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Consumer Preferences Regarding Country of Origin Labelling of Meat

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Executive Summary

In this report we present our findings and conclusions on the economics of country of origin food labels (CoOL) as they apply to meat sold to consumers in the UK. The need for this research was motivated by recent EU legislation regarding how meat products can and might be labelled with respect to CoOL. The main objectives of the research were:

1. To review and synthesise the existing literature to identify and understand UK consumer preferences regarding CoOL of meat products.

2. To design and implement a series of hypothetical choice experiments (CEs) to ascertain consumer perception of the relative importance of different labelling requirements in terms of average UK consumer willingness-to-pay (WTP).

3. To cover a broad range of meat products (i.e., unprocessed swine, sheep, goat and poultry) in fresh, chilled, frozen format plus meat used as an ingredient (including beef).

To address these objectives we undertook three specific but related pieces of research:

1. We designed and conducted 12 hypothetical CEs via six online survey instruments. To inform the design and implementation of our CEs we undertook an extensive review of the antecedent literature. This review revealed an extensive set of attributes to consider for use in our CEs. We then refined this set of attributes after extensive discussions and a small pilot study. The scope and coverage of products examined reflect the wide ranging scope of the legislation. For all 12 products we estimated WTP for CoOL and various other product attributes.

2. We designed and implemented an additional hypothetical CE employing eye-tracking (ET). The ET CE examined respondent attention and attendance to attributes during the CE. The results from the ET were compared to the online survey results yielding information in relation to how well respondents engaged with the CEs, magnitude of estimates as well as consistency. The results from our ET CE provide a means by which to assess the internal validity of the results provided by our 12 online CEs.

3. We undertook an analysis of market transaction data; a revealed preference study using data obtained from Kantar. This piece of analysis allowed us to see the extent to which consumers have already responded to CoOL and if there exists a

price premium being paid for CoOL in the UK. The results obtained from the Kantar data allowed us to assess the external validity of our CE results.[1] Our key findings are as follows:

Finding i: A review of the stated preference literature revealed that there are very few existing estimates of UK consumer WTP for CoOL for meat. Thus, the results we report make a contribution to the literature on this topic. For all the products considered using hypothetical CEs we found that UK CoOL was positively valued. Specifically, our key finding is that UK CoOL was the highest valued food label attribute for the fresh/chilled/frozen group of products (excluding chicken) and for gammon steak which many consumers may consider as fresh (although it is actually a form of processed meat).

Finding ii: Our hypothetical CE results indicate UK CoOL is valued relatively less for processed products where the quality signal provided by the Product Quality attribute and the Organic Production attribute are of greater importance.[2] This relative effect is important as it indicates that CoOL implementation is of greater public value for fresh/chilled/frozen meat compared to processed products. This finding suggests that CoOL use with lightly processed/composite meat products might be implemented on a voluntary basis with further analysis conducted in the future to inform the possibility of making this a mandatory labelling requirement.

Finding iii: Our revealed preference study found that meat products (e.g., beef) with a British CoOL attract a price premium. The importance of CoOL was found to increase across different origin labels after the horsemeat incident in 2013, indicating that CoOL takes on meaning, for many consumers, beyond that of simply indicating origin – i.e. a cue for authenticity.

Finding iv: Our survey results indicate that, when asked directly, respondents preferred a CoOL format that included a flag. However, for all the CEs the inclusion/exclusion of a flag had minimal impact on respondent WTP. That said, when examining a more complex CE design as part of ET CE there was a greater difference between text only CoOL WTP and text and flag WTP.

It is important to understand the robustness and the reliability of the results we present. With regard to robustness, we intentionally implemented the three

[1] The existing literature on CoOL such as Umberger (2010) makes almost no mention of validity checks on results which is somewhat surprising given the many issues surrounding the use of hypothetical stated preference research methods such as Contingent Valuation (CV) and Choice Experiments.

[2] The Product Quality attribute indicated if a specific product was either, Basic, Choice or Premium with an implicit assumption about quality. For the Organic Production attribute we indicate if the meat was produced using either organic production methods or conventional methods.

complementary pieces of research so that we could assess the internal and external validity of our hypothetical CEs WTP estimates.

By internal validity we mean the consistency of our hypothetical CE results with regard to the methods we have used. We used the ET CE to assess internal coherence. Importantly, we found that there was a strong correspondence in the results, especially the relative importance of the attributes, between the online CE and the ET CE. The ET CE found that most attributes were visually attended the majority of the time, with Price consistently the most visually attended attribute; CoOL was attended slightly less frequently. Given the strong similarity in results reported this provides good evidence that our CEs have achieved a high degree of internal coherence. Thus, we conclude that respondents have engaged with the CEs in a meaningful way and therefore that the results presented are robust.

With regard to assessing external validity we have established that the degree of attribute attendance as identified by the ET CE is in keeping with other published research. The magnitude of our CEs estimates is also in keeping with those previously reported in the literature. However, in conducting this research we have been cognisant of the CoOL legal requirements and by taking this into account we have generated a set of results that can be taken as more meaningful in relation to CoOL than many of the estimates previously reported in the literature.

In addition, the findings of our hypothetical CEs in terms of significance and value of CoOL correspond with those we have found in our revealed preference research. That is, CoOL is positively valued and does appear to attract a price premium. This validation is a particular strength and an approach we recommend in future research in this area.

Although we are confident that our hypothetical CE surveys have achieved a reasonably good degree of internal and external validity there are number of areas in which the current research is potentially limited and should therefore be treated with some caution.

First, our hypothetical CEs have been designed, implemented and evaluated following best practice in the literature (e.g., Hensher and Green, 2003, Johnson et al., 2013). Thus, we are confident that the results presented are robust, especially in light of the internal and external validity checks. However, the hypothetical nature of the CEs should be borne in mind and, for this reason, as is common within the stated preference literature that we focus on the relative importance attached to the different food label attributes as opposed to the absolute levels. Or to put this point another way: as is common within the stated preference literature, we attach higher

credibility to the relative importance attached to the various food label attributes than we do towards the absolute levels.[3]

Second, the set of meat products we have considered are far from exhaustive. However, the selection of these products was informed with reference to current levels of meat consumption within the UK.[4] Therefore, although we are confident in the products we have examined there is reason to consider undertaking further such research for a wider array of meat products.

Third, as is the case with any form of stated preference research there is always room for improvement in survey design. In particular, it would be interesting to consider more complex food labels for a greater range of products. We also acknowledge that this type of hypothetical survey can be subject to various biases that can affect the results. However, given that we have followed best practice with regard to the design of CEs as identified within the existing literature as well as the opinions collected during the design phase of the project, we are confident that our design is robust within the stated limitations imposed by the necessarily hypothetical nature of this exercise. Furthermore, the results of ET CE do not indicate types of respondent behaviour that are inconsistent with those observed in other hypothetical CE studies or for that matter inconsistent with appropriate engagement with the survey instrument.

Fourth, it is possible that in one hypothetical setting some attributes have greater influence than they would in a 'real' world environment or different hypothetical setting. Context matters because the role any given attribute level plays in decision making will depend on the other information that is also available. However, the observation that context matters is not specific to hypothetical settings. For example, the organic premium may depend on whether it is bought within a Supermarket or 'Farmers market'. Thus, while our caveats pertain to our CEs, it should be recognized that any specific situation may induce variations in values that differ from 'the average'.

Finally, we have only employed a limited number of meat products (e.g., beef) within our revealed preference study. This is because beef is the only meat product for which mandatory CoOL is already in place. An obvious limitation is that our stated

[3] The extent and magnitude of WTP estimates is varied. The existing studies in the literature that employ theoretically grounded methods such as CV and CEs yield a wide range of estimates. There are also other studies, such as those by FCEC (2013, 2014) that employ basic survey methods that lack theoretical rigour. The results reported in these studies are of interest but they do need to be treated with a degree of caution given the methods employed.

[4] Product choice was informed by considering the Defra Monthly Living Costs and Food Survey statistics to identify those products most commonly purchased by UK householders.

preference hypothetical CE did not consider beef explicitly (only in processed products) as it was not the focus of the policy question. Also the issue of meat authenticity has arisen with regard to beef and it is likely that part of the value we see attributed to CoOL for beef is a result of context specific effects. Thus, we need to be careful comparing the absolute magnitudes of consumer WTP for CoOL between products. This is another reason why we prefer to focus on the relative value attached to CoOL on a product by product basis for both our hypothetical CEs and revealed preference results.

List of Abbreviations

AIR – Attribute Importance Ranking

ANA – Attribute Non-Attendance

CEs – Choice Experiments

CPI – Consumer Prices Index

CoOL – Country of Origin Label

CV – Contingent Valuation

Defra – Department for Environment Food & Rural Affairs

DKK – Danish Krona

ET – Eye-tracking

EU – European Union

FSA – Food Standards Agency

GB – Great Britain

LCM – Latent Class Models

ME – Mixed Effects

MNL – Multinomial Logit

MXL - Mixed Logit

RE – Random Effects

RSPCA – Royal Society for the Prevention of Cruelty to Animals

RUT – Random Utility Theory

SE – Standard Errors

SEK – Swedish Krona

SKU - Stock Keeping Unit

UK – United Kingdom

WTP – Willingness-to-Pay

Introduction

Mandatory rules on CoOL are already in place within the EU for beef, fruit and vegetables, olive oil, wine, eggs, imported poultry, honey and hops. In the beef sector the label must distinguish between place of birth, and rearing and slaughter where these differ. Recently, Regulation (EU) No 1169/2011 of the European Parliament and of the Council on the provision of food information to consumers provides for mandatory indication of country of origin or place of provenance for unprocessed meat of pigs, poultry, sheep and goats from 13 December, 2014[5]. Following Impact Assessments, Commission Implementing Regulation (EU) No 1337/2013 of 13 December 2013 laying down rules for the application of Regulation (EU) No 1169/2011 of the European Parliament and of the Council as regards the indication of the country of origin or place of provenance for fresh, chilled and frozen meat of swine, sheep, goats and poultry sets out the requirements for CoOL for these species and CoOL became mandatory for these products from 1 April 2015. Unlike mandatory CoOL in the beef sector, CoOL as applied to pigmeat, poultry, sheep and goats will only specify the place of rearing and the place of slaughter; the place of birth will in general not be required, although there are rules explaining when this can be claimed.

The use of CoOL also extends to other food products via voluntary origin labelling (including regional).[6] For example, in the UK multiple retailers have also used voluntary CoOL to indicate the British origin of meat other than beef (fresh meat, lightly processed and composite products); in some cases CoOL is also used for meat originating outside the UK, for example, New Zealand lamb, Danish and Dutch bacon. There are also registered quality labels which, *inter alia*, include an indication of country of origin used for meat (for example, Label Rouge in France, Swedish Seal and the Red Tractor in the UK, although there can be exceptions in that imported products can carry these designations, so consumers need to use these labels as a guide to country of origin with care).

According to the Commission of the European Communities (CEC) (2008), an increasing number of products contain some indication of origin which in turn drives

[5] Under Article 44 a Member State can decide whether or not to require mandatory CoOL for non pre-packed unprocessed meat, such as meat packed by a butcher at the consumers' request or meat that is pre-packed for direct sale to consumers.

[6] In terms of voluntary origin labelling, the EU legal framework is Article 26(3) of Regulation (EU) No 1169/2011, but the implementing rules defining the detailed provisions for voluntary origin labelling have not yet been adopted.

consumer expectations of more CoOL as well as the expectation that when such labelling does appear it is not false or misleading. Indeed, CEC (2008) observe that the use of CoOL in the beef sector has further increased consumer demand for such labelling. This consumer demand is evidenced in a number of consumer studies in the EU, a selection of which is listed in CEC (2008) with further studies reported in Trans Atlantic Consumer Dialogue (TACD) (2008)[7]. CEC (2008) also stresses specifically the demand for labelling in the meat sectors and the need for clear rules on such labelling to ensure that there is a level playing field across the single market of the EU.

As a result of the recent changes to CoOL for meat and the potential changes that might occur in relation to various types of processed meat and food, the **main objectives** of the research presented in this report are as follows:

- To review and synthesise existing literature to identify and understand UK consumer preferences regarding country of origin labelling of meat products.
- To design and implement a series of hypothetical Choice Experiments (CEs) to ascertain UK consumer relative values for the different labelling requirements.
- To cover a broad range of meat products (i.e., unprocessed swine, sheep, goat and poultry) in fresh, chilled, frozen formats plus meat used as an ingredient (including beef).
- For each category examined labels needed to specify:
  - Place of animal's birth, rearing and/or slaughtering; and
  - Place of origin as a) Any specified country; b) UK or c) EU versus Non-EU.

To address these **objectives** we have undertaken three specific pieces of research:

1. We have designed and conducted 12 online hypothetical CEs for 12 meat products.[8] The reason for considering 12 products was to ensure adequate product coverage for the project brief. The selection of products was informed by reference to Defra Monthly Living Costs and Food Survey statistics that identify the types of products that are most commonly purchased by UK householders. The scope and coverage of products examined reflected the

[7] Oxford Evidentia (2010)"suggests" that consumer demand for CoOL and use of the labelling may differ.
[8] The specific products are as follows. For unprocessed, fresh and frozen meat: Chicken breast fillets; Turkey Mince; Pork leg joints and Lamb leg joints. For lightly processed meat: Pork Sausages; Bacon (Pork) rashers; Beef burgers (these are not 100% beef, but are lightly processed); and Bacon (Pork) gammon steaks. For composite meat products: Chicken pie; Pepperoni pizza; Beef lasagne; and Chicken Curry.

wide ranging scope of the recent legislative changes (i.e., fresh and unprocessed meat) as well as potential legislation that might be forthcoming (i.e., lightly processed and composite meat products). For all 12 products we have estimated Willingness to Pay (WTP) for CoOL as required.

2. We have designed and implemented an additional hypothetical CE employing Eye Tracking (ET). The face-to-face ET sample examined respondent attention and attendance to attributes during the CE in combination with debriefing questions measuring stated attendance as well as ranking of the attributes used in the CEs. The three measures (stated attribute non-attendance (ANA), attribute ranking (AIR) and ET) allowed us to improve our understanding of respondent attribute use. The results from the ET were compared to the online survey results. This comparison provided important information in relation to how well respondents engaged with the CEs and provided the opportunity to calibrate our estimates if significant differences had been identified.

3. We have undertaken an analysis of revealed preference data obtained from Kantar. This piece of analysis allowed us to assess the extent to which consumers have already responded to CoOL and to established whether there is a meaningful price premium being paid for CoOL in the UK.

The decision to conduct these three pieces of research needs to be understood within the research strategy we adopted.

First, there are very few existing estimates within the literature of consumer value of CoOL, especially for the UK. This evidence gap in relation to CoOL requires that we examine a large number of products. Importantly, we are required to use (hypothetical) stated preference techniques, such as CEs, as mandatory CoOLs are yet to be employed in practice for the vast majority of meat products. Also the use of a hypothetical CE as opposed to other stated preference valuation methods such as Contingent Valuation (CV) is justified on the basis of the type of value estimates required and how best to derive them in an efficient and effective manner.

Second, with the use of any hypothetical stated preference research method it is important to demonstrate that the results produced are as robust and meaningful as possible within the methodology. To this end the use of an ET CE helps to provide evidence with regard to the internal validity of the research in terms of how survey respondents have undertaken the tasks in hand.

Third, with the limited information available on actual meat purchases that have been subject to the use of CoOL, we have been able to undertake revealed preference

research so as to produce estimates of the value of CoOL where it is used. These estimates were then used to assess the hypothetical CE estimates in terms of significance. In this way our revealed preference estimates act as a form of control that we can use to gauge the hypothetical WTP estimates.

Finally, the research strategy we have employed to examine the value placed on CoOL in this study is in large part determined by data availability. Economists can employ revealed or stated preferences methods to derive WTP estimates. However, given the very limited amount of data on actual meat purchases that are subject to mandatory CoOL (fresh beef) we are limited in the extent to which we can use revealed preference methods with actual meat purchase data. This means that we needed to use hypothetical stated preference methods to address this issue. Revealed preference methodologies are known to result in relatively high WTP estimates and given this limitation the emphasis should be placed on the relative value attributed to CoOL compared to other food label attributes.

Given the research strategy adopted and the research conducted we are able to report that we have been successful in achieving the main objectives of the research project.

First, we have generated a very large number of WTP estimates for CoOL for a large group of meat products. The robustness and magnitude of the estimates is within the range of estimates derived using this methodology previously reported in the literature. However, it needs to be remembered that stated preference methodologies are hypothetical and as such our WTP estimates need to be treated with a degree of caution. Importantly, the relative WTP attached to CoOL reveals that it is of far greater value to respondents for fresh/chilled/frozen products than is the case for processed meat or for products where meat is used as an ingredient (including beef).

Second, we have generated revealed preference estimates of consumer use of CoOL for beef which we have used to help assess the external validity of our stated preference estimates. The importance attached to CoOL resulting from our revealed preference estimates indicates that the price premium being paid for CoOL is statistically greater than zero. This in turn allows us to view our stated preference estimates as plausible and reasonable in terms of the importance attached by consumers to CoOL.

Third, by employing ET to examine how respondents have engaged with a specific version of the CE we are better able to understand how well respondents engaged with the CE (Internal validity).

Based on these general findings we now summarise how we have addressed the specific research questions identified in the original tender brief:

1) **What are consumers' WTP under the following labelling scenarios?**

   Country of origin identified as place of animal's birth[9], rearing and/or slaughtering; and for each the origin country specified as:
   a) any specified country;
   b) UK; or
   c) EU versus Non-EU

Based on our CE estimates we find that survey respondents are WTP a price premium for meat products with a UK CoOL. These estimates are on average as high as 50% of the mid-price used in our CEs. However, as noted above, our estimates are derived from hypothetical CEs and need to be treated with a degree of caution. Of greater importance, our results indicate that CoOL is not always the most highly valued attribute presented in the CEs. On several occasions we found that the food quality attribute and the farming system attribute (indicating organic production) are highly valued. This provides important context for the WTP. In addition, we have found that the relative WTP for CoOL differs in relation to proximity to the UK. Thus, the CoOL which was least valued, for most but not all products, was that for countries outside the EU. In terms of a generic EU CoOL label and a specific EU country CoOL there is a general tendency for the specific country to be more highly valued, but only marginally so. We also find that the relative like/dislike of UK CoOL and the other options varies on a product-by-product basis.

In our research, we described CoOL in two ways in line with likely legislative requirements. For fresh, chilled and frozen meat products we employed the phrase "Reared and Slaughtered", whereas for the processed products we employed the words "Meat Origin". The size of our WTP estimates is similar using either description of CoOL. We also examined whether WTP was affected by the presence of country flags in addition to the text which is all that is required under the new legislation. We found very little differences in WTP between the data with text only, text and flag and all data combined.[10]

[9] We did not explicitly consider place of animal's birth as the legislation states that this will not be used in all cases. Furthermore, the limited information and statistics about animal movements (i.e., place of birth, place of rearing, place of slaughter) meant that we had no information upon which to frame this specific aspect of CoOL. For these reasons we did not consider this issue.

[10] Note, we have examined alternative CoOL formats for a range of different countries. Our CEs did not consider the presence versus absence of a CoOL. Although an important issue the existence of voluntary CoOL indicates that consumers probably value CoOL (or at least producers think so) as observed by Roe et al. (2014),

2) What drives these WTP estimates (eg indication of quality and taste) and how are they weighted in terms of importance of influencing the estimates?

In attempting to explain our WTP estimates for all 12 CEs we find that several socio-economic variables appear to explain choices. Thus, we find that age, gender and income all have an impact for some of the products considered, for some of the attributes used, some of the time. We also observe, as previously noted, that the food quality attribute was frequently highly valued by respondents. Thus, the relative importance of this facet of the label information appears to be of greater importance than the CoOL overall.

We have also examined the issue of CoOL within the ET part of the research by identifying CoOL for the meat as well as country of origin in terms of country of production. This additional attribute (plus an attribute providing a measure of calories per portion) which added a degree of complexity to the analysis, allowed us to see whether specific combinations of country indication impacted choices and resulting WTP. In general, we found that the increased complexity did not significantly affect WTP estimates, although there was a difference between the flag and no-flag case in the complex setting suggesting that flags may possibly act as a prominent or salient object in these cases.

3) Does the country of Origin labels affect consumers buying decisions, and why?

Based on the results we have generated for our hypothetical CEs it appears that there exists a positive WTP for CoOL which implies that this type of label information can sway purchase decisions in the same way that other attributes such as organic production can. The general finding that respondents are WTP a price premium for meat with a UK CoOL indicates that retailers may be able to sell some products at a slightly higher price. However, the extent and impact of this potential change has not been assessed. In addition, based on our revealed preference analysis we can also see that consumers are prepared to pay more for a British labelled food item and we therefore conjecture that the label can influence consumer purchase decisions. We also found within our econometric models that consumers value the CoOL more after the horsemeat incident in 2013 which indicates that CoOL not only is being used by consumers to infer source but it is also being viewed as a potential means by which to assess the authenticity of product.

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and the move toward ever greater mandatory CoOL requires an analysis of CoOL format and likely consequences.

4) Questions relating to reliability of the analysis:

a. How reliable are the estimates?

b. Does the WTP change with time?

c. How do we take account of demographic variations and research bias?

d. How representative is the sample to the population?

Starting with question 4a, it is reasonable to ask, how robust and reliable are the WTP estimates we have generated? First, in terms of external validity we have compared the relative magnitude of our CEs WTP for CoOL with our revealed preference estimates that have been generated using data from Kantar. The revealed preference results show that there appears to be a premium being paid for CoOL which corroborates our CEs results. Second, if we consider measures of internal validity, our results appear relatively robust across all the CEs. Also, based on de-briefing data respondents appeared to have engaged with survey instrument and choice tasks at least as much as we have observed in previous research on food related matters (Balcombe et al., 2015a). Third, we have been able to compare results between the online CEs and the ET survey and again these indicate that our results are reliable. Finally, we once again stress that we need to treat our hypothetical CEs WTP estimates with some caution which is in keeping with how any estimates produced using hypothetical survey methods need to be viewed. However, when we consider the relative value attached to the attributes we are confident that these results are robust and reliable. Thus, we are not surprised to find that CoOL is relatively less important for processed products such as EU sourced bacon with established identities which is very dominant in the UK market. We can, though, conclude from our estimates that the WTP for CoOL is broadly comparable to that for other attributes, such as organic status, and it would be reasonable to expect a similar level of premium.

The second question (4b) asks if WTP for CoOL changes with time. Whilst this cannot be assessed using the CE survey methods, this can be done using the revealed preference data. Our results, based on robust econometric specifications, show that consumers do appear to change the value they place on CoOL over time. We have been able to detect this result by looking at how consumers changed meat buying habits before and after the horsemeat incident[11] in 2013. Our results suggest

[11] The horsemeat incident refers the undeclared intentional substitution of beef with horsemeat in a range of processed products in early 2013 across the EU. It affected a wide range of branded and generic processed

that consumers placed a higher value on CoOL after the scandal because CoOL is being used by them as an implicit signal of food authenticity.

In terms of demographic variation and research bias (Question 4c), the impact of demographic variation on WTP was assessed. We regressed the CEs WTP estimate on a set of socio-economic variables. e.g., age, education, gender, income levels and number of children. These results reveal that for almost all the 12 products examined at least one socio-economic characteristic appears to help explain the WTP estimates generated. Turning to research, bias we designed and implemented our CEs following current best practice. During the design stage of the CE survey instrument we sought feedback from various groups and we trialled an early version of the survey instrument to assess how well respondents understood the survey requirements and the quality of responses provided.

The last question (4d) asks about sample representativeness. First, we note that our CE survey sampling strategy was based on collecting data from a representative UK sample using gender, age and income levels. Second, we required respondents to be the main buyer of food, specifically meat in the household.

Finally, we note that this project and the results and findings reported are subject to various data limitations. A detailed discussion of these issues is provided in the section on Research Limitations and Future Directions for Research (page 69 of this report).

Project Overview

This report begins by briefly summarising key findings from the existing literature based on an extensive review. It then provides details of our research methods followed by the results we have obtained. We present these as three pieces of research. For each piece of research we discuss the robustness and reliability of our findings. Extensive details about each piece of research conducted, as well as the literature carried out are provided in appendices that accompany this report.

products including retail minced beef, burgers and ready meals such as lasagnes, pastas and pizzas sold in the UK and other EU member states. A total of 4,144 beef products were tested for horse DNA across the EU and 192 beef samples (4.66%) of the total tested products, contained horsemeat. The largest number of positive tests for undeclared horsemeat was identified in products on sale in France, followed by Greece and Denmark.

CoOL and the Antecedent Literature

There is a reasonably large literature on CoOL which is part of a much bigger literature on food labels in general. In terms of CoOL, part of the literature examines the economics of the introduction of voluntary and/or mandatory CoOL (e.g., Joseph et al., 2014, and Roe et al., 2014). However, given the focus of the research to be conducted, our review of the literature on CoOL (see Appendix A for full details) had a specific focus on stated preference research.[12]

The most important observation we can make about the literature is simply the lack of any recent research on CoOL and meat for the UK. The only exception is research by Meas et al. (2014) that considered beef. Thus, although there is a reasonable number of existing studies on CoOL, only a small proportion of this considers meat and there are almost no studies that specifically focus on the UK.

We briefly summarise our main observations from the literature review on stated preference research:

I. **Product coverage** – the existing literature on CoOL has considered a variety of products that are always carefully described, relating very closely to products that are available on the market. However, the coverage of meat types is fairly limited (e.g., beef steak, pork steak, chicken breast) and there is virtually no research in relation to processed foods such as sausages, bacon, gammon, prepared curry, pizza, meat pies and lasagne. Thus, there is limited existing research to draw upon that can be used to inform the design, implementation and evaluation of our CEs. We have received the literature that is relevant for this research in our Literature Review (See Appendix A for full details). The main finding that stems from the existing literature in terms of product coverage is that the current research contributes to the literature and to an existing information gap.

II. **Description of CoOL** – there is no consistency in how CoOL has been presented within the literature. There is a mixture of text and graphics (e.g., flags, maps, text and various combinations) used within many of the papers examined. Given the prescribed way in which CoOL must be produced under

[12] We note that there are other recent studies on WTP CoOL such as FCEC (2013, 2014). These studies generate much lower WTP estimates of CoOL compared to those report in Table 1. However, we do not comment on these results in detail here (see Appendix A for more details) as the methods employed to generate the estimates are not of direct relevance to the methods required to undertake this research project.

mandatory CoOL there is a need to be more precise about the way in which CoOL is conveyed in research (if it is to have policy relevance). In contrast, for products that are only subject to voluntary codes there is more scope to examine variations in how to represent CoOL so that researchers can investigate how this impacts consumer valuation. Based on our review of the literature it is unclear whether how CoOL is described and presented has had any significant impact on the resulting estimates of WTP.

III. **CoOL and Multiple Sources** – there is virtually no research that considers products that have multiple CoOL information. The only exception is a set of papers by Lusk et al. (2014) who examined what happens when respondents are confronted with multiple origin labels. They observe that respondents are pessimistic about the information conveyed in these labels. Lusk et al. note that respondents tend to infer origin is much more likely to be from the less-preferred origin. This observation is important when it comes to CE design for processed products if multiple countries of origin are required.

IV. **Magnitude of WTP** - the actual size of the WTP estimates reported in the literature vary with the majority being quite large and most certainly larger than some reported in EU reports on CoOL (e.g., FCEC, 2013, 2014). Take for example, the estimates reported by Meas et al. (2014). These WTP estimates suggest price premiums of £4.00 per 375g of beef steak if from the UK compared to the other countries considered. This is approximately equal to 60% of the average price level used in their CE. This estimate, as with many reported in Table 1 appear high and as such suggest that we need to treat WTP estimates derived from hypothetical CEs or CV with caution, instead placing emphasis on the relationship between WTP for different attributes. It is also important to realise how WTP is reported. Differences can reflect how CoOL has been coded within data sets and how the results have been framed and reported. To help the reader better understand the variation reported in the literature, we have summarised the WTP values placed on CoOL in Table 1. These estimates are important as they can be used to place our own estimates in context and provide the means by which to assess aspects of external validity. Also, the research reported in Table 1 yet again reinforces the fact that the existing coverage of meat products considered in the literature is very narrow. Beef is the dominant meat, the reason for which can be traced to the fact that the beef trade in North America has been impacted by changes in the way the US requires CoOL to be implemented.

Table 1: Summary of WTP Estimates for CoOL on Meat Products Since 2010

Study	Product	CoOL WTP Estimates	Additional Comments
Boeri et al (2014)	Lasagne, € per unit, weight unknown	Ireland – €3.93 Norway – €3.68 Italy - €4.84 France – €5.97 Germany – €2.86 Spain – €3.73	Value of knowing if meat is imported – not clear then if the value of CoOL is specific to CoOL or other "wider" drivers of food choice.
Gracia (2014)	Lamb (min price €2.5/max price €4.0)	Local Lamb – €0.29 Lamb Type – €0.43	Euros per 250 gram package for Local Lamb compared to unlabelled.
Kallis et al (2011)	Rabbit (min price €5.5/max price €6.5) Restaurateurs	Foreign – €0.636 Spain – €0.063 Catalonia – €0.698	Euros per kg of meat – positive preference for local, negative for Foreign, statistically insignificant for Spain
Kallis and Gil (2012)	Rabbit (min price €5.50/max price €6.5) Consumers	Foreign – €0.947 Spain – €0.362 Catalonia – €0.585	Euros per kg of meat – positive preference for local and Spain, negative for Foreign.
Klain et al (2014)	Beef Steak and Pork Chop (min price $0.0/max $5.0)	Mean value of origin $1.37 per steak (CV) – when CoOL not shown Mean value of origin $2.15 per steak (CE) when CoOL shown	US $ for 12 oz (0.34kg) of meat – stronger preference for CoOL when the CoOL information can be seen as part of the experiment.
Lagerkvist et al. (2014)	Minced Beef (min price SEK200/max price SEK325)	CoOL – SEK 113.7	Swedish Krona (SEK) per kg – CoOL ranked most important attribute
Lim et al. (2013)	Canadian and Australian beef steaks (min price $5.0/max price $16.0)	US to Australia - $8.4 US to Canada - $6.1 Required price reduction Results for Latent Class Model are also very varied US to Australia – $1.1 /$49.5 average of $4.9 US to Canada – $0.7 /$35.1 average of $3.2	Strip loin Steak US$ per lb – there is need to reduce price for both imported forms of meat – extreme variation reported in the Latent Class Model.
Lim et al. (2014)	Canadian and Australian Beef steaks (min price $5.0/max price $16.0)	US to Australia – $7.33 US to Canada – $5.75 Required price reductions	Strip loin Steak US$ per lb – although high WTP estimates are moderated by attitudes to perceived food-safety levels.
Meas et al. (2014)	Beef steak 375g (min price £4.88/ max price £8.82)	All relative to: France – £4.39 Canada – £4.09 Germany – £4.06 Argentina – £4.67	Beef steak 375g pack. CoOL – GB, France, Germany, Argentina, USA and Canada. GB is the reference level per

		USA – £4.34	pack
Morkbak et al. (2010)	Minced Pork (min price (a&b) 20, max price (a) 80, max price (b) 120)	CE (a) Domestic– DKK 27.94 CE (b) Domestic– DKK 36.97	Danish Krona (DKK) 500g package – results illustrate how high price levels can yield more no choice responses
Pouta et al (2010)	Broiler Meat (min price €6.0/max price €16.0)	Denmark – 30-40% Brazil - 46-77% Thailand – 46-92%	Euros per kg – the WTP are relative to Finland. The reduction in WTP resulting from non-Danish are more substantial
Tonsor et al. (2013)	Beef Steak, Pork Chop or Chicken Breast (min price 0.01/max price 4.0)	Product of North America – 1.88 (2.3) Product of US 1.77 (3.2) Product of Canada, Mexico and US 1.07 (2.1) Beef Steak - 1.67 Pork Chops – 1.53 Chicken Breast – 1.44	US$ per 12 oz – WTP for MCOOL no difference North America and US. Also WTP higher if respondent aware of MCOOL

Source: Compiled by authors

V. **CE Design and Implementation** – within the existing literature, CE design has been very heterogeneous with no consensus regarding which attributes to use, the number and magnitude of levels to be used, or attention to specific aspects of definitions for particular attributes such as CoOL. This variation in CE design and implementation can in large part be traced to the motivation that has informed the research. Furthermore, it would appear that the variation exhibited across the existing studies suggests that researchers have significant degrees of freedom when it comes to designing and implementing CEs within this context. As the large set of attributes used within the existing CE studies demonstrates, there is no obvious set of attributes to always employ when conducting a CE on CoOL. Thus, we consider the selection of attributes can in part be informed by earlier research, but it also needs to be cognisant of current research requirements and policy issues.

VI. **Sample Size** – there is a large degree of variation in sample size used in CEs within the literature. As can be observed, sample size is partly a function of how a survey is delivered (i.e., face-to-face, online, etc.) and the complexity of the CE design. Based on the literature review there are samples with as little as 100 participants and several with more than 1,000. With regard to the UK, Meas et al. (2014) collected data from 402 respondents using an online

survey. Based on the literature, a sample size of at least 250 is considered necessary for the generation of statistically robust results.[13]

VII. **Statistical Analysis –** there is a large degree of variation in form and quality of statistical analysis within the existing literature. Within the CE literature the dominant (base) model is the multinomial logit (MNL). A MNL is a regression model that takes account of the fact that the dependent (left hand side) variable takes three or more values of zero or one. So, in the case of a CE with three choices, the selected choice will be coded as one and the two options not selected are coded as zeros. If we then progress from the MNL we are making more assumptions about how we model respondent choice. Thus, once efforts are made to consider respondent heterogeneity as well as quality of responses then model specifications become much more varied. In the literature reported in Table 1 some papers have made use of Mixed Logit (MXL) specifications whereas others have employed Latent Class Model (LCM) specifications. There are also other model specifications that can and have been used to examine data, with the actual choice determined by the specific research question being examined. For example, the generation of attribute WTP estimates as opposed to understanding best-worst choice will dictate the use of different econometric specifications.

VIII. UK Evidence – there is a lack of empirical research conducted for the UK with regard to CoOL and meat. To date the only relevant UK study is that conducted by Meas et al. (2014) who consider CoOL for beef. This research is interesting in that it shows that UK consumers appear WTP a premium for UK labelled beef, albeit the estimates do appear on the high side. As such the results generated in this research will prove useful for future studies that require WTP estimates for UK CoOL.

[13] It is worth noting that the efficiency of the CE experimental design can reduce the necessary size of a sample. See Scarpa and Rose (2008) for details.

Online Choice Experiment

Summary of Online Choice Experiments

The research conducted in this part of the project has generated a large set of WTP estimates for food labels that include a CoOL attribute. The estimates presented are for many products the first available in the literature. In addition, the results have considered how to present CoOL with specific reference to current legislation. The analysis has also considered the format of the CoOL attribute in examining choice with the use of text only or with a flag as well. There are marginal changes in WTP and as such we conclude that specific format does not appear to be very important with regard to CoOL.

Key findings are as follows:

1. For four products UK CoOL is the most highly valued attribute. These tend to be fresh/chilled/frozen products. Our estimates are within the range of those previously reported in the literature using hypothetical stated preference methods, but somewhat higher than those reported by FCEC (2013, 2014). As such, we consider our results robust albeit subject to the typical caveats that need to be placed on estimates generated using these methods.

2. For eight products UK CoOL is positively valued but far less than various other attributes (implying a lower WTP). This finding indicates that mandatory CoOL may not be of sufficient importance and value for this type meat products in the short to medium-term.

3. The importance of CoOL goes beyond simply preference for the UK. There are examples of strong aversion to certain non-UK CoOL labels that potentially raise questions about how trade in meat might be affected if total mandatory labelling of CoOL is introduced. This is an area that warrants further research.

If we next consider how these results can be explained we have the following results:

1. Age is important. Older respondents are less concerned with UK CoOL for fresh products, but it is much stronger for processed meat.

2. Gender also matters. There is typically a strong preference for UK CoOL from females and this is most strongly observed for fresh/chilled/frozen products.

3. Overall, socio-economic data does not yield much in the way of explanatory power with regard to CoOL. This is not surprising as many CEs struggle to find strong evidence to explain choices from standard socio-economic data.

Finally, we can consider responses with regard to attribute use. We find that on average 85% of respondents did not attend at least one attribute and this level of CE engagement is well within the ranges typically observed within the literature (Balcombe et al., 2015a,b).

Choice Experiments and Economic Theory

The development and introduction of CEs can be traced to the work of McFadden (1974) on Random Utility Theory (RUT). RUT assumes that a consumer selects a specific product because it yields the highest level of utility. As such the probability of selecting a specific product increases as the utility associated with it increases.

When implementing a CE the key idea is that respondents select between alternative options that contain a number of attributes of different levels. The attributes describe a specific product or context that the respondent is being asked to consider. This means that CEs are able to provide a means of analysing trade-offs that are made by consumers when confronted or presented with products that offer alternative, new or improved commodity attributes, such as CoOL.

In general a CE consists of the following elements:

- A set of fixed choice options that may have explicit names or labels;
- A set of attributes describing the potential differences in the choice options which it is hypothesised play an important role in the choice behaviour of interest;
- A set of levels (values) assigned to each attribute of each choice that represent variation in an attribute appropriate to the research objectives;
- A sample of subjects (survey participants) who evaluate all or a subset of the choice sets, selecting one of a possible number of options presented in each set; and
- The choices of the subjects are used to estimate the choice models.

This information then allows the analyst to identify how variation in the level of the attributes for the specific choices being examined relates to utility. Thus, assume

that U_i is the utility gained by individual *i* from consuming a piece of lamb at a given cost with given levels of the various product attributes. Assume that there are three choices: A, B or C which represent different combinations of cost and attributes associated with lamb. We then ask the survey respondent to identify their preferred option, such that the following might occur.

U(A)>U(B) and U(A)>U(C)

Now by revealing this specific choice we gain an insight into their specific preferences for lamb. It is this data that we need to eventually be able to estimate what consumers may be willing to pay for CoOL.

Choice Experiment Design and Implementation

There are six stages involved in implementing a CE. We briefly describe each stage as it applies to the CoOL CEs undertaken.

Stage 1: Attribute Selection

It was determined at the outset of the project that the maximum number of products that we could consider was 12. These were selected using UK meat consumption statistics drawn from the Defra Monthly Living Costs and Food Survey with reference to the required product coverage (given the new CoOL legislation and the potential for further legislative changes). These 12 products are listed in Table 2 below. The products selected include four unprocessed meat cuts, four partially processed meat products and four products that contain meat as an ingredient.

Having identified the set of products, we then considered the attributes required to implement the CEs. For the current project the choice of attributes to use was determined by reference to the literature, feedback from the steering group and results obtained from a small pilot study. Due to the logistics of designing and implementing 12 CEs simultaneously we decided to employ a homogenous group of attributes for each of the 12 meat products. However, there was some variation within some of the attributes between the CEs to capture differences between the products. Thus, for example, we varied the set of countries presented to respondents to reflect likely sources of meat supply.

The survey design process was iterative. An initial version of the CE survey instrument was shared with the project steering group and views sought. The initial version of the “food label” used in the CEs was based on a label format presented by the FSA (2012) in a document aiming to educate consumers about the meaning of

CoOL.[14] The revised CE survey instrument was piloted with a small group of respondents (30 responses composed mainly of students) for two products at the University of Kent. Preliminary data analysis of the pilot data using a MNL specification revealed that all parameters had the expected signs and were statistically significant.[15] When asked about easy of survey completion and understanding the respondents indicated that the survey instrument was relatively easy to understand and straightforward to complete. As a result a final version of the survey instrument was produced. The set of attributes employed were as follows: Price; CoOL; Product Quality; Farming System; and, Farm Assurance.

- **Price** - For this attribute, the range of values was jointly determined in combination with product specific size and description of each product type determined by reference to those most commonly on sale in UK shopping outlets. An extensive search of online and in-store prices of the selected product types was undertaken prior to final selection of price points.

- **CoOL** - For this attribute our final design was in part determined by the requirements of the project brief – *"Place of origin as a) Any specified country; b) UK or c) EU versus Non-EU."* Thus, we needed to decide what alternatives to offer to the UK. Our final choice was to select a specific EU country (that differed by product), a generic EU option and finally, a specific non-EU country. This meant that we had four levels for this attribute. At this point we decided to use specific countries and not, as has been done within the literature in several existing studies, to simply label non-UK as overseas. To help determine which countries to name we considered trade data reported in various publications (BPEX 2013,a,b and EBLEX 2014,a,b). Based on the data available we identified those countries that provided the highest level of imports for each meat type and the source of meat used in various processed products. It should be noted that in relation to proceeded food there is very little information regarding the source of meat used and the relative quantity within the food. For example, in Defra (2012), it is noted in regard to the production of chicken curry that identifying origin is "complex" as a result of the high level of processing. Typically, chicken breast is imported, although

[14] An important issue that was identified with meat labels is that the border colour of actual meat labels is frequently associated with a specific type of meat. Thus, although we employed a red border with our initial survey design we eventually employed a yellow border as this was considered a "neutral colour".

[15] We note, that following further discussions with the steering group and project team members it was decided to slightly modify one of the attributes because of potential confusion with an attribute level and country of origin. Thus, we had originally included the Red Tractor label as a level for one of our attributes (i.e., Quality Assurance), but the UK flag background was considered to potential conflate issues of quality assurance and country of origin.

source is not always clearly identified, chicken used in manufactured foods is frequently imported from Brazil and Thailand. This lack of data also meant that it was difficult to realistically create a CoOL attribute for the CEs that indicate different countries with regard to CoOL. As a result we did not explicitly use the "Place of animal's birth, rearing and/or slaughtering" and instead decided to state that the meat in question was from a specific country with the text for the CoOL attribute different for fresh/chilled/frozen products compared to processed meat and meat used as an ingredient.[16]

- **Product Quality** - For this attribute the choice of terms to use (three levels, Basic, Choice and Premium) was decided through discussion with members of the research team, the steering group and results from the pilot study. The inclusion of an attribute to describe product quality meant that we could implicitly capture aspects of each product that relate to taste or other quality related characteristics. In many ways the use of this type of information on food is to act as a cue indicating all of those characteristics that constitute "quality", but are not stated explicitly.

- **Farming System (Production)** - this attribute was initially intended to include a wide range of farming systems (e.g., free range, grass fed, etc.), however, this added unnecessarily to the complexity of the design and also introduced a degree of confusion. Thus, our final choice was simply Organic or Conventional. We made this choice in discussion with the Steering Group as we concluded that these two production systems represent the vast majority of meat production on the market and would be most familiar to consumers.

- **Quality Assurance** – For this attribute our final choice was no label, Freedom Food and the International Quality mark. We initially included the Red Tractor standard within the survey design used in our pilot study. The Red Tractor has been used in an earlier CE CoOL on beef by Maes et al. (2014). However, it was decided that this might cause confusion as it combines a tractor with the colours of the UK flag. Although this assurance mark can be used with products produced outside the UK we decided that the flag that is within the common form of the label may confuse consumers as to the actual country of origin of the product under consideration (it would also have provided an additional visual cue).

[16] Although this aspect of CE design was a departure from brief it was agreed to by the Steering Group. And our ET CE implemented a more complex design that goes some way to addressing this multiple country requirement.

The final set of 12 products used, the attributes and associated levels used in our CEs are presented in Table 2[17].

Table 2: Products, Attributes and Levels

Product	Chicken Breast (500g)	Pork Sausages (450g)	Chicken Pie(550g)
CoOL	UK, EU, Netherlands and Thailand	UK, EU, Denmark and Thailand	UK, EU, Ireland and Brazil
CoOL Words	Reared and Slaughtered	Meat Origin	Meat Origin
Production	Conventional or Organic	Conventional or Organic	Conventional or Organic
Product Quality	Basic, Choice, Premium	Basic, Choice, Premium	Basic, Choice, Premium
Farm Assurance	International, Freedom Food Or None	International, Freedom Food Or None	International, Freedom Food Or None
Prices (£)	3.00, 4.50, 5.50, 7.50	1.40, 1.80, 2.39, 3.05	2.00, 2.99, 3.49, 3.99

Product	Turkey Mince (400g)	Streaky Bacon (300g)	Pepperoni Pizza (14”)
CoOL	UK, EU, Germany and Thailand	UK, EU, Denmark and Brazil	UK, EU, Italy and USA
CoOL Words	Reared and Slaughtered	Meat Origin	Meat Origin
Production	Conventional or Organic	Conventional or Organic	Conventional or Organic
Product Quality	Basic, Choice, Premium	Basic, Choice, Premium	Basic, Choice, Premium
Farm Assurance	International, Freedom Food Or None	International, Freedom Food Or None	International, Freedom Food Or None
Prices (£)	2.00, 2.50, 3.50, 4.19	1.79, 2.50, 2.99, 3.79	1.99, 2.95, 3.75, 5.25

Product	Pork Leg (1.5kgs)	Beef Burgers (450g)	Beef Lasagne (600g)
CoOL	UK, EU, Denmark and Brazil	UK, EU, Ireland and Brazil	UK, EU, Germany and Brazil
CoOL Words	Reared and Slaughtered	Meat Origin	Meat Origin
Production	Conventional or Organic	Conventional or Organic	Conventional or Organic
Product Quality	Basic, Choice, Premium	Basic, Choice, Premium	Basic, Choice, Premium
Farm Assurance	International, Freedom Food Or None	International, Freedom Food Or None	International, Freedom Food Or None
Prices (£)	4.50, 6.50, 8.99, 12.49	2.09, 3.00, 3.29, 4.00	1.75, 2.50, 4.00, 5.99

Product	Lamb Leg (1.5kgs)	Gammon Steaks (225g)	Chicken Curry (400g)
CoOL	UK, EU, Ireland and New Zealand	UK, EU, Denmark and USA	UK, EU, Netherlands and Thailand
CoOL Words	Reared and Slaughtered	Meat Origin	Meat Origin
Production	Conventional or Organic	Conventional or Organic	Conventional or Organic
Product Quality	Basic, Choice, Premium	Basic, Choice, Premium	Basic, Choice, Premium
Farm Assurance	International, Freedom Food Or None	International, Freedom Food Or None	International, Freedom Food Or None
Prices (£)	9.50, 12.99, 13.50, 15.99	2.49, 3.50, 4.00, 5.50	1.49, 2.65, 3.60, 3.99

[17] For CoOL for all products there was also a UK and EU label plus the two countries identified.

As can be seen in Table 2 there is variation within some of the attributes across the different meat products. Thus, there is variation for CoOL by selection of countries as well as the text used on the choice cards. There is also variation by price as would be expected.

Given that we needed to undertake 12 CEs we employed a strategy that allowed us to obtain good sample size for each CE. Thus, we asked each respondent to complete two CEs within the version of the survey they were selected to complete. To do this we paired the 12 products which meant that we produced six survey versions. The pairing of products was agreed in advance with the Steering Group as follows:

- Chicken Breast Fillets and 14" Pepperoni Pizza
- Turkey Mince and Pork Sausages
- Pork Leg Joint and Streaky Bacon
- Lamb Leg Joint and Chicken Madras Curry
- Beef Burgers and Shortcrust Pastry Chicken Pie
- Gammon Steaks and Beef Lasagne

In total, with the six survey versions, we collected approximately 490 responses per survey yielding just over 2,951 responses in total.[18] Given the typical size of samples used within the literature we deemed 490 responses per survey version to be sufficient to generate statistically robust results.

Importantly, to enable us to investigate the impact of text and text and flag in relation to CoOL we employed two experimental treatments:

Treatment 1 (T1) - presented the choice cards with only text to describe the CoOL.

Treatment 2 (T2) - employed both text and the appropriate flag.

Each respondent completed a CE with text only CoOL and a version with text and flag (the order was randomised). Although the legislation permits, but does not mandate, the use of flags to signify CoOL, we considered it important to see if the

[18] Clearly, a bigger sample is preferred but a sample of 3,000 respondents was deemed sufficient to ensure that we recover statistically robust results.

exclusion/inclusion of a flag in addition to text seriously impacted on resulting WTP estimates.

Stage 2 – Choice Set Design

Having identified attributes and number of levels, we moved onto the design of the choice sets. We employed an efficient design following Scarpa and Rose (2008). The implementation of an economically efficient design starts with a decision on the number of attributes, their associated levels and an appropriate econometric model specification, such as a MNL to describe the data generating process. This means that we assume that we "know" the specification of the utility functions that are to be estimated. Once the model specification is complete the experimental design is generated which requires a decision regarding how many choice sets to generate in total, how many to give to each respondent, and how many choices are available per choice card.

In this study we employed a conservative approach to the design assuming a MNL utility specification and employing D-error as the measure of design selection. Our design was produced using Ngene version 1.1.1 (Choice Metrics 2012). We took this approach as it yields a robust design, but does not impose too much prior information on the design that might produce an inefficient outcome. [19]

In total, we generated 24 choice cards per each CE. For each choice card a respondent was given two choices and an opt-out "no buy" option. The "no buy" option is not given a specific set of attribute levels as there are many ways a consumer might spend their budget other than on the products being offered in the choice setting. To avoid respondent fatigue, these cards where blocked into four groups of six cards (Louviere, Hensher and Swait, 2001). The need to randomise the order of text (T1) or text and flag (T2) by choice set meant that we needed to generate a large number of survey versions (in total 8 versions for each survey yielding 48 in total).

Stage 3 – Focus Group and Pilot Survey

It is good practice to employ focus groups and undertake a pilot study. To ensure that we achieved the appropriate level of feedback on CE survey design the initial

[19] For more detail on experimental design see Scarpa and Rose (2008). For example, Scarpa and Rose (2008) discuss how to update experimental designs using a Bayesian approach. Although this approach to experimental design is in principle going to yield a more efficient design, with the understanding that there will be attribute non-attendance it becomes unclear if the actual gain in design efficiency are as large as has been claimed.

survey design was shared with various groups of students and staff at the University of Kent as well as the Defra Steering Group. Based on feedback we produced an initial working version of the CE survey instrument which we used to conduct a small pilot study with a group of students at the University of Kent. The survey was distributed to 100 students and 30 useable returns were provided. The basic econometric results of the pilot revealed that the respondents had engaged with the survey instrument in a meaningful way (i.e., generated survey data) in that the signs of the estimated model parameters for the attributes used were as expected.

Stage 4 – Other Parts of Survey

Prior to implementing the CE it was necessary to design the remaining generic parts of the survey instrument. The format of the survey design employed started with a series of questions about meat buying habits as well as consumption preferences. This was done to ensure that respondents with specific meat eating preferences were not presented with inappropriate product choices. Respondents were then asked to undertake a pre-CE priming task based on the research reported by De-Magistris et al. (2013). The CEs were then introduced. This began with a description of the task and the attributes to be used. So as not to place undue emphasis on the CoOL we did not state that the main reason for conducting the CoOL was to examine this aspect of food choice. Instead, we simply informed respondents that we were interested in their choices for the specific products being considered.

After each CE was completed respondents were asked a series of de-briefing questions including ranking the attributes in terms of their importance to them and indicating which, if any, attributes they ignored whilst undertaking the choice tasks. The order of the de-briefing questions was randomised. Finally, at the end of the survey we collected socio-economic information on respondents' which was used in subsequent data analysis.

A copy of the survey instrument as a screen shot is provided in Appendix B.

Stage 5 – CE Data Collection

We implemented our CEs using an online approach with UK-wide representative samples. We employed a market research company to help format and distribute the online survey.[20] We also employed a number of screening questions to ensure that survey participants did not receive a version of the survey that might compromise personal beliefs or offend.

[20] We used the market research company Toluna to undertake our survey (http://www.toluna-group.com/).

Stage 6 - Model Estimation and Results

The final stage in CE implementation is data analysis and the generation of results. Our results are presented in the next section.

Choice Experiment Data Analysis and Results

Preliminary Data Analysis

Our analysis of the CE data began by examining the responses provided to our introductory questions and the various socio-economic data provided.

On average 490 respondents completed each version of the survey (2,951 in total). Almost two-thirds (61%) of those completing the survey were female, partly reflecting who undertakes the shopping within a household.

Socio-economic characteristics (i.e., age, income, number of children, marital status and education) of the survey respondents are reported in Table 3i and 3ii below:

Table 3i: Survey Respondent Socio-Economic Data

Age	%	Respondent Income Before Tax	%	Number of Children Living at Home	%
18-25	14.1	Less than £5,000	4.7	0 children	67.9
26-35	15.4	£5,001 to £10,000	7.3	1 child	14.4
36-45	17.0	£10,001 to £20,000	21.9	2 children	12.8
46-55	19.8	£21,001 to £30,000	17.3	3 children	3.5
56-65	21.0	£30,001 to £40,000	15.0	4 or more children	1.4
Over 66	12.7	£40,001 to £50,000	9.3		
		£50,001 to £65,000	6.9		
		£65,001 to £80,000	3.9		
		More than £80,001	2.5		
		Unavailable	11.0		

Table 3ii: Survey Respondent Socio-Economic Data

Marital Status	%	Highest Level of Education	%
Married / Living with partner	59.6	School education to 16	23.0
Single	27.3	A-level or equivalent	19.4
Widowed / Separated / Divorced	13.0	Further education qualification	20.7
		Undergraduate degree	24.9
		Post-graduate degree	10.8
		Higher	1.3

As we can see in Table 3i there is a reasonably even distribution of respondents by age group and the income distribution has a relatively long right sided tail reflecting the average (median) income of respondents and the distribution of income. The number of respondents who did not provide a measure of income is 11%. Approximately 32% of households involved in the survey have at least one child. As would be expected the number of respondents with increasing numbers of children are relatively small. Table 3ii presents the level of educational achievement of our sample of respondents. The largest group is those who have obtained an undergraduate degree. Next are those who left school aged 16.

The regional composition of our sample is shown in Table 4.

Table 4: Regional Composition of Respondents

Region	%	Region	%
North East	5.6	East of England	6.9
North West	13.8	London	11.5
Scotland	8.0	South East	15.4
Yorkshire and The Humber	9.9	South West	8.0
East Midlands	7.8	Wales	4.7
West Midlands	8.6		

As can be seen above most respondents' live in the South East and London followed by the North West.

Respondents were asked about aspects of meat purchase and meat preferences. Current meat buying habits were assessed in several ways (Table 5 below).

Table 5: Meat Buying Habits

(%)	Beef	Pork	Lamb	Chicken	Turkey	Duck
Don't Buy	25.2	40.9	39.8	3.4	40.9	71.6
Buy	74.8	59.1	60.2	96.6	59.1	28.4

Chicken is bought by almost 97% of respondents. The next most popular meat is beef (75%) followed at some distance by lamb, pork and turkey. Duck is only bought by just over one quarter of respondents.

Table 6 reports on the frequency with which the different meats are bought. This confirms the dominance of chicken as the meat of choice amongst the majority of survey respondents.

Table 6: Frequency of Purchase

Which type of meat do you buy most frequently?	%
Chicken	73.8
Beef	12.7
Pork	7.9
Lamb	3.8
Turkey	1.5
Duck	0.3

The reasons provided by respondents for not eating various meats are reported in Table 7.

Table 7: Reasons for Not Eating Types of Meat

Why do you not buy?	Beef (%)	Pork (%)	Lamb (%)	Chicken (%)	Turkey (%)	Duck (%)
My beliefs	2.7	6.2	2.9	0.4	2.0	4.2
Health reasons	5.6	5.5	3.7	0.8	1.6	4.1
Don't like the taste	9.5	20.8	21.2	1.3	22.3	37.5
Other	7.5	8.4	12.0	0.9	14.9	25.8

Taste preference is the prime reason for not eating any of the meats listed. The high number of respondents who dislike the taste of duck offers a partial explanation for why it is relatively infrequently consumed. Taste is also the main reason cited for not buying chicken. Taste is therefore a very important factor in meat choice and preference.

Having ascertained a greater insight into the preferences of our respondents, the frequency of purchase and the form the meat was in was explored (Table 8). Meat is most frequently purchased fresh/raw rather than frozen.

Table 8: Purchase Frequency and Form

How frequently do you buy fresh/raw meat?	%	How frequently do you buy frozen meat?	%
Several times per week	16.2	Several times per week	6.1
At least once a week	54.6	At least once a week	25.9
At least once a month	20.8	At least once a month	24.9
Less often	8.4	Less often	43.1

Meat is purchased from Tesco by more than half of our respondents with Sainsbury's the next most popular outlet (39.0%) followed closely by Asda (37.9%) (Table 9). The results also confirm that 'other', which includes butchers, only supply a small amount of the total meat being sold in the UK and as such, it is how supermarkets label meat that matters the most in terms of the impact of CoOL.

Table 9: Preferred Retail Outlets

Aldi	Tesco	Budgens	Sainsbury	Asda	Waitrose	Morrisons
22.4	54.3	1.9	39.0	37.9	13.7	29.3
Booths	**Spar**	**Iceland**	**Lidl**	**Co-op**	**M&S**	**Other**
1.8	2.0	16.3	17.9	12.8	18.4	9.3

Choice Experiment Results

All CE data were estimated using a Mixed Logit (MXL) specification estimated in WTP space. In keeping with assumptions typically employed in the literature (e.g., Balcombe et al, 2015a,b), all attributes are assumed to be random parameters with normal distributions employed other than price which was modelled as a log-normal distribution. Full details of data estimation methods are provided in the Literature Review (See Appendix A for details).

We do not present all results generated in the body of the report as there is a very large quantity of data. Instead, we focus on WTP estimates for the text only version of the CEs. This is because text is the legally required format for mandatory CoOL. It is, however, worth noting that there is very little difference in the results generated for the two CoOL treatments and this is further confirmed when all data (i.e., both treatments) are combined. The full set of results is reported in Appendix C.

We first report average measures of WTP. The results need to be interpreted carefully and in the following way. In the case where there are two or more levels for an attribute, such as CoOL, then the results generated are relative to the selection of the base level (which is indicated in brackets). So in the case of Product Quality the estimates of WTP for Choice and Premium are relative to Basic Product Quality. With regard to CoOL the estimates are measured relative to a specific EU country. So in the case of chicken breast the CoOL WTP are relative to the Netherlands. The WTP are for the given quantity of the product in question. This means for chicken breast the WTP estimates are for 500 grams of the product.

A summary of the median WTP estimates are reported in Tables 10i, 10ii and 10iii.

Table10i: Median WTP Estimates (£) (No Flag Treatment)

	Pork Sausages	Pork Joint	Chicken Pie	Beef Lasagne
Choice (Relative to Basic)	0.3	0.85	0.39	0.78
Premium (Relative to Basic)	0.74	1.93	1.07	2.07
Organic	0.67	1.91	0.64	1.7
UK v EU Country	0.54	2.21	0.66	1.6
EU v EU Country	-0.18	-0.66	-0.5	-0.95
Outside EU v EU Country	-0.59	-2.31	-0.55	-1.06
Freedom Food label v None	0.28	2.02	0.47	0.96
International Quality v None	0.75	1.56	0.68	1.4

Table10ii: Median £ WTP Estimates (No Flag)

	Streaky Bacon	Beef Burger	Gammon Steaks	Chicken Curry
Choice (Relative to Basic)	0.27	0.54	0.31	0.42
Premium (Relative to Basic)	0.83	0.9	1.15	1.28
Organic	0.68	0.46	0.88	1.23
UK v EU Country	0.67	0.47	1.25	0.94
EU v EU Country	-0.42	-0.68	-0.47	-0.27
Outside EU v EU Country	-0.94	-0.85	-0.93	-0.57
Freedom Food label v None	0.5	0.42	0.73	0.52
International Quality v None	0.67	0.64	0.72	1.06

Table10iii: Median £ WTP Estimates (No Flag)

	Leg Lamb	Chicken Breasts	Turkey Mince	Pepperoni Pizza
Choice (Relative to Basic)	0.42	0.46	0.24	0.37
Premium (Relative to Basic)	1.41	1.02	0.91	1.01
Organic	1.31	1.49	1.15	1.28
UK v EU Country	2.12	1.67	1.03	1.12
EU v EU Country	-2.16	-0.17	-0.15	-0.74
Outside EU v EU Country	-0.68	-1.48	-0.77	-0.39
Freedom Food label v None	1.6	1.45	0.63	1.46
International Quality v None	0.85	1.91	0.98	0.99

The results in Tables 10(i-iii) in general confirm prior expectations. We can observe that for all products examined respondents have relatively strong preferences for Premium Quality produce, produced within an organic production system and

produced in the UK.[21] There were also positive preferences displayed for the Farm Assurance attribute with stronger preferences for International Quality over Freedom Food. The finding regarding the Freedom Food attribute may in part be traced back to public recognition and understanding. As noted by McNair et al. (2013):

> *"106. The FF scheme will thrive in future only if it achieves a significant level of recognition among consumers. It is demand for FF products that ultimately ensures the scheme's survival. At the moment, the degree of recognition of the FF label among consumers is low."*

If we focus on the CoOL results in more detail we see a very strong and consistent set of results. The UK CoOL is always the most preferred, followed by a specific EU country (that differed between products). So for example, when it comes to chicken breast the median WTP for UK CoOL is most preferred, followed by the EU wide label, without mention of a specific Member State, with non-EU products least preferred. Thus, for the outside EU country (which in the case of chicken breasts was Thailand), respondents require a price reduction compared to the EU and the UK.

These results confirm findings in earlier literature that show a strong home country bias over identical products from other countries. For example, Pouta et al. (2010) report that Swedish consumers' value home country broiler meat over that from Denmark, with Danish meat preferred to meat from Brazil and Thailand. Similarly, for beef steaks Lim et al. (2013, 2014) find that US consumers prefer domestic meat over that from Canada which is preferred, albeit it only marginally, to meat from Australia. Kallis et al. (2011) and Kallis and Gil (2012) reported the same pattern of preferences for Spanish consumers and rabbit.

Thus, the preferences exhibited by our respondents for the other identified EU countries over non-identified EU and non-EU countries is in accordance with previously reported research in the literature that has shown that distance, geographically and potentially culturally, has an impact on CoOL WTP.[22]

[21] The high WTP for organic can most likely be explained by the hypothetical nature of the survey. Indeed this type of result is not unusual in hypothetical stated preference research. That is, if offered an organic option in a hypothetical setting almost all survey respondents will be willing to accept this type product (regardless of price), whereas the price premium charged in markets acts as a serious hurdle to actual purchase.

[22] We note an exception to this result is provided by Maes et al. (2014) who reported their highest WTP for non-UK beef to be for France and this is greater than the estimates for Argentina, Brazil and the USA. This result is out of keeping with the others reported in the literature and it might be explained by a general dislike of the France in the UK (for whatever reasons).

Once we consider the relative size of the WTP estimates some are obviously higher for some products than others. For example, the results for Beef Lasagne are relatively high. However, if we compare our estimates with Boeri et al. (2014) who examined consumers' preferences for lasagne in six EU countries the size of our WTP for CoOL is somewhat smaller.

Another way to understand our WTP estimates for UK CoOL is to consider relative to the domestic price of the product. Thus, if we take the mid-point of the price range of the 12 products we examined in the CEs it can be seen that the WTP is almost always less than 50% of this price point. This implies that at average market prices for the specific set of goods consumed, UK consumers appear to be willing to pay up to 50% more for a product that is from the UK compared to an alternative from outside the EU. As already noted these estimates did need to be treated with a degree of caution given the hypothetical nature of the survey. However, what is clear is that our survey respondents do appear willing to pay a premium for UK products, or require price discounts if they are to consider buying non-UK products.

The estimates we have produced are in keeping, in terms of magnitude, with many of those already reported in the literature for hypothetical stated preference studies, albeit at the lower end. For example, if we compare our estimates to those reported in Lim et al. (2013, 2014) and Meas et al. (2014), which are all for beef, our estimates are lower. However, as already noted it important to treat our estimates and those previously reported in the literature with caution given the hypothetical nature of the survey methods employed.

We now consider each product in turn beginning with fresh, chilled and frozen products, followed by processed products.

Chicken Breast

For this product we see that Farm Assurance has a higher WTP than UK CoOL. We also note that generic EU CoOL is valued more than a specific EU country and the Outside EU CoOL is valued the least. This means that the largest price reduction will be required for chicken breast from outside the EU.

Pork Leg

The WTP estimates for leg of pork are interesting. The WTP estimates for the UK CoOL attribute indicate that this is highly valued. In contrast, the Outside EU CoOL attribute is negatively valued which implies that a respondent requires a price reduction to buy this specific product. Also Freedom Food farm assurance is more highly valued than International Quality. Organic production and Premium products

are also positively valued by respondents. Finally, both EU generic CoOL and Outside EU CoOL are valued less than a specific EU country.

Leg of Lamb

For this product we find that UK CoOL is the most highly valued attribute. The least valued attribute in that it has a negative WTP is EU Generic CoOL. In contrast to some other products, the value of discount required to purchase Outside EU CoOL is much smaller and this in part might be explained by the established historical imports of lamb from New Zealand. All other attributes are as we would expect with in this case Freedom Food having a higher WTP than International Quality. There is also a positive WTP for Organic although this is half the size of the WTP estimate for UK CoOL.

Turkey Mince

The results for turkey mince reveal that CoOL UK is valued marginally less than Organic production. We also find that Outside EU CoOL is the least valued and International Quality has a higher WTP than the Freedom Food farm assurance label.

Streaky Bacon

For this product we find that being a Premium product, being Organic and having an International Quality label are valued at least as much as UK CoOL. Also, as with several other products, Outside EU CoOL is the least valued attribute.

Pork Sausages

For pork sausages we see a similar pattern of WTP estimates as for streaky bacon. In terms of relative size of WTP, UK CoOL is valued less than International Quality, being a Premium product and being produced within an Organic farming system. Also the least preferred attribute with a negative WTP is the Outside EU CoOL.

Beef Burgers

The results for beef burgers are interesting as again we see that although UK CoOL is valued it is not the most highly valued attribute. In order of importance we find that Premium product is most highly valued followed by International Quality. Organic is valued slightly less than UK CoOL and Outside EU CoOL is again negatively valued.

Gammon Streaks

For this product UK CoOL is the most valued attribute. Also it is the biggest in relative terms, which means that this reverses the asymmetry we have observed for several products regarding their relative CoOL WTP estimates. We also see that a Premium product is highly valued as is Organic production. Also both types of Farm Assurance are valued relatively highly.

Chicken Pie

For this processed product we see that being a Premium product and International Quality farm assurance are valued relatively more than UK CoOL, which is only just bigger than the value placed on Organic. For this product we also see that the Outside EU CoOL attribute is negatively valued.

Beef Lasagne

For beef lasagne we find that as with several other products that UK CoOL is valued but less so than being a Premium product or being Organic. Also our WTP estimates are significantly less than those reported in Boeri et al. (2014).[23] We also see that the relative size of Outside EU WTP is less than UK CoOL. As with a number of other products, International Quality is valued more than Freedom Foods.

Chicken Curry

For chicken curry we see that Premium product, Organic and International Quality are more highly valued than UK CoOL. Also the Outside EU CoOL is negatively valued.

Pepperoni Pizza

For this product we see that Freedom Foods quality assurance is the most highly valued attribute, followed by Organic and then UK CoOL. The Premium product attribute is also valued and the relative size of the other CoOL attributes, are smaller than the UK CoOL.

[23]Boeri et al. (2014) report preliminary results for a CE for ready to eat lasagne carried out in six EU countries (Italy, France, Germany, Spain, Republic of Ireland and Norway). The study did include an attribute called "Origin of the Meat" and this had levels unknown, imported and national. The choice of attributes is different to those you might find on a label. WTP for "National" are relatively high. So they range from just less than €3 to almost €6 per product which is more than the maximum price used in the CE design set. Interestingly, although CoOL appears to be very highly valued what attracts an even higher WTP for four out of six countries is whether or not the meat has been tested for authenticity.

Key Observations

First, we see that for eight products UK CoOL is not the most highly valued attribute. This is important as it indicates that although UK CoOL does attract a reasonably large WTP estimate, it is not the most valued attribute.

Second, the times when UK CoOL is most important is for the fresh/chilled/frozen group of products (excluding chicken) and for gammon steak which many consumers may consider as fresh as opposed to processed. The fact that there is this pattern of results for UK CoOL would indicate that for processed products the quality signal provided by the quality attribute or the organic production system are of greater importance than origin. This relative effect is potentially important as it suggests that CoOL is most likely to be meaningfully employed in purchase decisions for fresh/chilled/frozen meat.

Third, for some of the products we have examined there is an asymmetric response to the CoOL that indicates that although UK CoOL is valued, it is not necessarily the most important piece of information. What appears to be relatively more important is knowing that a product is not from the UK (so it can be avoided). Generally the further away the origin the greater discount required to induce a purchase (with the exception of New Zealand lamb which is well established in the market). In these cases the introduction of CoOL may well lead to a change in purchase choices that could have potential impacts on the level of imports accompanied by an increasing demand for domestic production that might be met by increased supply or increases in price.

WTP and Socio-Economic Data

Next we present results that consider how the WTP estimates (by product and attribute) are related to the socio-economic characteristics of our survey respondents. To generate these results we have regressed (a basic OLS specification employing Classical methods) a set of socio-economic characteristics on our individual WTP estimates of WTP. Here we summarise the statistically significant results for each product for each attribute in Table 11(i-iv):

Table 11(i of iv): Relationship WTP and Socio-Economic Characteristics

	Chicken Breast		Leg of Lamb		Leg of Pork	
	+ve	-ve	+ve	-ve	+ve	-ve
Age	Choice EU CoOL	Premium Organic UK CoOL FF IQ	Choice EU CoOL	Premium Organic UK CoOL Out CoOL FF IQ		
Children	EU CoOL	Organic UK CoOL FF IQ				
Gender			UK CoOL		Premium Organic UK CoOL IQ	EU CoOL Out CoOL FF
Income			Choice Premium Organic UK CoOL Out CoOL FF IQ	EU CoOL		

Table 11(ii of iv): Relationship WTP and Socio-Economic Characteristics

	Turkey Mince		Gammon Steaks		Streaky Bacon	
	+ve	-ve	+ve	-ve	+ve	-ve
Age		Out CoOL FF		Choice Premium Organic UK CoOL Out CoOL FF IQ	UK CoOL	Out CoOL
Gender	Choice Premium Organic UK CoOL IQ	EU CoOL		FF	FF	

Table 11(iii of iv): Relationship WTP and Socio-Economic Characteristics

	Pork Sausages		Beef Burger		Chicken Pie	
	+ve	-ve	+ve	-ve	+ve	-ve
Age	CoOL UK	Choice Organic Out CoOL		FF	UK CoOL	FF
Education					FF	
Gender	Choice Premium Organic Out CoOL IQ	EU CoOL FF				
Income			Choice Premium Organic Out CoOL IQ	UK CoOL EU CoOL	Choice Premium Organic Out CoOL IQ	EU CoOL

Table 11(iv of iv): Relationship WTP and Socio-Economic Characteristics

	Beef Lasagne		Chicken Curry		Pepperoni Pizza	
	+ve	-ve	+ve	-ve	+ve	-ve
Age	UK CoOL EU CoOL	Choice Premium Organic Out CoOL IQ FF	UK CoOL	Choice Out CoOL FF	UK CoOL	
Children					EU CoOL	Choice Premium Organic FF IQ
Education				UK CoOL		UK CoOL
Gender			Premium UK CoOL IQ	EU CoOL FF		
Income			Choice Premium Organic UK CoOL Out CoOL IQ	EU CoOL		

The results presented in Table 11 (i-iv) are varied with product specific outcomes. However, there are a couple of general observations that we can make.

First, when we consider Age, we can see that as far as UK CoOL is concerned there is a negative relationship with three out of four fresh products, but for the remainder the relationship is positive. Thus, this indicates that older respondents are WTP more for a UK CoOL label when the meat product in question is processed or uses meat as an ingredient.

Second, for those products for which UK CoOL is related to Gender we always find a positive relationship. This implies that being female is positively related to WTP to a CoOL UK label for a third of the products we considered. And the balance of products for which we find this relationship is typically fresh/chilled/frozen.

Finally, for all the other socio-economic attributes we find very limited evidence to indicate any general impact on WTP for UK CoOL.

If we turn to the other CoOL attributes (EU and Outside EU) CoOL we can see that a label for a product from outside the EU is negatively related with Age for six out of 12 products. Thus, as respondents get older they are more likely to place a more negative value on Outside EU CoOL. This indicates that the use of CoOL to indicate the origin of meat is likely to have impacts on the preferred sources. The magnitude of this effect is uncertain, but evidence from the impact on cross-border trade between the USA and Canada after the USA changed its CoOL on beef suggests that trade effects can be very substantial (e.g., Poulliot and Sumner, 2014). Indeed, there has been a considerable reduction in the supply of beef from Canada to the US because of the way US consumers have reacted to how beef products are now being labelled.

We can also see some patterns in the data with regard to the quality attribute (i.e., Choice and Premium) and the production system attribute (i.e., Organic). For product quality there appears to be a negative relationship with Age, a positive relationship with being female and a positive relationship with income. Interestingly, we find the same pattern for Organic in terms of the socio-economic variables considered. However, it needs to be borne in mind that these results hold for between a third and one half of the products we have considered.

Choice Consistency: Attribute Attendance and Attribute Ranking

After completing all the choice cards, respondents were asked two sets of questions about how they ranked the importance of attributes and whether they ignored specific attributes when making their choices. Answers to these questions can be

used to cross-check how people interacted with the survey instrument, and provide an additional source of information about how people respond to attributes. If people indicate that they did not ignore an attribute they are said to have "attended" that attribute. Ideally, all respondents would attend all attributes. However, studies that have asked attendance questions have generally found that some people do not attend all attributes, with non-attendance increasing with the complexity of tasks (commonly 50% to 100% of people do not attend at least one attribute). While this may appear to be a source of concern, the literature has fortunately established that people who state that they have not attended an attribute have probably paid attention to it when making their choices, though they generally give it less importance. The ranking of attributes provides a complementary source of information which can be used to check the non-attendance data. There is empirical evidence that shows that attribute ranking data is a reliable in terms of assessing respondent engagement with CE survey questions (Balcombe et al., 2015a,b).

Non-attendance was fairly consistent for all attributes across all 12 products ranging from 15% to 35% for different attributes. In our CEs, on average about 85% of people did not attend at least one attribute. This is consistent with previous studies we have conducted (Balcombe et al., 2015a,b). For both the ranking and attendance questions, Product Quality was clearly the most important attribute. CoOL was consistently of mid-range importance according to both the ranking and attendance measures. The ranking and attendance measures assigned different levels of importance (on average) to Price, with it being the least attended attribute, but the second most important attribute by rank across the majority of products, giving us some confidence that people did pay attention to the Price.

Format of CoOL

Once all the CE data had been collected we asked all 2,951 respondents their preferred format for CoOL. The responses are provided in Table 12.

Table 12: Preferences Regarding CoOL Format

The Country of Origin can be displayed in different formats on food packaging. Which option do you prefer?	Percentage
Text only	17.5
Text and Flag	41.7
Flag Only	40.8

As can be seen from Table 12 survey respondents appear to have a strong preference for a format that employs a flag. However, despite this the actual difference in WTP with and without a flag is minimal and as such the preferred format does not appear to necessarily influence choice.

Revealed Preference Research

Summary Revealed Preference Study

This research has presented revealed preference results for CoOL using data obtained from the Kantar World Panel. Our results reveal that UK consumers value the CoOL on meat, specifically beef, and that the consumers place a greater on this label compared to other labels. This finding is consistent with the findings of both previous studies in stated preference literature (e.g., Meas et al., 2014) and the online CE by this study, albeit for different types of meat. As such we are able to view the results we have generated from our online CE as being externally validated by the revealed preference research findings.

Another important finding that emerges from our analysis is that the WTP estimates have increased since the horsemeat incident in 2013. This finding would suggest that CoOL can play a role in the mind of the consumer with regard to meat authenticity. However, our analysis employed five years of data for a limited number of products (15 SKUs). The use of a longer time series and greater product coverage would allow us to see if the results we have presented here are robust across longer timescale and more products.

Introduction

A hedonic modelling approach was employed to assess to what extent CoOL has actually impacted purchase choice. The hedonic approach assumes that the differentiated products in food markets are a bundle of product attributes that cannot be purchased separately. Although the use of the hedonic approach goes back many years in economics it was Rosen (1974) who formalised the hedonic price model. The approach introduced by Rosen (1974) consists of two stage regressions, although most studies only implement the first stage, as we do here. In the first stage, the prices of goods are regressed on the goods' attributes to estimate an implicit price for each attribute. The coefficients in this regression are econometrically interpreted as the (marginal) market price for an attribute (Bajari and Benkard, 2005). Thus, if we assume that a market is in equilibrium, this marginal price can be viewed as a lower bound WTP for consumers who purchase a product with that attribute, whilst the marginal price becomes the upper bound WTP for consumers who do not purchase the same product (Griffith and Nesheim, 2013).

In line with this literature, we assume that meat product prices can be explained as a function of the product attributes including various aspects of label information including CoOL. Thus, by conducting a hedonic modelling exercise to examine revealed preferences (i.e., preferences as revealed by actual food choices being made), we are able to see the extent to which CoOL has or has not led to price differences reflecting the value placed on it by consumers. In addition, we are able to use these estimates as means of assessing the (external) validity of our CEs result. Thus, if we find that actual retail data reveals a price premium for CoOL we can then consider the magnitude of this premium in relation to the estimates we have reported for our CEs.

Kantar Retail Data

This analysis was carried out using actual retail data from food purchases in the UK held in the Kantar World Panel, a large panel (30,000) of households which is geographically and demographically representative of the Great Britain (GB) population. Our data set includes meat and meat product purchases made over a five year period between February 2010 and January 2015. Data are gathered via shoppers who scan products they purchase using technology provided by Kantar who then retrieve the data into databases on a four-weekly cycle. In order to validate shopper-scanned data, Kantar also collects purchase receipts.

Each scanned item is identified by a unique stock keeping unit (SKU); a barcode used by retailers to manage stocks. Our data is comprised of 20 SKUs, each containing either single or multiple products (2 to 25). In total, our data set contains 170 different products. Although retail products within SKU are differentiated by packaging size and other marketing strategies such as branding and price promotions, each SKU captures products with the same intrinsic attributes and CoOL which is the variable of main interest here. Importantly, Kantar data captures CoOL for products legally required to carry CoOL (i.e. mandatory CoOL), mostly fresh beef products, and products labelled under voluntary schemes.

Variables, Data Format and Regression Specification

We first began by setting the data up in a balanced panel format.[24] To do this we used the SKU code as a panel identifier and month of purchase as a time variable. The variables available to us are shown in Table 13. The initial data set comprises 1,010 observations over the five year period. Apart from price, which is a continuous variable, all variables in the data are categorical variables with two or more sub-categories which have been coded accordingly.

Table 13: Kantar World panel data for meat products sold by main UK retailer, 2010-2015

Variable	Description	Mean	Std. Dev.	Min	Max
SKU	Unique panel identifier			1010	1020
Price(£/Kg)	Meat product	5.01	2.58	0	17.98
CoOL	Country of origin label			1	5
Branv	Brand Value			1	3
Packz	Pack Size			1	6
Prodc	Product categories			1	2
Prodt	Product type			1	7
Retai	Retailer name			1	5
M	Month of purchase			1	12
Y	Year of purchase			2010	2015

Taking each of the variables shown in Table 13 in turn:

- *SKU* – for this variable in our analysis we have focused on beef as this is by far the largest single species represented in the data, accounting for 15 out of the 20 top-selling SKUs in the data. This is also appropriate to the current research in that CoOL on beef is mandatory. This means that we have 682 observations in our modified data set.

- *Price(£/Kg)* – prices are adjusted for inflation and possible quality changes based on the National Statistics Office's Consumer Price Index (CPI) for meat. CPI is a Laspeyres-type index which measures the change in the price of a basket of fixed composition, quantity and as far as is possible quality (Office of National Statistics, 2014).

[24] A balanced panel means that we have repeated observations for each product over the entire time dimension of the data set. So if we have 20 products observed for 104 weeks then we have a balanced panel. An unbalanced panel would be where we have 20 products but some of them are not observed for all 104 weeks; so there are "missing" observations.

- *CoOL* – this is a dummy variable that captures the four CoOL classifications included in the data set. These are Britain, England, Ireland and Other. As a percentage of the data British was 60%, Ireland 14%, England 9% and Other 17%.

- *brandv* – this variable codes three brand value categories: finest value coding for premium fresh products; mid-range value coding for most branded fresh meat and chilled or frozen processed products; and value coding for the lowest value mostly processed products such as pizza and burgers.

- *packz* – this is a categorical variable for pack size sold under a SKU. For some SKU more than one pack size is sold under a specific SKU. To model this we have assigned each SKU a pack size (based on a weighted average of size) as follows:
    - large (>1.3kg),
    - Medium (0.50-1.3kg)
    - small (<0.5kg).

  The SKU weights have been selected to allow for consistent econometric estimation.

- *prodc* – this variable codes two-level categories: fresh meat and frozen products, which are mostly processed products. In line with EU labelling requirements (European Parliament, 2004), we categorise meat products in the data into two main categories:

  Fresh meat – this is meat that has not undergone any preserving process other than chilling, freezing or quick-freezing including meat that is vacuum-wrapped or wrapped in a controlled atmosphere. This may include meat that has been reduced to fragments (e.g. mincing), which has had foodstuffs, seasonings or additives added to it or which has undergone processes insufficient to modify the internal muscle fibre structure of the meat and thus to eliminate the characteristics of fresh meat (European Parliament, 2004).

  Processed meat – this is products resulting from processing of fresh meat or from processing of already processed products, so that the cut surface shows that the product no longer has the characteristics of fresh meat.

- *prodt* – this is a categorical variable with seven levels of coding for burgers, grilled meat, joints, minced meat, chilled lasagnes, pizza and steaks. The coding strategy for this variable aims at grouping products under a small

number of manageable categories which may allow any effect of origin on different types of products affected by the horsemeat incident to be revealed.

- *retai* – this variable controls for the five major GB retailers (by market share) selling the 20 SKUs in the data – Tesco, Asda, Sainsbury's, Morrisons and Mark and Spencer. According to Kantar these five retailers currently[25] have grocery market shares of 29%, 16.9%, 16.7%, 11.1% and <2.7%, accounting for at least 72% of GB grocery sales between them.

- *M* – this is a series of dummy variables that indicate month of purchase and are included within the regression to control for seasonal effects.

In addition to the data available, we have also included within our analysis an additional dummy variable to control for the possible effects of the horsemeat incident on consumer preferences for CoOL, such that the variable (d) is equal to 1 for year 2013 and onwards and 0 otherwise. In addition, we have also included a seasonality dummy (S) variable to control for any seasonal effects in the data. Finally, because of the selected set of SKUs (15 from 20) we do not include the variables prodc, prodt or M in our final model specification.

Thus, our preferred regression specification is as follows:

$$Price_{it} = \alpha_i + \beta_0 + \beta_{1i}\, CoOL_{it} + \beta_2\, d_t + \beta_{3i}\, d_t{*}CoOL_{it} + \beta_4\, branv_{it} + \beta_5\, packz_{it} + \beta_6\, retai_{it} + \beta_7\, S1_{it} + \beta_8\, S2_{it} + \beta_9\, S3_{it} + \varepsilon_{it}$$

where β_0 is and overall model intercept, α_i is a random intercept for panel or individual product-level fixed effects, and ε_{it} is an error term which accounts for unobserved heterogeneity across SKUs and over time (t) and i is British, England, Ireland and Other.

Results

A Random Effects (RE) model specification with clustered errors and an equivalent Mixed Effect (ME) model specification were used to contrast and cross-validate the results from the two different estimators (For details see Appendix A).

Based on model performance our preferred model specification ME yields the results shown in Table 14. Note that the table reports only parameters of interest to Defra.

[25] Grocery Market Share, 12 weeks ending 01.02.2015, http://www.kantarworldpanel.com/en/grocery-market-share/great-britain

Table 14: Model Estimates for ME Specification

Price (Dependent variable)	ME Coeff.	S.E	P Value
Intercept	5.48	2.83	0.053
CoOL*			
English	-0.14	1.90	0.942
Irish	-0.36	1.0	0.719
Other	-0.50	1.13	0.662
Time dummy (d)	0.08	0.19	0.673
Interaction terms			
*d*English CoOL*	4.05	0.53	0.000
*d*Irish CoOL*	1.89	0.44	0.000
*d*Other CoOL*	1.67	0.40	0.000
Branv**			
Mid-range	0.77	1.47	0.601
Value	0.90	1.50	0.549
Packz***			
Medium	0.92	1.90	0.627
Small	1.28	1.0	0.198
Seasonal dummies+**			
S1 (Jan-March)	-0.12	0.20	0.552
S2 (April-June)	0.38	0.20	0.063
S3 (July-Sept)	0.41	0.20	0.039
Model Fit			
Log likelihood	-1402.49		
Wald $Chi^2(17)$	276.56		0.000
N	682		

*British origin is the reference level category and as such cannot be directly estimated. However, its marginal effects on price are predicted to be approximately 49 pence per 100 grams although this is likely an overestimate because of uncontrolled quality effects. All other origins are measured from this reference base level.

**Reference level is highest brand value
*** Reference level is large size
+ Excluded S4(Oct-Dec.) to avoid collinearity

With regard to the estimated coefficients for CoOL, we set British as the reference level so that other CoOLs can be assessed against British origin. This means that we interpret the intercept as the measure of value associated with British CoOL. As we can see at the top of Table 14 this parameter is significantly different from zero indicating that consumers do value British CoOL. However, it is also important to understand that, as a categorical variable, CoOL cannot be interpreted as an absolute implicit price or marginal WTP but rather as a relative WTP measured from the base level – i.e. British origin.

We also need to treat our parameter estimate of British CoOL with a degree of caution. This is because the parameter estimate is potentially overestimated because there will be aspects of underlying quality differences between products in our sample which we have not been able to control for via the quality-adjusted index. This will be a particular issue for (latent) quality

differences that are time-invariant but less so for time-varying unobserved heterogeneity which are captured via the time dummy in the model specification. In other words, where quality differences are not constant over time, the model can account for those changes. However**,** if there are any underlying quality differences that persist over time, their effect may be understated in the CoOl variable coefficient, hence the estimate of WTP for CoOL could be an overestimate.

Next, we can see that the coefficients for CoOL (other than British) are negative and statistically insignificant. This finding indicates that, prior to 2013 and the horsemeat incident on average consumers are WTP for British-labelled beef but not for meat labelled as “England”, “Ireland” and other sources, holding constant the variables for retailer, brand and pack size. Importantly, given the insignificance of the coefficients for the labels other than British, the results indicate that consumers did not value these labels as an authenticity cue prior to the horsemeat meat incident.

Turning to the time dummy *CoOL* coefficients, *d* and *d*CoOL,* these capture the differences between *CoOL* before (*d*=0) and after (*d*=1) January 2013 when the first incidents of beef substituted with horsemeat were reported. The coefficients are all highly significant and positive suggesting that there has been a significant structural break or shift in preferences for *CoOL* towards greater demand for origin labelling. In other words, the horsemeat incident has affected consumers' valuations of CoOL significantly inducing greater willingness to pay for meat authenticity for all origin labels. In terms of changes in the magnitude of the slopes, consumers are WTP a little more for a British origin label, but significantly more for all the others after 2013. This shift is in particular most pronounced for “England” CoOL, which has a relatively large coefficient.

Turning to the other variables included in the specification we see that the inclusion of variables *branv* and *packz* has yielded statistically insignificant estimates. Also, as is common in demand studies, controlling for seasonal effects is important as *S2* and *S3* are statistically significant.

Finally, in terms of model specification we note that there are no significant random effects, α_i across beef product-types, suggesting that the observed effects of CoOL on purchase choice is systemic. Also, we consider these results to be reasonably robust as the model fit is very strong and the likelihood ratio test for the ME specification is also highly significant.

In summary, these results regarding consumer reaction to the horsemeat incident are not surprising given the high profile nature of the incident.1 In the UK some leading supermarkets significantly affected by the scandal, such as Tesco, pledged to source more meat domestically in the future (BBC, 2013). Consumer preferences

may also have shifted toward British-produced meats which are perceived as being more authentic than imports. According to a YouGov poll conducted immediately after the scandal, 79% of UK consumers preferred to buy UK-sourced meat and poultry compared to imported meat.

Eye-Tracking and Choice Experiment Research

Summary of Eye-Tracking Choice Experiment

In this part of the research project we have undertaken a second set of CEs combined with the use of Eye-Tracking (ET). The results of this part of the project reveal that in general we can be confident about the results of our online research. We have found that visual attention to attributes was relatively stable with regard to the two treatments (i.e., flag vs no-flag) as well as to differing levels of complexity. We also found that increased CE complexity lowered attendance on the Organic and Quality Assurance but attendance on Price, Product Quality and CoOL remained relatively similar with higher complexity.

Turning to WTP the ET sample group had a similar order and magnitude of WTPs for the attributes within the study compared with the online sample, but with few substantive differences. Interestingly, increased complexity (the inclusion of a Country of Production attribute and Calories) did not obviously change the WTP for the CoOL, although there was a difference between the flag and no-flag case, for the complex treatment, which suggests that flags may possibly act as a salient object in a complex setting.

In terms of country specific effects the ET sample had a somewhat lower WTP for the UK CoOL attribute relative to Italian CoOL, but with a larger WTP differential for Italian CoOL relative to US CoOL. Finally, most respondents yielded responses displaying some degree of preference reversal, although the probability of this outcome is relatively low.

So, in summary, the ET CE results in general support the findings of the online CE in terms of the WTP estimates, they provide a measure of internal validity with respect to behaviour and choice and they are in keeping with previous results reported in the literature regarding the relationship between stated and visual attribute attendance.

Introduction

The ET CE only considered one product, Pepperoni Pizza. The specific focus of this part of the research was to consider how respondents actually engaged with the choice cards used in the CE (i.e., attention and attendance of attribute) building on the research of Balcombe et al. (2015) as well as to consider how a simple versus a

more complex CE, in terms of number of attributes, impacted WTP. To this end we exposed respondents to two CEs. The simple CE was identical in form and style to that employed in the online part of the project. The complex design modified the design by including two additional attributes: Country of Production (UK or EU) and calories with three numerical levels. The inclusion of these additional attributes required us to modify the text within the CE and to extend possibilities available as part of the de-briefing questions. Importantly, the more complex CE design enables us to assess whether respondents are likely to change their behaviour when in a more complex environment by comparing visual attendance/attention between the simple and complex CEs.

Below we briefly explain what ET is and what it can be used for in general and within economics specifically. We then explain in more detail the CE we have designed and implemented. Finally, we present results and conclusions.

Eye-Tracking: A Brief Introduction

An individual will move their eyes when confronted with visual stimuli because sharpness across the retina rapidly diminishes with distance from the fovea (that part of the eye responsible for processing fine-grained, detailed visual information). As only 2% of the visual field is projected onto the fovea, for a subject to attend an object the eyes have to move. Thus, examining eye movements can in principle be important in helping to understand how information is acquired (McSorley et al., 2009).

Eye movements are classified into two types:

1. Fixations – these occur when eye movements are relatively still with durations of between 200-500 milliseconds in which a contiguous area is projected onto the fovea allowing detailed visual processing.

2. Saccades – very rapid movements shifting gaze to areas of interest and taking as little as 20-40 milliseconds. This type of movement helps project specific locations of a scene onto the fovea.

Taken together, an understanding of eye movements and eye-tracking research aim to understand how the brain deals with visual information received. This information, which is transmitted via the optic nerve, is dealt with using various attentional mechanisms that aid in the selection of a subset of relevant information that is subject to enhanced processing. This means that the brain is simultaneously enhancing and suppressing information.

In normal viewing situations attention and eye movements are intimately linked and move in tandem to the same visual location (Findlay, 2009). This comes from evidence examining the close correspondence between eye movements and higher-order cognitive processes (e.g., Rayner, 2009). As such eye-tracking research has provided insights into the control of visual attention (Findlay, 2009). In practice, eye-tracking research looks for patterns based on fixations and saccades. Eye-trackers record patterns of these movements and pauses, while people view a visual stimulus. These patterns are then collected together in what is referred to as a scanpath. This scanpath provides spatial-temporal data on the spatial distribution of attention across the visual stimulus. Therefore, eye fixation is in principle a good indicator of visual attention because (i) acuity deteriorates rapidly outside the fovea; (ii) little visual information can be obtained during saccades (Matin, 1974); and (iii) fixation and attention are naturally yoked.

The Role of Eye-Tracking in Choice Experiments

The principal aim of eye-tracking is to assess the degree to which respondents are able to engage with the survey instrument in a manner which is consistent with trading off alternative attributes. The second aim is to use it as an indicator of the relative importance of attributes in the decision making process, and whether this changes as the respondent faces increased complexity.

It is widely recognised that attribute attendance and ranking questions give another layer of information about respondent attitudes that can be complementary to the main choice tasks. For example, Busemeyer and Townsend (1993) assert that decisions and visual attention are closely associated. Whereas individuals often indicate that they have ignored attributes, there is a body of evidence suggesting this stated non-attendance is not reliable. Visual fixations and “dwell times” therefore offer another window from which to examine preferences. Additionally, the last attribute upon which respondents fix is indicative that this attribute may be pivotal to choice.

Previous research (Balcombe et al., 2015a) has tentatively established that answers to debriefing questions can diverge significantly from what might be expected from visual attribute attendance/attention. Eye-tracking provides another avenue for the assessment of the degree to which respondents engage with the survey instrument.

Ideally all attributes should receive high levels of visual attendance/attention. High attendance of the price attribute, in particular, is crucial for the reliability of WTP estimates, since if price is really being ignored then the WTP estimates will be grossly inflated.

We now distinguish between visual attention and attendance, although the two concepts are related.

Visual attendance requires that the respondent "fixed" on the attribute on both labels in a given choice set (card).[26] The requirement that both labels are fixed upon (where neither are blank) is needed for a proper comparison of attribute levels to have been made.

Visual attention can be measured by the total number of fixations (i.e., times looked at) on a given attribute. It could also be defined as the total "dwell time" on a particular attribute (i.e., how long looked at). Note, dwell time and the total number of fixations are closely related. We also recognise that the last attribute visually visited by the respondent may indicate that this attribute is particularly important to choice. We define this as a form of attention.

Importantly, visual attention and attendance can be compared with the stated attendance of respondents (respondents having stated whether they ignored an attribute) along with their rankings of the importance of attributes. The stated information is collected from survey respondents after they complete a set of choice cards (see Appendices B and D for examples of the stated attribute use questions). Together these results enabled us to examine whether there was a change between the flag and non-flag versions with similar complexity, to examine the impact of increased complexity, and to evaluate the consistency of choices.

Eye-Tracking Choice Experiment Implementation

The Sample

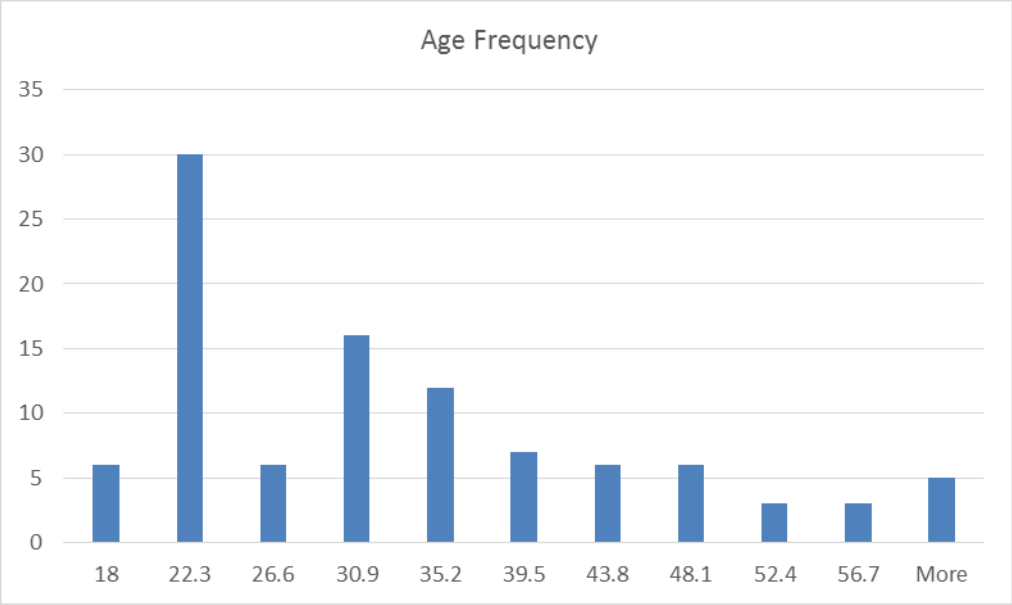
Some 100 participants were selected for the ET experiment. These were recruited using University of Reading mailing lists, with respondents being incentivized by £10 for participation. This sample was not intended to be fully representative of the UK population, since the essential aim of this component was to examine the engagement of participants with the survey instrument, and how this response changed given alternative designs. Nonetheless, we gathered a wide range of ages. In terms of the gender mix our sample was composed of 47 males and 53 females. We note that the proportion of males is somewhat higher than in the online sample.

[26] In the case where the attribute contained a blank, only a fixation on the non-blank regions for the attribute was required in order for this attribute to be deemed attended.

However, given the purpose of the ET CE stated above an exact match in terms of gender mix is not essential.

The age distribution for the ET sample is presented in Figure 1.

Figure 1: Age Distribution of ET Sample



The data in Figure 1 illustrates that sample was composed of a wide range of ages, but with a larger proportion of young people than in the population as a whole. There were also very few participants over 55 years of age.

All participants consumed meat. Almost all (96) indicated that they were either the main shopper in the household (60) or shopped for meat some of the time (36). The majority of these participants indicated that they bought fresh meat more commonly than frozen, usually at least once a week and that they shopped in the expected range of supermarkets.

The Eye-Tracking Choice Experiment Design

Each of the participants completed 48 cards, 24 of a simple variety and 24 of a more complex experiment for Pepperoni Pizza. Respondents were given the briefing materials prior to taking part in the experiment, and were given a rest in between completing the two sets of 24 cards. The order of the simple and complex designs was reversed for half of the respondents. Half of the respondents completed the simple version first, and half completed the complex version first. The sequence of cards within each of these treatments was the same for all participants. As with the online versions respondents also completed the debriefing questions concerning

their ranking of attributes and those they ignored when making their choices. This was done separately after completing each task.

The simple designs (attributes, levels of attributes, and combinations) were the same as the online version. The complex design contained two additional attributes, Calories and Country of Production. Each design (simple and complex) had a flag and no-flag version. Fifty participants completed the simple design without a flag along with a complex design with a flag. The other 50 completed a simple design with a flag and a complex design without flags. All participants were eye-tracked while making their choices. Respondents indicated their choices by choosing one of three buttons on the console (option A, B or don't know).

The simple designs for the ET CE repeated the online version exactly. The complex version with flags contained 24 new cards.[27] This enabled us to draw a comparison with the simpler version in terms of the impact of increased complexity. The no-flag version was constructed from half of the complex flag cards, which were repeated twice (without flags) meaning that each respondent would make a choice with respect to 12 cards twice. The purpose here was to examine whether respondents were prone to preference reversals, which should be relatively infrequent for results to be considered reliable. The complex no-flag version was used to study preference reversals as this was more likely to produce preference reversals.

Eye-Tracking Choice Experiment Results

We present our results in several parts. We first consider visual attention, then visual attendance and then we examine our WTP results for both designs.[28]

Visual Attention

We first present a summary of the visual attention results:

- Visual attention to attributes was relatively stable with regard to flag v no-flag treatments and to differing levels of complexity.
- Visual attention was relatively stable throughout the course of the experiment.
- Visual attention indicated that Price and Product Quality were consistently the attributes paid most attention followed by CoOL and Calories. Organic

[27] A copy of the ET CE survey instrument is provided in Appendix D.

[28] We note that the way in which ET is implemented (see Appendix A for specific details about the ET technology and respondent interaction) might raise concerns about the quality of the data. However, previous research (e.g., Balcombe et al., 2015a) has identified that CE respondents do not appear to be impacted by the use of ET technology.

Production and Quality Assurance received less attention along with the Country of Production attribute in the complex experiment.

We now consider the results in detail. To help understand the results we summarise respondent number of visual fixations (Y axis) on the attributes for each of the 24 cards (X axis) in the sequence in which they were presented in Figures 2 to 5.

Figure 2: Fixations – Simple CE No Flag

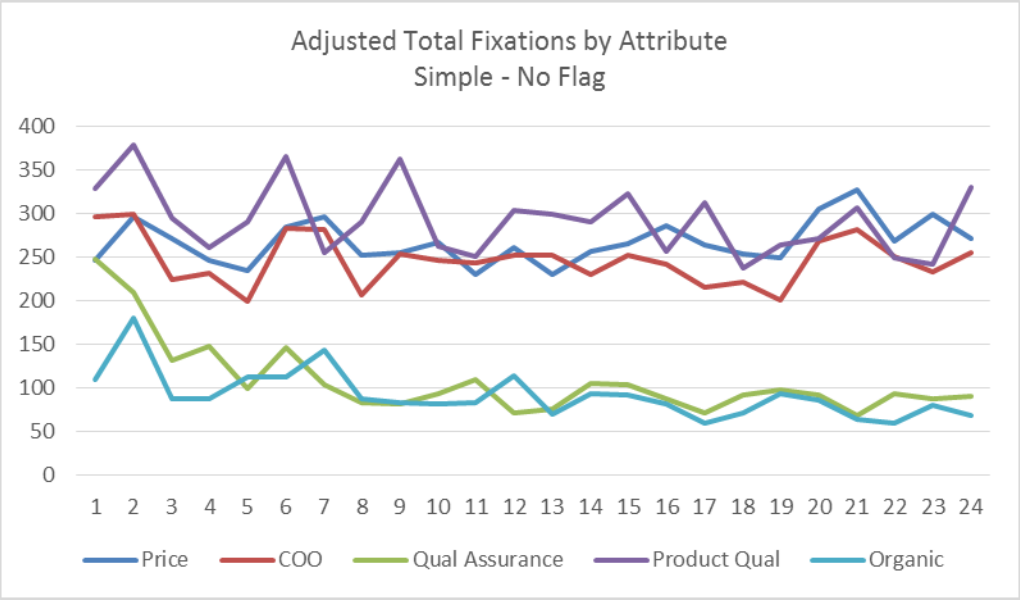


Figure 3: Fixations – Simple CE Flag

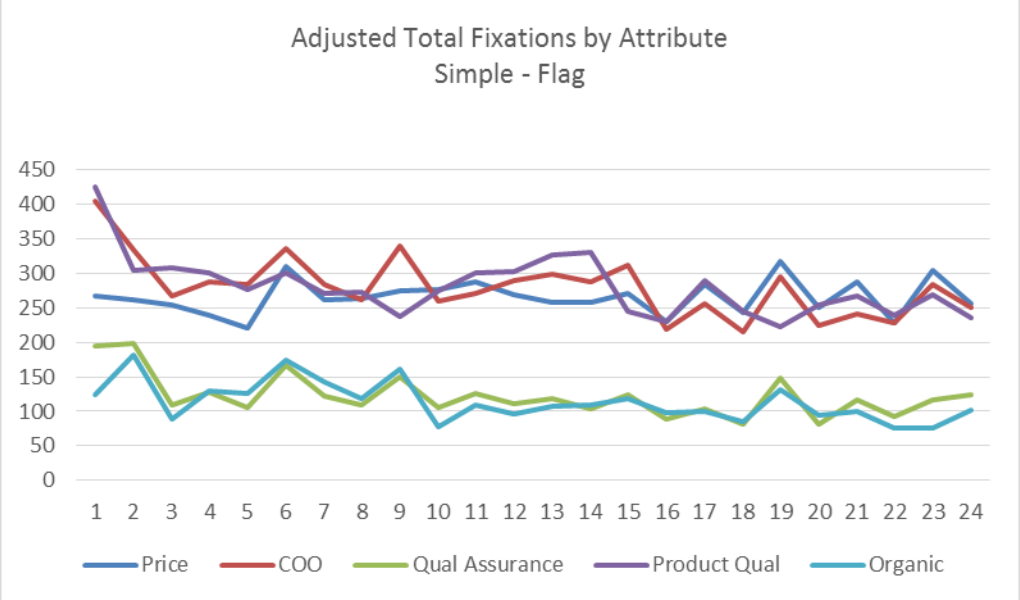


Figure 4: Fixations – Complex CE No Flag

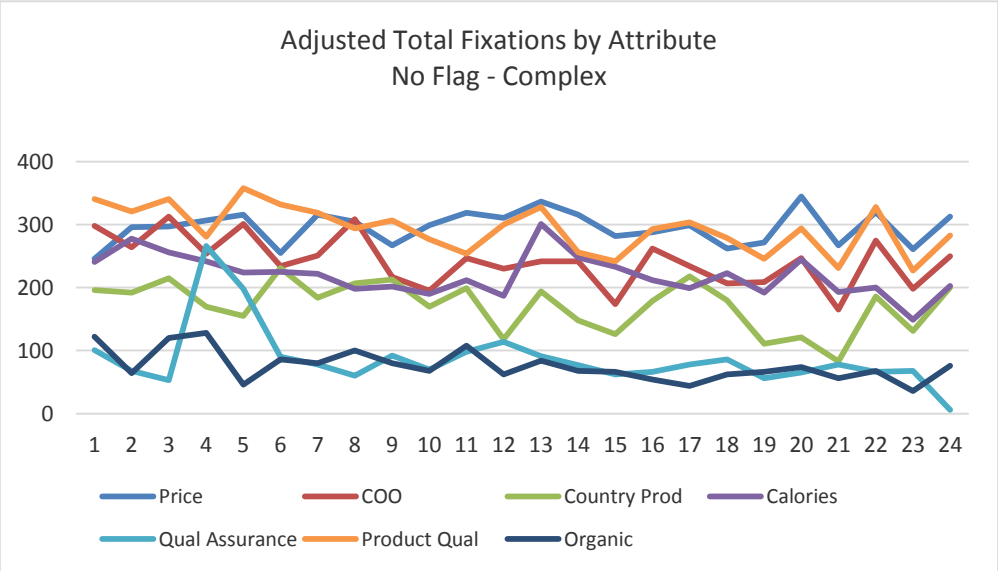
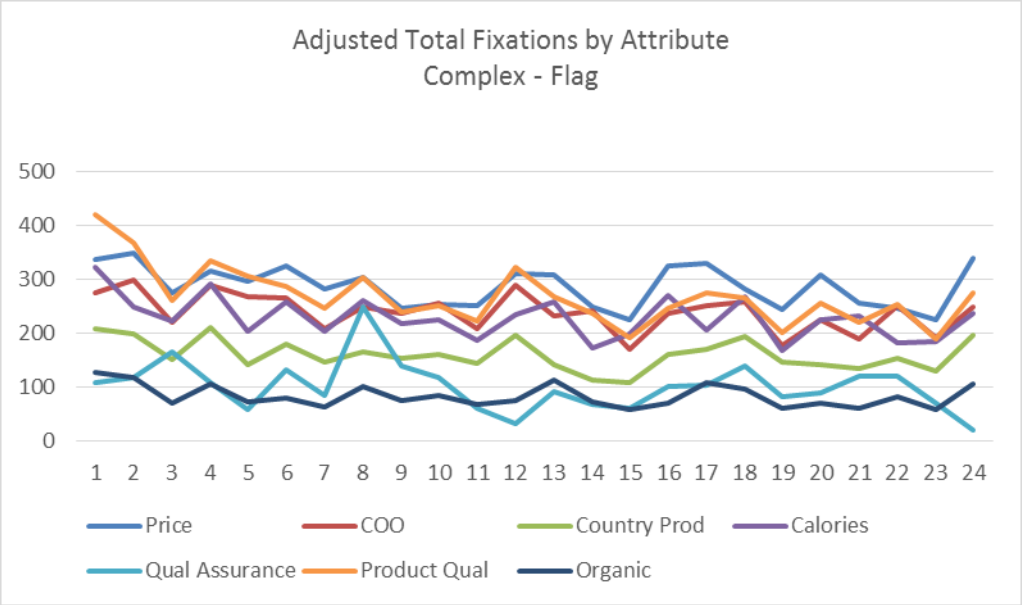


Figure 5: Fixations – Simple CE Flag



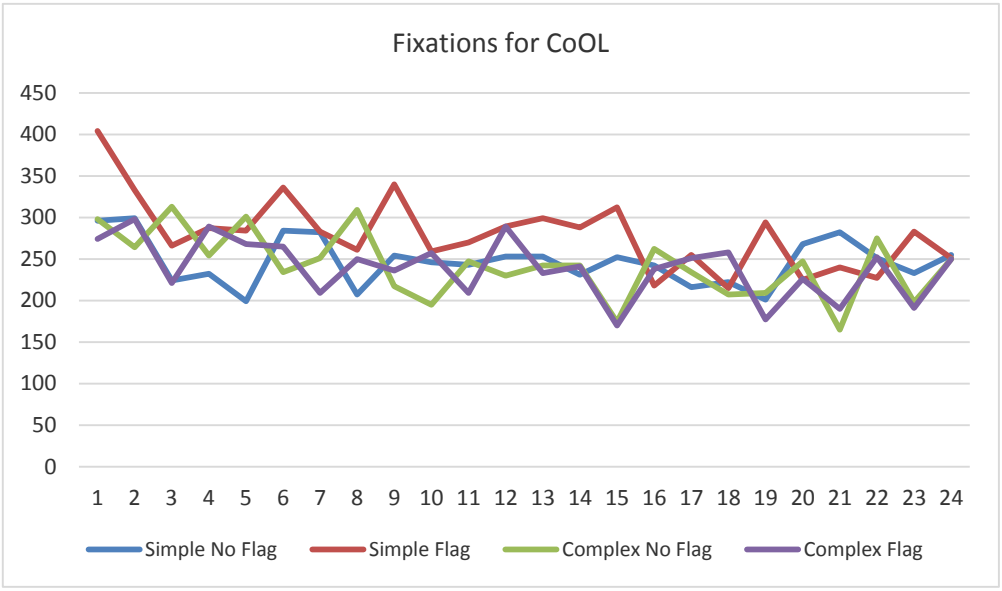
Figures 2, 3, 4 and 5 have been adjusted to account for the fact that some of the attributes have blank values in one or both of labels, and thus would be expected to be visited visually less often. Evidently in figures 2, 3, 4 and 5 fixation counts stayed relatively stable over the 24 cards within each experiment both in the simple and more complex experiments. While there is weak evidence of increased levels of higher visual attention at the very beginning of the experiment, there is no notable trend downwards either collectively or for particular attributes. This suggests that

there was no undue fatigue in the respondents that induced inattention. Since the online participants completed less choice cards, we would therefore conclude that these tasks were not unduly tiring.

As outlined above, Figures 2 and 3 pertain to experiments which were of the same design as those carried out online. These indicate that Price, Product Quality and CoOL receive reasonably comparable attention whereas Organic and Quality Assurance received much less attention. These findings remained unaltered by the addition of two more attributes (Country of Production, and Calories).

The next set of results we consider are presented in Figure 6 which shows the total fixations for the CoOL attribute.

Figure 6: Fixations – For CoOL Attribute



As can be seen visual attention to this attribute remains broadly invariant to both the existence of flags and to the addition of attributes, including the country of production. The relative stability of visual attention to the existence of flags is consistent with the findings of the online survey which did not uncover consistent substantive differences between the flag and no-flag versions. While flags may have been highly 'salient', they did not seem to draw attention in the manner which might have been expected.

Next we summarise in Table 15 a number of measures of attribute attendance, of which two relate to visual attention.

Table 15: Fixations, Importance and Attendance

Simple No Flag	Prop Fix	Prop Lastfix	Prop V-Attend	S-Attend	S-Importance
Organic	0.05	0.06	0.49	0.54	1
Q-Assurance	0.07	0.12	0.47	0.76	1.98
CoOL	0.27	0.23	0.71	0.7	1.83
Price	0.29	0.23	0.79	0.92	3.15
Quality	0.32	0.37	0.70	0.84	2.04
Simple Flag	**Prop Fix**	**Prop Lastfix**	**Prop V-Attend**	**S-Attend**	**S-Importance**
Organic	0.06	0.06	0.57	0.54	1.04
Q-Assurance	0.08	0.09	0.57	0.76	1.48
Price	0.28	0.23	0.83	0.9	3.02
CoOL	0.29	0.27	0.78	0.78	2.21
Quality	0.29	0.35	0.71	0.82	2.25
Complex No Flag	**Prop Fix**	**Prop Lastfix**	**Prop V-Attend**	**S-Attend**	**S-Importance**
Organic	0.03	0.04	0.25	0.62	2.13
Q-Assurance	0.04	0.08	0.25	0.8	1.81
C-Produced	0.13	0.13	0.54	0.68	2.75
Calories	0.17	0.18	0.68	0.48	2.33
CoOL	0.18	0.14	0.70	0.68	3.33
Quality	0.22	0.28	0.72	0.84	4.15
Price	0.22	0.18	0.84	0.86	4.5
Complex Flags	**Prop Fix**	**Prop Lastfix**	**Prop V-Attend**	**S-Attend**	**S-Importance**
Organic	0.03	0.05	0.36	0.5	1.81
Q-Assurance	0.05	0.06	0.38	0.72	3.25
C-Produced	0.12	0.14	0.53	0.74	2.77
Calories	0.18	0.17	0.70	0.84	2.44
CoOL	0.19	0.18	0.68	0.7	2.96
Quality	0.21	0.25	0.76	0.84	3.21
Price	0.22	0.16	0.86	0.88	4.58

Notes:
Prop Fix = Proportion of Fixations on this attribute by all respondents over all cards
Prop Lastfix = Proportion for which this attribute was the last attribute to be visually fixed upon
Prop V-Attend = Average proportion of the cards for which this attribute was visually attended
S-Attend = Average Stated Attendance for this attribute
S-Importance = Average Stated Importance according to Stated Rank (Higher more important)

The first column (Prop Fix) gives the proportion of fixations given to attributes. If we consider the top Simple No Flag option, we see that 32% of fixations are for the Quality attribute, whereas only 5% is for Organic. In the second column (Prop Last Fix) we have the proportion of the time that a given attribute was the last one visually visited by the respondents. Interestingly, Quality is the attribute most frequently visually visited in all four treatments.

Within Table 15 the attributes have been ordered according to the least visually fixed (Prop-V Attend) to the most visually fixed attribute within each of the four treatments. Product Quality and Price are the two attributes that are ranked first across the experiments. CoOL is ranked second or third with regard to total fixations across the experiments with a surprising invariant level of proportional fixations across flag and no-flag designs.

Thus, it is evident from Table 15, that Product Quality is the most common final fixation, with Price and CoOL being the next highest “last visit”. It is also worth noting here that perhaps in both the simple and complex cases there is some more evidence that the flag has increased the proportion of the time that CoOL was last visited.

Visual Attendance

We now consider respondent visual attendance. We begin with a summary of key findings:

- Most attributes were visually attended the majority of the time;
- Price was consistently the most visually attended attribute (in around 80 to 85% of cards on average) with CoOL being attended slightly less in around 70 to 80% of cards;
- Organic and Quality Assurance items were the least visually attended items (as low as 30-40% of cards);
- Increased complexity lowered attendance on the Organic and Quality Assurance, but attendance on Price, Product Quality and CoOL remained relatively the same with higher complexity; and
- There was little evidence supporting a relationship between stated attendance and visual attendance.

From a CE perspective attendance is arguably a more important phenomenon than attention. Without attendance a proper comparison of attribute values cannot have been made across the two labels by respondents. However, non-attendance need not be a problem if the respondent has decided that an attribute is of negligible utility,

and thus ignores it. But, if price is not attended then the underlying basis for calculating willingness to pay (and other welfare measures) is undermined. While 100% visual attendance is an ideal, it is unrealistic from a practical perspective. It must also be acknowledged that the eye fixations may not be 100% accurate and sometimes the respondent may have fixed close enough to have attended the attribute “peripherally” without this being identified as a fixation.

In the online version there was relatively large stated non-attendance of attributes, including price, which typically had rates of stated attendance of around 70% (that is 30% or more said they ignored price). Price commonly had greater levels of stated non-attendance than other attributes. While previous evidence suggests that stated non-attendance is a poor indicator of actual non-attendance, visual attendance data provides additional information as to whether price was actually not attended.

The third column of Table 15, gives the average proportion of cards which were visually attended within each of the four treatments. We would regard Price visual attendance as encouragingly high since it was among the highest visually attended attributes. As indicated in Table 15, Price was visually attended in around 80% of all of the cards on average. This suggests that there was no flaw in the survey instrument that induced respondents to ignore price. Table 16 gives the same average proportions of attendance as in Table 15 in the third column, but, it also separates the visual attention of those stating non-attendance and those not stating non-attendance.

Table 16: Average Visual Attendance of Cards by Attribute

	By S-Non Attenders	by S Attenders	Overall
Simple No Flag			
Organic	0.41	0.49	0.47
Q-Assurance*	0.46	0.52	0.49
Quality	0.56	0.73	0.70
CoOL	0.62	0.75	0.71
Price	0.88	0.78	0.79
Simple Flag			
Organic	0.53	0.60	0.57
Q-Assurance *	0.50	0.60	0.57
Quality	0.49	0.76	0.71
CoOL	0.65	0.82	0.78
Price	0.63	0.85	0.83
Complex No Flag			
Organic	0.19	0.28	0.25
Q-Assurance*	0.25	0.27	0.27
C-Produced**	0.53	0.55	0.54
Calories	0.67	0.70	0.68
CoOL	0.68	0.70	0.70
Quality	0.61	0.75	0.72
Price	0.74	0.86	0.84
Complex Flag			
Organic	0.34	0.37	0.36
Q-Assurance*	0.41	0.40	0.40
C-Produced**	0.46	0.55	0.53
CoOL	0.72	0.66	0.68
Calories	0.72	0.69	0.70
Quality	0.76	0.76	0.76
Price	0.81	0.87	0.86

Notes:
S-Non Attenders = Average Stated Non Attendance for an attribute
S-Attenders = Average Stated Attendance for an attribute
*Quality Assurance; **Country of Production

As we can see in Table 16 there is a perhaps a slight tendency for stated non-attenders to visually non-attend, but in most cases this is small and in a number of cases entirely the opposite. This tends to support the contention that those stating

that they ignored price had not in fact ignored price. Therefore, when considering the online results which had some relatively highly reported non-attendance of attributes (including price) the eye-tracking suggests that participants were in fact often attending these attributes. This in turn gives increased credence to the online results.

The fact that CoOL was also highly attended in around 70% of cards (on average) is an interesting finding given the study's focus on this attribute. Along with product quality, CoOL tended to be the next most highly attended attribute to Price. In the simple design there was slight evidence of an increased visual attendance resulting from the introduction of a flag. However, this finding was not replicated in the more complex design. Thus, we tentatively conclude that flags have surprisingly little influence in both attention and attendance. This result was perhaps reflected in the WTP estimates from the online experiment which showed a lack of differential WTPs between the flag and no-flag versions. This suggests that the findings of this experiment are not simply artefacts of a particular visual design. It is also worth noting that attendance of the CoOL attribute did not drop as a result of increased complexity. Visual attendance of Organic and Quality Assurance did on the other hand tend to fall with greater complexity. We would conclude therefore that when consumers are faced with high levels of information, they may continue to register CoOL labelling.

Evaluation of Choices and WTP from the Eye-Tracking Choice Experiment

We begin by summarising our WTP estimates that are reported in Table 17:

- The ET sample group had a similar hierarchy and range of WTPs for the attributes within the study compared with the online sample, but with a few substantive differences.
- Quality was a clear dominant attribute in terms of WTP for the ET sample, particularly the avoidance of the "Basic" attribute, but with slightly less differential between "Choice" and "Premium".
- Increased complexity, with an additional Country of Production attribute did not clearly change the WTP for the CoOL label, though there was a difference between the flag and no-flag case in the complex setting suggesting that flags may possibly act as a salient object in a complex setting.
- The ET sample had a positive WTP for the UK CoOL attribute relative to an Italian CoOL. In contrast we see that relative to an Italian CoOL we have a negative WTP for US CoOL. This implies the UK CoOL is most preferred and that Italian CoOL is preferred to EU CoOL generic and US CoOL.

- Most respondents had some propensity to reverse their preferences when given the same choices twice within the no-flag complex experiment. However, most respondents were consistent in over 9 out of the 12 choices.

Table 17: Summary of WTP Estimates (Median, Lower and Upper Quartiles) for the On-line, ET Simple and ET Complex Pizza CEs

On Line	1 Flag and no Flag			2 No Flag			3 Flag		
Attributes	Median	Lower 25%	Upper 25%	Median	Lower 25%	Upper 25%	Median	Lower 25%	Upper 25%
Choice relative to basic	0.51	0.25	0.77	0.37	0.10	0.64	0.55	0.23	0.86
Premium relative to basic	1.59	0.44	2.74	1.01	0.16	1.88	1.37	0.46	2.27
Organic	1.48	0.48	2.47	1.28	0.35	2.23	1.32	0.32	2.33
CoOL UK relative to Italy	0.91	0.65	1.17	1.12	0.73	1.50	0.94	0.38	1.50
CoOL EU relative to Italy	-0.95	-1.85	-0.06	-0.74	-1.66	0.18	-0.54	-0.89	-0.19
CoOL US relative to Italy	-0.50	-0.85	-0.15	-0.39	-0.83	0.05	-0.59	-1.00	-0.19
Freedom Food label v None	1.35	0.88	1.84	1.46	1.07	1.85	0.68	0.39	0.97
International Quality v None	1.31	0.31	2.29	0.99	0.31	1.68	1.01	0.09	1.92

Eye Tracked – Simple	4 Flag and no Flag			5 No Flag			6 Flag		
Attributes	Median	Lower 25%	Upper 25%	Median	Lower 25%	Upper 25%	Median	Lower 25%	Upper 25%
Choice relative to basic	0.56	0.36	0.77	0.54	0.33	0.75	0.58	0.40	0.76
Premium relative to basic	1.17	0.64	1.70	1.14	0.42	1.85	1.65	1.38	1.92
Organic	1.05	0.14	1.96	0.97	-0.12	2.06	1.23	1.00	1.47
CoOL UK relative to Italy	0.47	0.20	0.75	0.53	0.26	0.81	0.51	0.31	0.70
CoOL EU relative to Italy	-0.12	-0.33	0.08	-0.06	-0.27	0.15	-0.35	-0.54	-0.15
CoOL US relative to Italy	-0.71	-1.02	-0.40	-0.71	-1.25	-0.17	-0.93	-1.12	-0.74
Freedom Food label v None	1.08	0.68	1.48	1.08	0.72	1.43	0.91	0.72	1.09
International Quality v None	0.90	0.40	1.39	0.91	0.24	1.57	1.11	0.90	1.32

Eye Tracked – Complex	7 Flag and no Flag			8 No Flag Repeated 12 sets			9 Flag		
Attributes	Median	Lower 25%	Upper 25%	Median	Lower 25%	Upper 25%	Median	Lower 25%	Upper 25%
Choice relative to basic	0.57	0.40	0.75	0.50	0.28	0.72	0.54	0.36	0.72
Premium relative to basic	0.83	0.50	1.16	0.95	0.61	1.29	0.72	0.40	1.05
Organic	0.46	0.22	0.69	0.44	0.19	0.68	0.44	0.16	0.73
CoOL UK relative to Italy	0.45	0.23	0.66	0.06	-0.13	0.25	0.44	0.21	0.66
CoOL EU relative to Italy	-0.04	-0.22	0.13	-0.34	-0.54	-0.15	-0.04	-0.25	0.17
CoOL US relative to Italy	-0.21	-0.42	0.00	-0.17	-0.40	0.05	-0.18	-0.41	0.05
Freedom Food label v None	0.44	0.26	0.62	0.63	0.44	0.81	0.45	0.24	0.66
International Quality v None	0.42	0.24	0.59	0.44	0.26	0.62	0.39	0.20	0.57
COP UK relative to EU	0.19	0.01	0.36	0.01	-0.16	0.18	0.19	-0.01	0.38
Calories	-0.36	-0.56	-0.17	-0.37	-0.67	-0.07	-0.34	-0.58	-0.11

Table 17 contains the values for the online experiments (Treatments 1, and 3) as well as the ET results (Treatments 4 to 9) with the Treatments 4, 5 and 6 presenting results for the simpler experiments, and Treatments 7, 8 and 9 for the more complex experiments. We remind readers that since the demographics for the eye-tracking group are somewhat different (and less representative) than the online sample we should expect some differences in the results.

In terms of the simpler designs the WTPs are in fairly high accord between the online and ET samples. There is a high WTP for Product Quality of between £1 and £1.50. The ET sample WTP for the UK relative to the Italian CoOL is somewhat smaller than for the online sample (being only around 50p compared to over a pound for the online results). However, the ET group actually has a higher level of WTP to avoid the US option than was found in the online study. Thus, the ET group does not reflect a lower WTP for CoOL labelling per se, but a difference in the relative WTP for particular countries. Our ET sample has a more favourable view towards both Italian and EU labels relative to the online sample.

There is a further reduction in the WTP for the CoOL attributes in the complex versions relative to the simpler versions. However, this may reflect to some extent the dilution effect of having a Country of Production (COP) label as well as a CoOL. Overall, the complex results suggest that respondents would in addition to the CoOL,

be prepared to pay on average around 20p for the UK Country of Production (vs EU) for this product. Smaller WTPs for CoOL are produced in the no-flag complex version. On one hand this may reflect that in a more complex setting the flags start to act as important cue for respondents. However, due to the fact that respondents were only given 11 cards, coverage of the attribute space is very limited and the results will reflect this lack of variation. As can be seen by the comparison of Tables 17.7 and 17.9, when the flag and no flag results are estimated together, these give results that are very similar to the result given by the complex flag experiment alone.

Finally, the number of preference reversals (partial and full) for the 50 respondents completing the repeated 12 cards, are given in Table 18.

Table 18: Preference Reversals

Number of Reversals	Number of Respondents (Partial)	Number of Respondents (Full)
>6	0	0
6	1	0
5	4	3
4	5	1
3	8	10
2	15	11
1	8	12
0	9	13

Note: Partial: DK or definite preference changes; Full: Reversal of Definite Preferences only (e.g., from Option A to Option B or vice versa)

As the results in Table 18 show, the most reversals, when described as partial, by any respondent was 6 (out of a possible 12). In this case, more than 75% of respondents made more than 9 out of 12 consistent responses, with the modal reversal frequency being 2 out of 12. When we consider full reversals, that is a respondent's changes from a definite choice like option A to option B (but not the "don't know" option), then the number of reversals is even smaller.

Given these results are for the complex task, we would expect lower levels of reversals for the simpler case. Thus, these results give us some confidence that the majority of respondents are being highly consistent, as less than 20% of respondents were inconsistent.

Research Limitations and Future Directions for Research

As with any piece of research there are limitations that need to be recognised. However, there are also opportunities and potential developments for further research going forward resulting from the current report.

If we begin with the methods we have employed, there are many concerns expressed in the literature with regard to the meaning and robustness of hypothetical stated preference research results. We acknowledge that these limitations (e.g., hypothetical bias that can give rise to relatively high WTP estimates) can be an issue, but at the same time argue that our results are relatively robust and only require careful interpretation. First, much of the earlier research on CoOL has used methods that have been criticised as yielding biased results (see Umberger, 2010, pages 5 and 6 for details). This is an inevitable criticism of hypothetical research and we have made every effort to minimise the many issues that have been identified in the literature previously. Furthermore, we have followed the suggestions of Umberger (2010) and employed a discrete hypothetical CE that should in principle control and minimise many of the criticisms of hypothetical stated preference research methods. Second, many of the existing WTP estimates for CoOL in the literature are not supported with reference to tests (implicit or explicit) of either internal or external validity. As we have explained, the research we have undertaken was designed to allow us to assess both internal and external validity of our results. Thus, we are able to claim that our WTP estimates are both within the range of those previously published using the same methodology, that they are of a reasonably similar magnitude to those produced using revealed preference methods (albeit for different types of meat) and the analysis of respondent engagement with the CEs is such that this appears to be in keeping with previous studies using these methods. In other words, all that can be done to mitigate the limitations of the necessary methodology has been done.

Another potential limitation of the research presented here relates to the design of the CEs. As we acknowledge, the development of the hypothetical CEs was undertaken within a short period of time. This development was also complicated by the need to develop several CEs simultaneously. As such there is the potential to re-examine the design of the CEs in future research to check that they are robust. However, we do note that both the feedback we had during the design phase as well as the results of the pilot study indicated that the CE design is credible. Furthermore, we employed well established methods to generate our experimental designs.

With regard to the development and piloting of the CE survey instrument, we acknowledge that we did not employ a sampling strategy, but rather used a convenience sample of university students and staff members. The use of this sample was driven by the speed required to develop the survey instruments. Thus, we cannot claim that the sample used in the pilot study is fully representative, although it is representative for some characteristics such as gender. However, our main concern with the pilot study was to assess understanding of the survey instrument and to check that data generated yielded preliminary estimates that were consistent with our prior expectations and therefore a lack of representativeness is not a problem.

Another potential limitation of the research presented here is that we did attempt to assess issues such as the horsemeat incident in 2013 within the CEs. Although we realise that such an event can impact the use of CoOL, especially for beef, this is not the rationale behind the use of these labels and as such we decided that to conflate the two topics would potentially affect and/or bias the results we present. However, if there is a need to examine CoOL and meat authenticity together, then CEs provide an appropriate methodology with which to do this. Furthermore, our revealed preference results do suggest that CoOL on beef sold in the UK has been used in this way. Thus, an examination of this issue in more detail is potentially a topic that could be researched in the future. Another potentially important way in which to extend this research in the future would be to expand the coverage of products as well as the time frame of the analysis.

In terms of the specific methods we have employed, the ET research can be considered a rather unusual survey environment. Although the context in which data is collected is somewhat unusual (i.e., head kept still on a chin rest) experience with the research methods employed indicates that the quality of the data collected is not impacted. Of maybe more importance for this product is the fact we only considered one product within this part of the study. With additional time and funding the examination of more products would have been preferred. However, the purpose of undertaking the ET CE as a means to assess the interval validity of the CE methodology has been successful. We are confident that overall engagement with the CE survey instrument has been at an appropriate level. Thus, although considering more products would have allowed us to consider WTP estimates specifically, the objective of assessing respondent behaviour has been achieved. We would also note that considering further developments in label complexity as well as specific aspects of design could be considered in future research.

The research presented here also revealed issues with regard to identifying country of origin information for meat from several countries. We only dealt with multiple

origins indirectly via the complex ET CE by including an additional attribute describing the country of production of the food product. There is good reason to assume that for certain types of meat products, CoOL could require the listing of several countries. However, this issue proved problematic to resolve because of a lack of trade data that describes in detail the specific supply chain and associated movement of meat between various countries. This data limitation remains an issue and is an area which requires further consideration.

Other issues that might be considered limitations of this research and potentially important areas for future research are the selection of products. There is every reason to believe that as trends in meat consumption change, the required mix of products to examine in this type of research will need to change. Furthermore, the research presented here, like all previously published in the literature, only considers the purchase of a single good in isolation. This is clearly an unrealistic representation of the typical shopping experience and it does raise questions about the use of CoOL in more complex and time pressured contexts.

Finally, we are of the opinion that the methods presented in this report provide a template for future research in this or related areas, especially if stated preference methods are to be employed. In particular, the strength of the research presented here is how the various pieces of research complement each other and allow more robust conclusions to be drawn. However, it would be sensible if future research could examine the same products using both methods simultaneously.

Conclusions

In this report we have presented our findings on the economics of CoOL as they apply to the meat sold to consumers in the UK. The research has considered a broad range of meat products (i.e., unprocessed swine, sheep, goat and poultry) in fresh, chilled, frozen format, plus meat used as an ingredient (including beef). The research was composed of three specific, but related pieces of work designed to reveal consumers preferences regarding CoOL in a statistically robust manner.

Our research yielded five key findings. First, there was virtually no existing research on CoOL for meat in the UK. Based on our 12 CEs we have established that UK consumers positively value CoOL and that this value appears to have increased as a result of the horsemeat incident in 2013. This finding indicates that CoOL has a meaning, for many consumers, beyond that of simply indicating origin.

Second, the importance of CoOL was found to be greatest for the fresh/chilled/frozen group of products (excluding chicken) and for gammon steak.

Third, CoOL was relatively less important as a product attribute for processed products where the quality signal provided by the Product Quality attribute and the Organic Production attribute are of greater importance. This relative effect is important as it might be considered as evidence to continue with a voluntary CoOL approach as opposed to adopting mandatory CoOL for these products.

Fourth, we found that survey respondents preferred a CoOL format that included a flag, even though this is not required by the legislation. Also we found that a food label with a flag yielded differences in value attached to CoOL as the food label became more complex. This is important in as much as food labels are becoming more complex with more information and a flag indicating CoOL may aid consumer search.

Finally, there is, for some of the products examined, an asymmetric response to the CoOL whereby a positive value associated with UK CoOL is accompanied by a larger negative value for non-EU CoOL. What this means is that consumers value more highly knowing that a product is not from the UK.

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List of Appendices to Accompany the Main Report

Appendix A - Literature Review

Appendix B – Screen Shot Copy of Online Survey Instrument

Appendix C – Full Set of WTP Results

Appendix D – Copy of ET CE Survey Instrument