting differences in willingness to pay in the two settings.

References

Anderson, S. P., Goeree, J. K. and Holt, C. A. (1998). A Theoretical Analysis of Altruism and Decision Error in Public Good Games. *Journal of Public Economics* 70: 297–323.

Andreoni, J. (1989). Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence. *Journal of Political Economy* 97(3):1447-1458.

Andreoni, J. (1990). Impure Altruism and Donations to Public Goods. *The Economical Journal* 100:464-477.

Banterle, A. and Stranieri, S. (2008) Information, labelling, and vertical coordination: an analysis of the Italian meat supply networks. *Agribusiness* 24(3): 320.

Barnes, A.P., Vergunst, P., and Topp, K. (2009) Assessing the consumer perception of the term "organic": a citizens' jury approach. *British Food Journal* 111(2): 155-164.

Batte M.T., Hooker N.H., Haab T.C., Beaverson J. (2007) Putting their money where their mouths are: Consumer willingness to pay for multi-ingredient, processed organic food products, Food Policy, vol. 32, pp. 145-159

Bierlaire, M., 2003. BIOGEME: A free package for the estimation of discrete choice models. Proceedings of the 3rd Swiss Transportation Research Conference, Ascona, Switzerland.

Borger, B., & Fosgerau, M. (2008). The trade-off between money and time: A test of the theory of reference-dependent preferences. *Journal of Urban Economics* 64(1):101-115.

Bosworth, R., Cameron, T. A., & DeShazo, J. R. (2010). Is an Ounce of Prevention Worth a Pound of Cure? Comparing Demand for Public Prevention and Treatment Policies. *Medical Decision Making* 30(4):40-56.

Bulte, E., Gerking, S., List, J. A., & Zeeuw, A. (2005). The effect of varying the causes of environmental problems on stated WTP values: evidence from a field study. *Journal of Environmental Economics and Management* 49:330-342.

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,

Carpio, C. E. and Isengildina-Massa, O. (2009). Consumer Willingness to Pay for Locally Grown Products: The case of South Carolina. *Agribusiness* 25(3):412-426.

Clements R. (2004) Keeping Farmers on the Land: Agritourism in the European Union, Iowa Agricultural Review, vol. 10(3), pp. 8-9, summer 2004 (http://www.card.iastate.edu/iowa_ag_review/summer_04/article4.aspx)

Darby, K., Batte, M. T., Ernst, S., and Roe, B. (2008). Decomposing Local: A Conjoint Analysis of Locally Produced Foods. *American Journal of Agricultural Economics* 90(2):476-486.

Darby K., Batte M.T., Ernst S. & Roe B. (2006) Willingness to pay for locally produced foods: A customer intercept study of dirct market and grocery store shoppers, paper præsenteret på American Agricultural Economics Association Annual Meeting, Long Beach, California, July 23-26, 2006

Dolnicar, S. & Grun, B. (2009). Environmentally friendly behavior - can heterogeneity among individuals and contexts/environments be harvested for improved sustainable management?. Environment & Behavior, 41(5), 693-714.

European Union - Committee of the Regions (2011) Local food systems can boost rural development and improve the CAP, Committee of the Regions tells Commissioner Cioloş, press release COR/11/3, Brussels, January 27, 2011 (http://europa.eu/rapid/pressReleasesAction.do?reference=COR/11/3&format=PDF&aged=1&language=EN&guiLanguage=en)

Giraud, K. L., Bond, C. A., and Bond, J. J. (2005). Consumer Preferences for Locally Made Specialty Food Products Across Northern New England. *Agricultural and Resource Economics Review* 34(2):204-216.

Greene, W. H. (2003). *Econometric Analysis*. New York: Prentice-Hall International, Inc.

Hu, W., Adamowicz, W. L., & Veeman, M. (2006). Labelling Context and Reference Point Effects in Models of Food Attribute Demand. *American Journal of Agricultural Economics* 88(4):1034-1049.

Hébert, M. (2011). Examining current research on local food: a review. *Studies by Undergraduate Researchers at Guelph* 4(2):88-92.

ICROFS (2008). Development, growth, and integrity in the Danish organic sector - A knowledge synthesis on the opportunities and barriers for a continued development and market-based growth in production, processing, and sale of organic products. October 2008, International Centre for Research in Organic Food Systems (ICROFS).

Johnston, R. J., & Duke, J. M. (2007). Willingness to Pay for Agricultural Land Preservation and Policy Process Attributes: Does the Method Matter? *American Journal of Agricultural Economics* 89(4):1098-1115.

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica* 47(2):263-292.

Lancaster, K. J. (1966). A New Approach to Consumer Theory. *The Journal of Political Economy* 74 (2):132-157.

Levy, J. S. (2003). Applications of prospect theory to political science. *Synthese* 135:215-241.

Lloyd, A. J. (2003). Threats to the estimation of benefit: are preference elicitation methods accurate? *Health Economics* 12:393-402.

Loureiro M.L, Hine (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 vol. 34(3), pp. 477-487

Loureiro M.L. & McCluskey (2000) Assessing consumer response to protected geographical identification labelling, Agribusiness, vol. 16 (3), pp. 309-320

Louviere, J., Hensher, D. A., and Swait, J. (2000). *Stated Choice Methods. Analysis and Applications*. Cambridge, UK: University Press.

Luce, R. D. (1959). *Individual choice behaviour*. New York: Wiley.

Lusk, J., Nilsson, T., and Foster, K. (2007). Publice Preferences and Private Choices: Effect of Alturism and Free Riding on Demand for Environmentally Certified Pork. *Environmental and Resource Economics* 36:499-521.

Marsden T., Banks J. & Bristow G. (2000) Food Supply Chain Approaches: Exploring their Role in Rural Development, Sociologia Ruralis, vol. 40(4), pp. 424-438

Marsden T. & Smith E. (2005) Ecological entrepeneurship: sustainable development in local communicites through quality food production and local branding, Geoforum, vol. 36(4), pp. 440-451

McFadden, D., 1974. Conditional Logit Analysis of Qualitative Choice Behavior. In: P. Zarembka (ed) Frontiers in Econometrics. Academic, New York.

McFadden, D. (1999). Rationality for Economists? *Journal of Risk and Uncertainty* 19(1):73-105.

Meyerhoff, J. and Liebe, U. (2009). *Discontinuous preferences in choice experiments: Evidence at the choice task level*. Paper presented at the 2009 EAERE Conference, Amsterdam.

Morrison MD, Blamey RK, and Bennett JW (2000). Minimising payment vehicle bias in contingent valuation studies. *Environmental and Resource Economics* 16(4):407–422.

Morris, M. (2009): The Ethics and Politics of Animal Welfare in New Zealand: Broiler Chicken Production as a Case Study. *Journal of Agricultural and Environmental Ethics* 22(1): 15-30.

Mørkbak, M.R., Christensen, T. & Gyrd-Hansen, D. (2011): Consumers' willingness to pay for safer meat depends on the risk reduction methods - a Danish case study on Salmonella risk in minced pork. *Food Control,* vol. 22(3-4) pp. 445-451. DOI: 10.1016/j.foodcont.2010.09.024.

Mørkbak, M.R., Christensen, T. & Gyrd-Hansen, D. (2010): Consumer preferences for safety characteristics in pork. *British Food Journal* vol. 112(7) pp. 775-791

Nelson, C. H. (2001). Risk Perception, Behavior, and Consumer Response to Genetically Modified Organisms. *American Behavioral Scientist* 44(8):1371-1388.

Rose JM, Collins AT, Bliemer MC, Hensher DA 2009. Ngene 1.0 Stated Choice Experiment Design Software, University of Sydney.

Swait, J., Adamowicz, W. L., Hanemann, M., Diederich, A., Krosnick, J., Layton, D., Provencher, W., Schkade, D., & Tourangeau, R. (2002). Context Dependence and Aggregation in Disaggregate Choice Analysis. *Marketing Letters* 13(3):195-205.

Stefani G., Romano D., Cavicchi A. (2006) Consumer expectations, liking and willingness to pay for specialty foods: Do sensory characteristics telle the whole story? Food Quality and Preference

Train, K., 2003. Discrete Choice Methods with Simulation. Cambridge University Press, Cambridge.

Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: a reference-dependent model. *The Quarterly Journal of Economics* (November):1039-1061.

Von Neumann, J., & Morgenstern, O. (1944). *Theory of games and economic behaviour*. Princeton University Press.

Yue, C. and Tong, C. (2009). Organic or Local? Investigating Consumer Prefernce for Fresh Produce Using a Choice Experiment with Real Economic Incentives. *HortScience* 44(2):366-371.