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# Consumers' choice of broiler meat in Finland: the effects of country of origin and production methods

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**Abstract**— Among consumers there is an increasing interest and concern about the ways food is produced. This calls for the poultry industry to differentiate their products and production methods to directions valued by the consumers. In this study we use choice experiment to analyse the importance of broiler production method and the country of origin for the Finnish consumers. In the experiment, we offer several alternatives for regular broiler, including products that have been produced using organic methods, as well as products produced by emphasising animal welfare or consumer health aspects. The conditional logit model of consumer preferences for broiler meat in Finland revealed the very strong positive perceptions of domestically produced broiler products. Although the effect of production method was minor it also had an impact on consumer choice behaviour, particularly emphasising animal welfare in production increased the choice probability. The latent class analysis revealed the heterogeneity of consumer preferences but did not facilitate profiling the consumer groups based on socioeconomic data.

**Keywords**—Choice experiment, latent class analysis, preference heterogeneity.

## I. INTRODUCTION

Among consumers there is an increasing interest and concern about the ways food is produced, e.g. demand for organic food has been growing rapidly in US and Europe. Food is a package of different attributes, and the consumer chooses the package that is closest to his/her preferences. Consumer preferences for various ways to produce meat have been studied with stated choice methods. The focus has been in issues such as food safety [1], growth hormones and genetically modified feed [2], and animal welfare [3]. The consumer preferences regarding production of beef [2] and pork [4,3] have been studied. However, consumer preferences for poultry production methods

have not been previously studied in choice experiments.

In Finland the supply of broiler products has been very homogenous in terms of the country of origin and production methods, partially due to concentrated industry structure. There is very little variation in the ways broiler is produced in Finland, and for example organic broiler products are missing. Most of the products available for consumers have until recent years been domestically produced. The average annual consumption of poultry products has significantly increased during the past decade being 16 kg per person in 2006, most of which (13 kg) was broiler products. Since 2000 the amount of imported poultry has doubled, but the imported meat is mostly used in convenience food industry as well as restaurants and institutional catering units [5]. Still the increase in broiler products imports has raised supply chain actors' concern about the future competitiveness of broiler production in Finland and the interest of poultry industry towards differentiating their products and production methods valued by the Finnish consumers.

In this study we use choice experiment to analyse the importance of broiler production method and the country of origin for the Finnish consumers. In the experiment, we offer several alternatives for regular broiler, including products that have been produced using organic methods, as well as products produced by emphasising animal welfare or consumer health aspects. Using the choice experiment data we estimate a conditional logit model to analyse the relative importance of the attributes. To obtain more information about the heterogeneity of consumer preferences for broiler meat we use a latent class model that takes into account differences in preference structures.

## II. METHOD

The data used in the study were collected using an online internet questionnaire in November 2007. The consumer data set (N=1312) with a response rate of 51% is a representative sample of Finnish internet users in the age of 18-79 years. The survey included questions about consumer patterns of using poultry meat, several attitude and belief questions related to broiler production, socioeconomic background variables and the choice experiment. The choice experiment was framed by telling respondents to imagine that they were choosing broiler fillet for weekend dinner. The product was standardised to fillet to avoid its dominance over the attributes that were of special interest in this study. In the survey consumers were asked to choose between three different fillets, but they were also allowed to indicate that they were not willing to choose any of the products. Each product alternative was described by three quality attributes and price (Table 1). These attributes were seasoning of the fillet (unseasoned or marinated), origin (Finland, Denmark, Brazil, Thailand) and production method. The production methods were described in a separate table (Table 2). The price attribute varied on seven levels from 6 €/kg to 16 €/kg.

Given the four attributes and their varying levels, a large number of different products could be

constructed. To reduce the number of alternatives we used balanced overlap design (Sawtooth software). The balanced overlap procedure allows for some overlap of the attribute levels within the choice task and makes it possible to use interactions of the attributes in the choice models.

There are several statistical approaches to model consumer's product choice in this kind of an experiment. In this study we use basic conditional logit model and latent class model. In conditional logit preference homogeneity is assumed, which implies that all respondents have the same tastes for the attributes. Socio-economic variables can be included as interactions with attributes or different models can be estimated for subpopulations, but these are rather limiting ways of demonstrating preference heterogeneity. To solve this problem a latent class model that allows heterogeneity of the respondent preferences has been proposed [6]. In latent class model heterogeneity is statistically accounted for by dividing individuals simultaneously into behavioural groups or latent segments and estimating a choice model for each of these segments. Within each class, preferences are assumed to be homogeneous, but they can vary between the segments. The latent class approach includes also a model of individuals' membership probability to a latent segment.

Table 1 Example of choice experiment question

<input type="checkbox"/> <b>Product:</b> <b>Honey marinated broiler fillet</b>  <b>Country of origin:</b> Finland  <b>Price:</b> <b>12 €/kg</b>  <b>Production method:</b> Organic	<input type="checkbox"/> <b>Product:</b> <b>Unseasoned broiler fillet</b>  <b>Country of origin:</b> Thailand  <b>Price:</b> <b>8 €/kg</b>  <b>Production method:</b> Consumer health	<input type="checkbox"/> <b>Product:</b> <b>Unseasoned broiler fillet</b>  <b>Country of origin:</b> Brazil  <b>Price:</b> <b>11 €/kg</b>  <b>Production method:</b> Animal welfare
<input type="checkbox"/> I would not select any of these products		

Table 2 Poultry production methods valued in the survey

Production method	Description
Regular	<ul style="list-style-type: none"> <li>• vegetarian feed, 65% cereal</li> <li>• approximately 20 birds / m<sup>2</sup></li> <li>• birds are reared indoors</li> <li>• reared to 5 weeks of age</li> <li>• transportation time not regulated</li> </ul>
Animal welfare	<ul style="list-style-type: none"> <li>• vegetarian feed, 65% cereal</li> <li>• approximately 14 birds / m<sup>2</sup></li> <li>• birds have access to run outdoors during summer season</li> <li>• birds are reared to 5 weeks of age</li> <li>• perches provided as a stimulus</li> <li>• maximum transport time is 2 hours</li> </ul>
Consumer health (omega-3)	<ul style="list-style-type: none"> <li>• feed contains linseed that increases the omega-3 content of the meat</li> <li>• approximately 20 birds / m<sup>2</sup></li> <li>• birds are reared indoors</li> <li>• reared to 5 weeks of age</li> <li>• transportation not regulated</li> </ul>
Organic	<ul style="list-style-type: none"> <li>• organic feed</li> <li>• approximately 14 birds / m<sup>2</sup></li> <li>• access to run outdoors during summer season</li> <li>• reared to 11 weeks of age</li> <li>• perches provided as an enrichment</li> <li>• transportation not regulated</li> </ul>

### III. RESULTS

Preliminary results from the conditional logit model and latent class model are presented in Table 3.

The conditional logit model gives the general idea of the effects of the attributes and their levels on product choice. All coefficients were highly statistically significant. Price had a negative effect as expected. From the product attributes seasoning decreased the probability of choice. In the model, the three other countries of origin are compared to Finland as the reference level. Products from all other three countries were less preferred. The broiler fillet from Denmark was closest to the Finnish alternative, and the broiler fillet from Thailand was less probably chosen. From production methods particularly the method that emphasised animal welfare aspects had a positive effect on respondents' choice probability, but the organic product was almost as highly valued. The consumers preferred less the product that had positive

effect on consumer health. However, the effect of omega-3 treatment was still positive.

From the several alternative latent class models we selected the three class alternative. Based on the R<sup>2</sup>-statistics latent class approach improved the fitness of the model. The interpretation of the classes was quite clear. The first class valued highly particularly organically produced Finnish broiler meat. For this class the price of the product was less important. The second class was especially sensitive to price but less sensitive to the country of origin. The third class was between these two with respect to price and country of origin, but for this class the consumer health did not play any significant role. The reasons for the heterogeneous preferences remained unexplained as the most included socioeconomic variables were non-significant.

Table 3. Conditional logit and latent class models for broiler fillet choice.

	Conditional logit		Latent class					
	Coeff.	p-value	Class 1		Class2		Class3	
Coeff.			p-value	Coeff.	p-value	Coeff.	p-value	Coeff.
Constant (1)	2.591	0.000	3.054	0.000	3.937	0.000	1.334	0.000
Constant (2)	2.577	0.000	3.018	0.000	3.917	0.000	1.319	0.000
Constant (3)	2.623	0.000	2.924	0.000	4.019	0.000	1.408	0.000
Price	-0.132	0.000	-0.055	0.007	-0.185	0.000	-0.120	0.000
Unseasoned	0.103	0.008	-0.746	0.000	0.100	0.006	0.567	0.006
Denmark	-1.771	0.000	-3.533	0.000	-0.864	0.000	-2.314	0.000
Thailand	-3.508	0.000	-6.272	0.000	-2.508	0.000	-4.276	0.000
Brazil	-2.780	0.000	-5.899	0.000	-1.848	0.000	-3.007	0.000
Animal welfare	0.687	0.000	0.990	0.000	0.754	0.000	0.673	0.000
Consumer health	0.237	0.000	0.416	0.020	0.395	0.000	0.033	0.756
Organic	0.538	0.000	1.458	0.000	0.514	0.000	0.367	0.000
<i>Class membership function</i>								
Constant			0.776	0.076	0.226	0.533	reference	
Gender			-0.443	0.057	0.026	0.890	group	
Dummy_age			0.053	0.843	0.072	0.744		
Dummy_income			-0.000	0.999	-0.211	0.280		
Dummy_education			-0.066	0.781	0.074	0.706		
Dummy_children in the household			-0.003	0.992	0.320	0.193		
Respondents	1312		1312	p-value	<0.0000	<0.0000		
Chi <sup>2</sup> (likelihood ratio)	5961		6999	Pseudo-R <sup>2</sup>	0.33	0.39		

#### IV. CONCLUSIONS

The choice experiment of consumer preferences for broiler meat in Finland revealed the very strong positive perceptions of domestically produced broiler products. Although the effect of production method was minor it also had an impact on consumer choice behaviour. Emphasising particularly animal welfare in production increased the choice probability. Although the attribute level of organic production included the most indicators related to animal welfare, except for limits in the transportation of animals, it did not tempt consumers as much as alternatives focusing purely on animal welfare. The latent class analysis revealed the heterogeneity of consumer preferences but did not facilitate profiling the consumer groups based on socioeconomic data. This emphasizes the importance of social psychological attitude and belief variables in profiling consumers.

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