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**The implications across Europe of the ‘horse meat scandal’ on the monetary value of meat authenticity and food safety in ready to heat lasagne: evidence from six countries**

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## Abstract

The recent ‘horse meat scandal’ in Europe has sparked huge concerns among consumers, as horse meat was found in beef lasagne ready to be consumed. This study investigates consumers’ preferences towards characteristics of ready to heat lasagne, including origin of the meat, whether the meat is tested as beef, safety of the lasagne, and nutritional value, using Discrete Choice Experiments in six EU. Our sample of 4,598 consumers makes this the largest cross sectional study of this kind. The results of this study present evidence that consumers in Europe are concerned about the authenticity and origin of the meat.

**Keywords:** Random Utility Maximisation; food safety; ready meals; horse meat scandal; consumer’s preferences.

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## 1. Introduction

In Europe (late 2012/early 2013) a crisis occurred for the food industry when it was found that particular pre-prepared foods contained horsemeat and this was not declared on the package, food label or ingredients list (EC 2014). This is commonly referred to as ‘the horse meat Scandal’. The scandal is largely contained within Europe and first came to light when the Food Safety Authority of Ireland published results that beef burger products had tested positive for equine DNA. This led to further incidences being revealed across Europe including Italy, Germany, Spain and France and Norway.

This has affected consumer confidence in the integrity of the pre-prepared food (containing meat) market. In light of this it is necessary to investigate issues pertaining to consumer preferences for pre-prepared meals including beef to discover the perceived benefit to consumers and if they are willing to pay for enhanced features.

The study employed the Discrete Choice Experiment (DCE) method to ascertain the additional value consumers and potential consumers are willing to pay for improved safety, information and quality features of ready lasagne. The DCE survey was administered in six countries – namely Republic of Ireland, France, Italy, Spain, Germany and Norway. Our sample of 4,598 consumers makes this the largest cross sectional study of this kind. The results from multinomial logit models show that consumers are willing to pay more to know that the meat they eat is beef, with Italians least concerned and Irish most concerned. Consumers also consider it important to support locally sourced meat. Food safety is relatively less important. The results of this study present strong evidence that consumers in Europe are highly concerned about the authenticity of the meat declared on ready meals and strongly prefer to know that the meat is national. This evidence suggests that there is great value in providing information on these attributes, both from a consumer perspective and where this leads to an increased consumer confidence has benefits for the food industry.

Section 2 highlight the background literature, Section 3 describes the methodology and introduces the case study; Section 4 presents the results; Section 5 concludes the paper.

## 2. Background literature

Whilst consumer preferences for food quality and safety features are well known there is little evidence of those preferences when fraudulent labelling has occurred as with the horse meat scandal. (See for example previous papers such as Loureiro and Umberger, 2007 about traceability, Ortega et al., 2011 about quality features and Loureiro and Umberger, 2007; Alfnes and Rickertsen, 2004 who investigate region of origin labelling.)

Sorenson et al., (2011) use the theory of planned behaviour to examine why consumers buy and consume convenience meals (ready meals or takeaways) and find that value for money is most important for those who intended to buy or did not intend to. They suggest that for a marketing strategy focus should be on value for money.

It has been shown in previous research that preferences differ between consumers of different regions have been shown to differ between consumers in different regions. For

example UK consumers were found to place the quality of steak as more important compared to German and French consumers who placed the origin of labelling of steak as most important (Roosen and Fox, 2003). In a cross regional study Bernués et al. (2003) found that consumers in France, Italy and Spain had a greater concern for food safety compared to British and Scottish consumers.

### 3. Description of the study

The questionnaire was designed to be administered in the six regions by means of an online survey. We used focus groups and discussions with stakeholders to design the questionnaire and set the levels for the attributes describing the RTH products. The DCE questionnaires usually begin with general ('warm-up') questions aimed at making the respondent comfortable with participating in the survey and answering questions (Bateman et al., 2002). However, our questionnaire starts with socio-demographic questions, as the answers to these questions were used by the survey company to screen respondents to obtain a sample as representative as possible of the population. Whenever a quota had been achieved for specific socio-demographic variables, such as age, gender, educational level, geographical location of the respondent and income the survey company would stop surveying people from that group. A screening question was used to ascertain if consumers currently bought RTH meals or would consider buying them in the future.

Following the socio-demographic questions respondents are asked questions about ready meals to understand if they currently buy them, who for, why (or if they would consider) and how often. Subsequently questions are asked on attitudes towards food in general, the purpose of this is to provide understanding to the preferences elicited in the DCE exercise and for validation purposes. Next, the five attributes used in the DCE are described. A question is asked after each attribute description to help keep the respondent actively engaged and focused on the DCE attributes and levels before the DCE is shown to them. The central part of the survey presents eight DCE questions, followed by final socio-demographic questions which are of a more sensitive nature than those asked at the beginning but not related to quota controls. When designing a DCE, selection of relevant attributes and alternatives are very important; care should be taken to reduce a high cognitive burden on respondents (Powe et al. 2005). Attributes were selected based on focus groups, consultation with SMEs producers of ready lasagne, relevant literature. Five major attributes were selected: risk of food poisoning, origin of the meat, test of meat authenticity, retention of nutritional values. Attributes and levels used in the DCE are reported in Table 1. The cost has been converted in PPP using the tool available on Methodex Currency Converter as the following: Germany 2010 is used as the baseline for PPP, for France we have multiplied the cost by a coefficient of 0.917, for ROI 0.890, for Italy 0.955, FOR Norway 0.086 and for Spain 1.084.

*Table 1: Attributes and Levels - Lasagne*

Attributes	Levels
Risk of food poisoning	Enhanced Safety
	Current Safety
Origin of the meat	Unknown
	Imported
	National
Test of meat authenticity	Tested
	Not tested
Retention of nutritional values	Twice the current level
	Current level
Price	€2.8, €3.0, €3.5, €4.0, €4.5, €5.0
	Kr.38,40,45,50,55,58

Respondents faced 8 choice tasks in which they were asked to state their preferred lasagne among two experimentally designed alternatives and a current situation. They also had the option to not buy any lasagne.

We designed the questionnaire adopting the Db-efficiency under uninformative priors criterium for the indirect utility coefficients (Ferrini and Scarpa, 2007). Twenty-four different choice sets were produced and then divided into three blocks composed by eight choice sets each. The survey instrument was administered online to a random sample of households across six regions. The survey took place during December.

#### 4. The econometric approach

DCE is an application of the theory of value (Lancaster, 1966) combined with the Random Utility Maximization Theory (see Thurstone, 1927; Manski, 1977). Under this setting, the core assumption of DCE is that choices are driven by the maximisation of respondents' utility. The utility that each alternative brings to the respondents can be represented by the function:

$$U_{nit} = V_{nit}(\beta, X_{nit}) + \varepsilon_{nit}, \quad (1)$$

where n indicates the respondent, i the chosen alternative, t the choice occasion, x is a vector of attributes,  $\beta$  is a vector of parameters to be estimated and  $\varepsilon$  is a random error term (unobserved by the researcher, often referred to as disturbance) assumed to be iid Gumbel distributed. Given the utility function of Equation 1 the probability for individual n of choosing alternative i over any other alternative j in choice set represented by a multinomial logit (MNL) model (McFadden, 1974) is:

$$Pr_{nit} = \frac{e^{\mu V_{nit}}}{\sum_{j=1}^J e^{\mu V_{njt}}}, \quad (2),$$

where  $V_{in} = \beta'x_{in}$ .

Willingness to pay (WTP) were then derived as the ratio of two coefficients: the coefficient of the attribute of interest and the coefficient representing the monetary attribute.

$$WTP_k = -\frac{\beta_k}{\beta_p} \quad (3)$$

#### 6. Results

It is important to note that direct comparisons between the coefficient estimates are not possible as there might be differences in scale across countries. As an exploratory analysis, we will consider sign and significance. Results for MNL model estimations in each country were not included in this version of the manuscript, but are available upon request from the authors. This should be considered a preliminary exploration before running more complex models in WTP-space to allow for a more sensible interpretation of results. From this model's results, it is firstly important to notice that the sign of all attributes conform to prior expectations with negative preferences for higher cost and positive preferences for less risk, knowing that the meat is imported, knowing that the meat is national, test of meat authenticity and improved nutrition. Knowing that the meat is national and tested is highly significant for all regions. Less risk is only insignificant in France suggesting that French consumers placed less importance on this attribute when making their choice. Nutrition is only significant for ROI consumers thus indicating that they value this attribute when choosing RTE lasagne.

The current option is only significant for Italy, Germany and Spain of which Italian consumers prefer to choose one of the other alternatives and German and Spanish consumers prefer to stick with the current option. No buy retrieved significance for ROI, France and Spain. In France and ROI the sign is positive suggesting that they preferred not to buy any of the proposed lasagne in contrast to Spain where respondents preferred to choose one of the alternatives.

*Table 2 WTP for each enhanced attribute*

	ROI		NOR		ITALY		FRANCE		GERMANY		SPAIN	
Attribute	WTP	t-ratio	WTP	t-ratio	WTP	t-ratio	WTP	t-ratio	WTP	t-ratio	WTP	t-ratio
Less risk	0.35	3.27	0.46	3.28	0.88	4.22	0.38	2.05	0.60	5.80	0.79	5.40
Imported	1.39	7.20	1.66	4.24	1.90	3.90	1.62	3.39	0.62	4.50	1.78	5.47
National	3.44	9.58	3.68	4.52	4.84	3.74	5.97	3.28	2.86	7.09	3.73	5.98
Test	3.93	10.31	4.02	4.87	4.17	4.18	5.14	3.45	3.39	7.91	4.32	6.39
Nutrition	0.44	3.97	0.28	1.81	0.35	2.40	-0.04	-0.15	0.06	0.46	0.25	1.86

In Table 2 we can analyse WTP in different countries. These values are comparable across countries, but in future analysis we will use more sophisticated methods to retrieve them. As a first exploration of the data we can already highlight that all WTPs but Nutrition are statistically significant. Nutrition is only positive and statistically significant in ROI and Italy. In ROI Respondents place high monetary value on the RTE lasagne being Tested for meat authenticity (€3.93) and to know that it is National (€3.44). The least valued attributes are Less risk (€0.35) and Nutrition (0.44). Knowing that the meat is Imported is also important with a value of €1.39. In Norway respondents place most monetary value on the RTE lasagne being Tested for meat authenticity (€4.02) and to know that it is National (€3.68). The least valued attributes are Less risk (€0.46) and Nutrition (0.28). Knowing that the meat is Imported is also important with a value of €1.66. In Italy respondents place most monetary value on knowing that RTE lasagne the meat is National (€4.84) Tested for meat authenticity (€4.17). The least valued attributes are Less risk (€0.88) and Nutrition (€0.35). Knowing that the meat is Imported is also important with a value of €1.90. In France respondents place most monetary value on knowing that RTE lasagne the meat is National (€5.97) and Tested for meat authenticity (€5.14). The least valued and significant attribute is Less risk (€0.38). Knowing that the meat is Imported is also important with a value of €1.62. In Germany respondents place most monetary value on knowing that RTE lasagne is Tested for meat authenticity (€3.39) and that the meat is National (€2.86). The least valued and significant attributes are Less risk (€0.60) and knowing that the meat is Imported (€0.62).

Finally in Spain respondents place most monetary value on knowing that RTE lasagne is Tested for meat authenticity (€4.32) and that the meat is National (€3.73). The least valued and significant attribute is Less risk (€0.79). Knowing that the meat is imported realises a value of €1.78.

## **7. Conclusions**

In this study we investigate consumers' preferences, attitudes and willingness to pay towards RTH lasagne including origin of the meat, whether the meat is tested as beef, safety of the lasagne, and nutritional value. We use a Discrete Choice Experiments in six countries - Republic of Ireland, France, Italy, Spain, Germany and Norway. Our sample of 4,598 consumers makes this the largest cross sectional study of this kind. Results indicate that consumers would greatly benefit from the enhancement of quality and safety in ready meals. Results are coherent with priors and expectation and, analysing descriptive statistics and attitudinal questions it appears evident that the survey instrument worked well in all subsamples. While we find many similarities across the six regions, we also observe some differences. The results show that all consumers have strong preferences for meat produced in their nation and for meat tested.

This can be the impact of the recent 'horse meat scandal' in Europe which has sparked huge concerns among consumers, as horse meat was found in beef lasagne ready to be consumed. The results from multinomial logit models show that on average consumers are willing to pay about €4.3 to know that the meat they eat is beef with Italian least concerned

and Irish most concerned. Food safety is relatively less important as consumers are willing to pay €0.6 to reduce risk of food poisoning. Consumers also consider it important to support locally sourced meat with an average willingness to pay of €4.1 to consume lasagne produced with national meat. Primarily the results of this study present strong evidence that consumers in Europe are highly concerned about the authenticity of the meat declared on ready meals and strongly prefer to know that the meat is national. This evidence suggests that there is great value in providing information on these attributes, both from a consumer perspective and where this leads to an increased consumer confidence has benefits for the food industry suggests that there is great value in providing information on these attributes, both from a consumer perspective and where this leads to an increased consumer confidence has benefits for the food industry. In the highly competitive market for food, this suggests that local producers have scope to differentiate and add value to their products through enhancing the safety and quality of RTE meals by enhancing certain attributes such as food safety and origin labelling. A further important finding from this study is that strong regional differences in price premiums exist for these enhanced features. This suggests that food producers should consider tailoring their products for different markets.

The limitations of this paper are mainly related to the fact that the data were only very recently collected and therefore we only present very simple, preliminary analysis. Models in WTP-space including random parameters to accommodate for heterogeneity in both preferences and scale factor and for correlations across attributes will be included in next version of the paper.

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