An Economic Analysis of Consumer Attitudes Towards Food Produced Using Prohibited Production Methods: Do Consumers Really Care?

Kelvin Balcombe, Dylan Bradley and Iain Fraser[1]

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Abstract

Taking account of consumer preferences for food produced using prohibited production methods matters if welfare of analysis of potential trade deals is to be considered meaningful. To enable this to occur it is necessary to appropriately examine consumer preferences. To this effect, we report the findings from four discrete choice experiments examining UK consumer attitudes for food produced using several agricultural production methods currently prohibited in the UK e.g., chlorine washed chicken. Our results reveal negative preferences for these forms of agricultural production methods whereas EU food safety standards are highly valued. Willingness to pay estimates indicate that the positive values for food safety are frequently greater than the negative values placed on prohibited food production methods. Similarly, UK country of origin was highly valued but organic production was less valued. The implications of these results and the use of stated preference estimates in economic modelling underpinning trade negotiations are discussed.

Key Words: Consumer Preferences, Trade Negotiations, Discrete Choice Experiment, Chlorinated Chicken, Hormone Implants, Hormones in Feed

1. Introduction

Now that the United Kingdom (UK) has officially left the European Union (EU), there is much discussion surrounding the form and content of future trade agreements with the EU and the rest of the world (Sampson, 2017). There is the possibility, as a result of new trade deals coming into force, that the UK trading arrangements, associated rules and regulations regarding food could depart significantly from those that have prevailed whilst being a member of the EU (Sheldon, 2019). For example, there has been much speculation surrounding what form a trade agreement with the United States (US) might take (Office of the United States Trade Representative, 2019; Millstone et al, 2019 a,b). One aspect of such a trade deal that has received a great deal of attention relates to how trade in agricultural produce and food might change. Historically, the extent of agricultural trade between the US and the UK has been small, only $1.7 billion in 2015 which is equivalent to 1.3 percent of total US agricultural

[1] Kelvin Balcombe is at the University of Reading, UK. Dylan Bradley is with Agra-CEAS Consulting, Wye, UK. Iain Fraser (contact author: i.m.fraser@kent.ac.uk) is in the School of Economics, University of Kent, Canterbury, UK. This independent research was funded by the Food Standards Agency (Project: FS303019). All views expressed in this paper are those of the authors and not necessarily those of the FSA. We thank the reviewers for detailed and thoughtful comments on an earlier version of this manuscript.

exports.[2] There have also been gradual changes to the trading arrangements over time. For example, the EU and US, have had a tariff rate quota (TRQ) in place for non-hormone treated beef for several years. The TRQ means that the US can export up to 45,000 metric tonnes although only 17,500 was exported during 2013-15 via the USDA Non-Hormone Treated Cattle (NHTC) program which partly reflects the increased costs associated with program compliance (Beckman and Arita, 2017). However, more recently the US has expressed a strong preference for allowing trade to occur in food produced using agricultural production methods common in the US but not currently permitted by the EU or UK e.g., chlorine washed chicken and beef grown using hormone implants.[3] The continued use of these production methods in US agriculture can in large part be explained by the increases in productivity obtained by producers (Maples et al., 2019).

Clearly, with any change to existing trade arrangement it is necessary to understand the economic consequences, and in this case, the likely reaction of consumers. To date, there has been a lot of public opinion research published about UK consumer attitudes towards agricultural production methods, such a chlorine washed chicken. For example, Which? (2018) reports that 93 percent of respondents wish to maintain existing food standards after Brexit, 80 percent opposed the introduction of hormone-treated beef and 72 percent opposed chlorine washed chicken. Similarly, Savanta ComRes (2020) in a survey conducted for the RSPCA reports that 82 percent of respondents do not support a trade deal with the US that would allow chlorine washed chicken to be imported into the UK. The significance of these findings can be understood by the fact that many UK supermarkets have vowed not to sell chlorine washed chicken (Business Insider, 2020). In contrast, there is currently no economic analysis of UK consumer preferences regarding currently prohibited food products and without appropriate economic estimates of relative value it is difficult to know if the resulting welfare changes that might emerge from a trade deal that involves products of this type can be considered economically beneficial for UK consumers.

Within the literature that evaluates the potential economic consequences of relaxing trade restrictions such as non-tariff measures (NTMs), allowed by the World Trade Organisation (WTO) (i.e., Sanitary and Phytosanitary (SPS) arrangements or the Agreement on Technical Barriers to Trade (TBT)) the economic models used need to capture consumer preferences in order to predict responses accurately. For example, Arita et al. (2017) conducted an analysis of removing the many barriers to

[2] Poppy et al. (2019) note that the international meat trade was worth £74.25 billion in 2015 with the UK accounting for over 5 percent of this trade, making it the fifth largest market.

[3] In the Office of the United States Trade Representative (2019) the following negotiating objective is explicitly stated: *"Establish a mechanism to remove expeditiously unwarranted barriers that block the export of U.S. food and agricultural products in order to obtain more open, equitable, and reciprocal market access."*

trade in food between the US and EU (tariffs and NTMs) using a computable general equilibrium (CGE) model. The results of this study indicate that gains from trade from removing all barriers would be $11.6 billion, but when they adjust for consumer preferences, the gains fall to $7 billion. Now of course, in CGE models the level of detail employed to describe consumer preferences and the resulting response can be highly aggregated such that the results potentially simplify how EU consumers will react. But, how best to capture consumer preferences is also complicated even when employing a more disaggregated model. For example, Soon and Thomson (2019) employ a partial equilibrium model of the international beef market that allows for differentiation between hormone- and non-hormone-treated beef so as to study the US, Canada and EU dispute with respect to beef. This analysis assumes that EU consumers will buy hormone-treated beef if the price is sufficiently discounted i.e., 15 percent. Clearly, the results of any such modelling study are a function of the assumption they make regarding consumer preferences.[4]

In this paper, we examine UK consumer preferences for four food products produced using various production technologies currently not authorised in the UK that might become available as a result of relaxing existing trade restrictions: hormone implants in beef; Ractopamine (a feed additive which promotes leanness and improves feed conversion efficiency) in pig feed; chlorine washed chicken; and Atrazine pesticide in corn production. Clearly, an analysis of revealed preferences employing actual purchase data would be our preferred method of analysis (e.g., Hussein and Fraser, 2018). However, as there are no consumer purchase data for these products in the UK, we have developed and employed a stated preference discrete choice experiment (DCE), to generate estimates of consumer's willingness-to-pay (WTP) for specific food types with a given set of product attributes.

Given the need to employ a stated preference DCE to examine consumer preferences this means that although this research is framed in relation to trade post-Brexit our research also contributes to several other literatures that stem from the use of a DCE as well as the set of product attributes we employ.

[4] There is a related stand of the trade literature that has examined aspects of NTMs in agriculture, specifically chlorine washed chicken and hormone beef. This literature considers the politically economy of the development of trade barriers and how protectionism can arise as a result of scientific uncertainty such that public preferences can be manipulated such that what constitutes an objective fact is in many cases difficult for the general public to find or understand (Calzolari and Immordino, 2005;Bullock et al., 2019). Many US consumers assume that hormones are used in the production of other types of meat, e.g. chicken and pork. This misconception on the part of consumers is partly down to the use of a food label that allows produce to be sold as "no added hormones" (NAH). This misconception is unsurprising as the debate surrounding the use of hormones in agricultural production has become polarised in the US (see Norwood et al., 2015).

First, our research adds to the literature examining consumer attitudes and preferences for food produced using new, novel or previously prohibited production methods. The scope of this literature ranges from studies examining genetically modified organisms (GMOs) (e.g. Grebitus et al., 2018), the use of RNA interference (RNAi), a gene editing technology (Britton and Tonsor, 2019; Muringai et al., 2020), transgenic rye used to produce bread (Edenbrandt et al., 2018), and the use of nanotechnology in food safety (Erdem, 2015, 2018). It has frequently been found that consumers have concerns regarding new or novel technologies (e.g., Frewer, 2017; Kamrath et al., 2019). These concerns can act as a constraint on acceptance by consumers as well as the potential commercialisation of technology.

Second, our research contributes to the wider discussion surrounding country of origin (CoO) food labelling. The UK introduced mandatory CoO food labels for unprocessed pig, poultry, sheep/goat meat in 2015 via Commission Implementing Regulation (EU) No 1337/2013 (it was already in place for beef). In contrast, voluntary CoO labelling is in place for semi-processed meat and when meat is used as an ingredient in processed food.[5] Mandatory labels generally correct market inefficiencies such as asymmetric information such as ensuring that consumers are informed about the origin of food. In contrast, voluntary labels are used to signal differences in product quality and to highlight specific credence attributes. The distinction between mandatory and voluntary labels is important as it has notable cost implications for business – mandatory labelling is more costly (Roe et al., 2014). At the same time the economic evidence on consumer use and value attached to CoO suggests that although CoO is wanted by consumers, it is not as highly valued as other food attributes e.g., price, taste, appearance and duration (Balcombe et al, 2016).[6] However, despite this evidence, there have been calls to extend mandatory CoO labelling post-Brexit. For example, a 2018 UK parliamentary Food and Rural Affairs Committee (House of Commons, 2018) explicitly acknowledged the need to extend mandatory CoO labelling to include more food products such as bacon, sausages and cheese. This position could be viewed as emerging out of a political need to support the UK farming food industry. Also other survey results such as those reported by Benton et al. (2017) indicate that 67 percent of survey respondents prefer to buy UK food with 27 percent claiming they would buy more British produce even if imported food prices declined. Given the mixed evidence regarding consumer values attached to CoO, the analysis we present provides additional evidence, especially when CoO

[5] Commission Implementing Regulation (EU) 2018/775 requires the provenance of the primary ingredient to be indicated where this differs from the advertised provenance of the final product with effect from 1 April 2020.
[6] Using an economic experiment to test information preferences, Beiermann et al. (2017) report that a high proportion of respondents (i.e., 80 percent) use CoO information when free and that demand increases when combined with food safety benefits associated with local production.

information is combined with other credence attribute information relating to forms of agricultural production.

The structure of this paper is as follows. In Section 2, we briefly review the relevant DCE literature, this is followed in Section 3 by a description of the production methods we examine. Next in Section 4, we detail how we designed and implemented our DCE. In Section 5, we introduce our econometric specification and in Section 6 we report our results. Then in Section 7, we consider the implications of our findings regarding consumer preferences and new processing technologies and the implications for trade negotiations. Finally, in Section 8, we conclude.

2. Literature Review

As noted in the Introduction, we employ a DCE to examine consumer preferences for food that has been produced using production methods not currently permitted in the UK. The provision of information about such production methods is an example of a credence attribute, and how it is conveyed matters (Messer et al., 2017; Lusk and McCluskey, 2018). Furthermore, the combination of attributes used is important as there is evidence of attributes being included or excluded from choice sets impacting the way in which attributes are valued. As such our study contributes to several existing areas of research, in particular, the specific production methods examined as well as CoO.

In terms of the prohibited production methods, by far the largest number of studies focus on the use of growth hormones in beef. For example, Tonser et al. (2005) reports that UK consumers are prepared to pay reasonably high prices to avoid hormone-grown beef. More recently, Lewis et al. (2017) conducted a DCE to estimate the value of a hormone-free label for beef (as opposed to no label) with results indicating respondents' valued hormone-free beef very highly.[7] Also respondents who valued the hormone-free label considered food safety as important, a finding previously reported by Miller et al. (2016) who note that the literature indicates that food safety frequently yields very high estimates of WTP and these estimates are higher than those for animal welfare or environmental concerns.

For chlorine washed chicken it is the act of washing that is typically examined within the context of food safety. In particular, the literature considers consumer preferences for the use of chlorine

[7] No hormone produced beef enters the UK because of existing trade restrictions. This means that a hormone-free label only has meaning if the DCE informed respondents that the products on offer could be produced using growth hormones.

washed chicken as a means to reduce *Campylobacter* (a food borne bacterium that can cause various forms of illness) which is a concern for the UK government (MacRitchie et al., 2014). One study by Kawata and Watanabe (2018) examined Japanese consumers' WTP to reduce food related illness using a large set of approaches including a chlorine wash. As such this study did not elicit consumer preferences regarding chlorine washed chicken. Turning to pork, Ortega et al. (2020) examined how consumer preferences for a GM 500 gram pork loin are affected by information provision regarding genetic modification (GM). Interestingly preferences for GM change depending on the specific benefit of the GM technology. Thus, if the benefit of using GM technology is to improve food safety then this gives rise to greater acceptance on the part of respondents, although WTP for GM pork remained negative. Finally, there is a literature examining pesticide use in food production and consumer attitudes (e.g., Chalak et al, 2008; Peschel et al., 2019). Although, there is no literature specifically examining Atrazine, the pesticide we consider, the literature indicates that consumers generally prefer the use of less pesticide and if feasible, agricultural production that is pesticide free, such as organic. A recent example of this type of finding is provided by Peschel et al. (2019) who examine a pesticide-free food label for dates.

Turning to the CoO literature, we know that the relative importance of CoO information differs by product type. For example, Balcombe et al. (2016) observe that CoO is highly valued for fresh meat produce but is less so for processed meat in the UK. Asante-Addo and Weible (2020) conclude that Ghanian consumers' value domestic chicken more than imported chicken with a specific preference for antibiotic hormone-free produce. Aboah and Lees (2020) in a review of the literature, note that CoO matters more for beef and lamb than for chicken for which organic is considered the most important attribute. They put this finding down to how existing CoO legislation can require information about geographic origin with regard to animal raising stages of production whereas activities such as chlorine washing of chicken do not. It is also the case that higher values are attached to CoO for food that originates from a respondent's own country i.e., a home-country bias. However, this bias can be reduced by the existence of other information. For example, Slade et al. (2019) report that Canadian consumers positively value imports of dairy products if accompanied by geographical indications (GIs). In contrast Norris and Cranfield (2019) note that Canadian consumers require a significant price discount to buy imported dairy products as a result of a new trade deal with the EU.[8] Clearly, CoO appears to be valued by consumers but the interaction between CoO and other product attributes does impact consumer values.

[8] Canada has moved away from protecting its domestic dairy industry with the introduction of trade agreements such as the Comprehensive Economic and Trade Agreement (CETA) with the EU.

3. The Production Practices

Our DCE examined four food products that are currently unavailable to UK consumers due to the production practices employed: chlorine washed chicken; beef produced with the use of growth hormones such as hormone implants; pork feed hormone additives (e.g. Ractopamine) during production; and atrazine pesticide in corn production. Before we provide detailed information regarding the design and implementation of the DCE, we briefly describe the production practices and treatments examined.

Chlorine is used in certain countries (e.g. US) to rinse whole chickens to kill microorganisms on the surface of the bird, specifically bacteria such as species of Salmonella and Campylobacter. This practice is sometimes referred to as pathogen reduction treatment and chicken treated this way have been excluded from the EU market since 1997. Importantly, the European Food Safety Authority (EFSA) does not view the use of chlorine in this context as unsafe. The EU operates a "farm-to-fork" approach to reduce meat-borne bacteria at all points along the meat supply chain. This is perceived to meet food safety requirements while also delivering higher animal welfare. The economic rationale for undertaking a chlorine wash is that it can reduce the overall costs of production because fewer efforts are made to control bacteria in the supply chain while still ensuring food safety for the consumer.

Turning to beef produced with the use of hormone implants, hormones are naturally occurring and as a result are found in both plants and animals. The use of additional hormones in animal production is reasonably common in countries such as the US and Australia. In beef production the hormone is typically released into the animal over time by means of an implant. The economic case for using hormones is that they allow the animal to grow bigger more rapidly whilst consuming less feed which reduces the costs of production. Also, because of the resulting changes in the diet of the animals they will have a leaner carcass that in turn satisfies consumer preferences for less fatty meat and reduces the amount of cholesterol consumed.

Although the dosage levels of hormones are relatively low, the European Commission banned the use of hormones in animal production on potential safety grounds. This precautionary approach is still in operation as there remains uncertainty and insufficient evidence about the types of hormones being used and what doses can be considered safe. To address potential consumer concern in the US, a negative labelling regime is in place, i.e. beef produced without the use of hormones can be labelled

"No hormones (beef)". There are specific sets of farming practice that need to be followed for this statement to be allowed.[9]

Pork producers in the US are allowed to use Ractopamine as a feed additive to increase the rate of animal growth. Ractopamine (a beta agonist growth promotant) increases protein synthesis, thereby making the animal more muscular, reducing the fat content of the meat and therefore increasing the return per animal. Unlike hormone implants, Ractopamine does not affect the hormone status of the animal. The use of Ractopamine is currently not authorised in the EU because the EFSA argued that there was insufficient evidence to declare this product safe. More importantly, it is argued that this type of food additive has a detrimental impact on animal welfare through the way in which it changes animal growth rates and allows production systems to be organised. The EU's position on Ractopamine has recently been followed by Thailand which has banned pork imports grown using this additive.

Finally, turning to pesticides, the EU does not permit the use of Atrazine. However, it is a frequently used herbicide in the US on crops such as maize and sweetcorn where its use is recommended in combination with other chemicals. In the US herbicides are applied to 97 percent of corn planted land with Atrazine accounting for 60% of herbicide active ingredients (USDA, 2017). The EU's main concern with Atrazine is the off-site environmental impact and specifically the contamination of groundwater. As with all chemicals, small (and safe) residue levels are tolerated in food e.g. 0.05 mg/kg.

4. DCE Design

Given the set of production and processing methods we are interested in, we identify four food products with which to examine consumer attitudes. This choice was informed during several one-to-one focus group sessions we ran to consider product type of choice of DCE attributes as well an examination of product sales data in the UK. The specific products we employed are:

1. 500 grams chicken breast
2. 250 grams beef sirloin steak
3. 1 kg pork loin joint

[9] More details are provided by the USDA: https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/food-labeling/meat-and-poultry-labeling-terms/meat-and-poultry-labeling-terms/!ut/p/a1/jZDNCsIwEISfxQcI2doqepSCtFVbRNSYi6ya1kCblCYq-vRaREHxp7unZb5hh6GcMsoVHmWGVmqFeX3z7hqm0HX6PkRJ3xlCGC-mycj3oTfr3IDVDyB2G_q_zAD--aMGD9rVxJ9klJdo90SqVFOWCUtQmZOoDGWp1jtiMBX2TFLcWmL2QtiHkONG5FJllBUCa9eOlPqQ2-r8lIgVVWH-A0vKX-OCc9swdmdeEMUuJN478KHPO_C9sLKYs8t4EIAMW1dofMrM/#top

4. 2 pack of corn on the cob

Next, we considered the set of attributes to include within the DCE. Based on one-to-one feedback during the initial stages of the design of the DCE, we arrived at the following set of attributes that are summarised in Table 1.

{Approximate Position of Table 1}

The specific text used to describe the attributes used in our study is provided in a copy of the survey instrument available in Appendix C. However, as the text used to describe the method of production differed by product, and as we only provide one survey version in Appendix C, the text used to describe the four methods of production is provided in Figure 1.

{Approximate Position of Figure 1}

With the identified set of attributes, we then considered the levels for each attribute for each product, and these are summarised in Table 1. In terms of the attribute levels employed, we note that when describing CoO, we have explicitly labelled the UK and the EU but we have not for meat from outside the EU. We took this approach as the study is specifically examining the methods of production and we did not want to conflate this with specific countries. The impact of employing specific country names on meat demand in the UK using a DCE has previously been undertaken by Balcombe et al. (2016).

Given the products and the final set of attributes employed, we needed to include a constraint within the design because several combinations of attributes were deemed to be infeasible. Specifically, we did not allow organic production to occur simultaneously with the use of hormone implants in beef, the use Ractopamine with pig production or Atrazine use for corn on the cob. We also modified the set of quality assurance levels between the products to again ensure that respondents did not treat some combinations as unrealistic. Thus, for chicken, we included three quality standards as well as a "no standard" option. It was necessary to modify the quality assurance standards for the three other products because the production methods being considered are inconsistent with the RSPCA and QAI quality standards. Therefore, we simplified the quality assurance standards attribute to be either no quality assurance standard or Red Tractor. The use of the Red Tractor is feasible as the assurance standard is not limited to agricultural production only undertaken in the UK.

Given the number of attributes and attribute levels, a balanced design required that we generated multiples of 12. It was decided to generate 48 cards each with 3 options employing 4 blocks yielding 12 cards per respondent. We employed an efficient design assuming an MNL utility specification

assessed using D-error (Scarpa and Rose, 2008). We assumed uninformative priors such that our design can be considered conservative. To implement our experimental design, we employed Ngene version 1.1.2 (Choice Metrics 2012). The constrained design of 48 cards of 4 blocks of 12 yielded an MNL D Error equal to 0.081295.

A series of choice cards were designed based on the design described. An example of the final online choice card is presented in Figure 2.

{Approximate Position of Figure 2}

In Figure 2, it can be seen that we first asked respondents to make a selection from one of the options available. We then subsequently allowed them to indicate if they would reject this option and as such select no choice. This approach to the collection of DCE data is referred to in the literature as the dual-response method (Brazell et al., 2006). The benefit of designing the choice cards in this way is that a full set of conditional choice data was obtained. In the econometric analysis presented, we do employ the no choice responses.

Having designed our choice cards for each of the food products, we undertook a small pilot study of the survey instrument. The pilot was implemented online yielding a total of 35 for the Chicken DCE. The pilot data revealed that the survey instrument and associated DCE had worked appropriately. Model results in terms of attributes and associated values all appeared plausible. In addition, the level of respondent engagement was as good based on feedback.[10]

5. Model Estimation

To analyse our DCE data, we employed a Bayesian (random parameter) mixed logit (MXL) specification to estimate the preference parameters of respondents. Bayesian methods are now well established in the stated preference literature. There are several reasons why we use a Bayesian specification to undertake model estimation. Most importantly, within the literature Bayesian methods are recognised at being better able to deal with difficulties of empirical identification associated with Classical approaches to simulation (Balcombe et al. 2016).

Within Bayesian circles the MXL model is also referred to as the Hierarchical Bayesian Logit (Balcombe et al. 2016). This model allows for heterogeneity across respondents so that each respondent has

[10] A full version of the chicken DCE is provided in Appendix C as an example of the final survey instrument. Note the version provided is slightly different to that employed online in terms of page by page progression.

their own preferences. Accordingly, the WTP attributes can be elicited at the individual level. The MXL model also allows for heterogeneity of responses meaning that differences in respondent characteristics which may be expected to lead to differences in WTP are "allowed for" in the model specification and captured in the estimates produced.

Our model specification can be formally defined as follows. Let x_{ijs} denote a *k×1* vector of attributes from the DCE presented to individual *j* (*j = 1,…, J*) in the *i*th option (i=1,…I) of the *s*th choice set (*s = 1,…,S*). Next, let U_{ijs} be the utility that the individual *j* attains from x_{ijs}. Given these definitions, it then follows that individual *j* receives utility from the *i*th choice in the *s*th choice set. Consequently, the utility function is of the form:

$$U_{ijs} = x'_{ijs}t(\beta_j) + e_{ijs} \quad (1)$$

where β_j is a *(k ×1)* is an independently and identically normally distributed vector describing the preferences of individual *j* with mean α and variance covariance matrix Ω. *t(.)* is some transformation of the parameters that can take a number of forms. For example, we might employ the log-normal for the price coefficient and the normal distribution for all other parameters. Finally, the error term e_{ijs} in equation (1) is assumed to be extreme value (Gumbel) distributed, independent of $x`_{ijs}$ and uncorrelated across individuals or choices, which leads to a logistic likelihood of an individual choosing a given option in any given task.

We estimate our models in WTP space such that our model parameters are directly interpretable as WTPs. To estimate the MXL in WTP space, we employed a parameterisation of the form:

$$t(\beta_j) = exp(\beta_{1j})(1, \beta_{2j}, \ldots, \beta_{kj})' \quad (2)$$

where the quantities $\beta_{2j}, \ldots, \beta_{kj}$ are the marginal rates of substitution (MRS) with the numeraire being the first attribute, which will always be the price or cost attribute within the given DCE. These therefore represent estimates of the WTP for each of the specified attributes By estimating in WTP space the MRS are estimated directly and it has previously been found that this approach can significantly reduce the instability associated with WTP estimates recovered from preference space (Balcombe et al., 2010).

With our MXL we modelled all attributes as random parameters employing the normal distribution. The only exception was for price which was modelled as a log-normal distribution. Given the set of attributes employed our econometric specification is as follows for the Chlorinated Chicken data

$$U_{ijs} = \exp(\beta_{1,j}\,[-Price_{ijs} + \beta_{2,j}Chlorwash_{ijs} + \beta_{3,j}EU\ FS_{ijs} + \beta_{4,j}Organic_{ijs} + \beta_{5,j}CoO\ EU_{ijs} + \beta_{6,j}CoO\ UK_{ijs} + \beta_{7,j}QS\ RedTrac_{ijs} + \beta_{8,j}QS\ RSPCA_{ijs} + \beta_{9,j}QS\ QAI_{ijs} + \beta_{2,j}OptOut_{ijs}] + e_{ijs} \quad (3)$$

where the $OptOut_{ijs}$ captures the no choice option.

Turning to the other model parameters, Chlorwash is a dummy for whether the chicken has been chlorine washed; EU FS is a dummy indicating that the food meets EU food safety standards; CoO UK and CoO EU are dummy variables relative to the excluded level non-EU; Organic is the type of farm production system with the reference level being Conventional; QS RedTrac, QS QAI and QS RSPCA are dummies for the quality standard relatively to the excluded level of no quality assurance (for the other products it will only be QS Red). For the Cases of Corn, Pork and Beef. Chlorwash was replaced with Atrazine (for Corn), Hormone in Feed (for Pork), and Hormone Implants (for Beef). For these goods the quality assurance only contained the Red Tractor vs none option (i.e. no RSPCA, or QAI attribute). Thus, for these three goods we had

$$U_{ijs} = exp(\beta_{1,j})[-Price_{ijs} + \beta_{2,j}ProdMethod_{ijs} + \beta_{3,j}EU\ FS_{ijs} + \beta_{4,j}Organic_{ijs} + \beta_{5,j}CoO\ EU_{ijs} + \beta_{6,j}CoO\ UK_{ijs} + \beta_{7,j}QS\ RedTrac_{ijs} + \beta_{2,j}OptOut_{ijs}] + e_{ijs} \quad (4)$$

The priors used for all the models were standard normal for the prior mean of $\beta_{k,j}$ along with Gamma(1,1) distributions for the precision parameters. Additionally for the parameters $\beta_{k,j}$ k>1 represent willingness to pay truncated so we imposed the condition that its absolute size must be less than or equal to the total difference to maximum and minimum price for the experiment. i.e., no one attribute can be worth more than the total price variation in the experiment to and individual. For the means we imposed the condition that this must be less than 75% of this amount.

Estimation for this study was conducted using the Software STAN, (https://mc-stan.org/) which employs Hamiltonian Monte Carlo Markov Chain algorithms to simulate the posterior distribution for both the individual parameters and mean and variances of these parameters. For further details about these algorithms and software, readers are referred to the User Guide in the link above. For all the

models we ran, we employed a "Warm-up" of 5,000 iterations followed by 2,000 draws from 5 independent chains (10,000 draws in total). Convergence was monitored visually using trace-plots, and using the Rhat (Vehtari et al., 2019) diagnostic. All models converged well according to these criteria, and indicative trace plots are presented in Appendix B.

6. Survey Implementation and Results

6.1. Socio-Economic Data and Descriptive Statistics

In total, some 1,600 survey responses were collected between December 2018 and January 2019. Overall, our sample data shows that we recruited slightly more males (51 percent) than females (49 percent) for all four DCE. The age composition of each DCE was close to a uniform distribution with slightly more responses collected from those in the over 65 age group. Household size had a mode of two and almost 60 percent of respondents live in a household with children. In terms of household income, the sample mean was in the range £26,000 up to £31,199 which is consistent with the UK population. In terms of educational attainment, the mode for all DCE is an undergraduate degree. Next, we asked all respondents about their shopping habits and attitudes to food and Brexit. More than 60 percent of respondents are responsible for all or most of the food and grocery shopping. We also asked respondents if they thought EU exit will have a positive, neutral or negative effect on food (in general) over the next couple of years. The responses provided indicate that more respondents think that EU exit will have a negative effect on food (36 percent) than a positive effect (24 percent). Also, there are approximately 40 percent of respondents for all DCE who think the effect will be neutral or do not know. Finally, we asked respondents with regard to food if they thought that the quality of food can be judged by its price. Four out of five respondents agreed that the quality of food can be judged by price.

6.2. DCE Results

We now examine our DCE econometric results. In all of the results tables presented we place the attributes in descending order of WTP. First, we begin by examining the results for chlorine washed chicken that are presented in Table 2.

{Approximate Position of Table 2}

The first point to note about the estimates in Table 2 is that the estimates for chlorine washed chicken are negative. In terms of the magnitude of the WTP estimates in Table 2, the RSPCA quality assurance

attribute is very highly valued along with the Red Tractor label and the EU Food Safety attribute. A high value is also placed on UK production compared to that from the EU or Non-EU. Finally, although positively valued, organic production has the lowest WTP estimate.

Another interesting feature provided in Table 2 is the proportion of respondents reporting a positive value for the attributes (extreme right-hand column in both tables). The mean estimates can be misleading where they mask considerable variation. The actual posterior distributions for individuals confirms – as might be expected – substantial variations in responses. For example, while people on average do not like chlorine washed chicken, with some hating it, around 40 percent express a positive valuation of it (see in Table 2). Thus, as always, we need to be careful simply reporting mean estimates as they can masks heterogeneity of preferences. This result is in strong contrast for the other attributes where there is considerably less heterogeneity in response.

The other products and the respective WTP estimates are reported in Tables 3, 4, and 5.

{Approximate Position of Tables 3, 4 and 5}

The results in Tables 3, 4, and 5 are very much in keeping with those reported in Table 2. There are negative estimates for all of the production methods examined. The magnitude of these estimates is almost as strong as the positive estimates for the other attributes used. Interestingly, the proportion of respondents expressing a positive value for the method of production are all less than 20 percent and this is significantly lower than for chlorine washed chicken. As already noted, this result might occur because of the potentially high value some consumers place on food safety in terms of possible food poisoning. However, examining this motivation in more detail is beyond the scope of the current research. That said, it has been the case that chlorine washed chicken has received a considerable amount of attention within the UK media recently as a result of the decision to exit the EU and this might have modified attitudes to this specific production practice.

We also produced WTP results for the three types of meat using a common per unit measure (i.e. per 100 grams) (See Appendix A). The results indicate that, per 100 grams, the largest negative estimate is for hormone implants in beef, followed by hormone in food for pork and finally chlorine washed chicken. It is also the case that the relative magnitude of the WTP estimates is greatest for beef, although the quality assurance attributes for chicken are highly valued. Importantly, the results

generated for our four DCE are generally consistent in terms of the magnitudes and the importance attached to each attribute.

Finally, the magnitude of the negative WTP are not insignificant if we consider them as a percentage of the case price. For chicken the negative WTP equates a price reduction of approximately 30 percent, for beef it is 50 percent and for pork it is nearly 70 percent. In each case this price reduction is considerably larger than the estimates used in the models examining the economic benefits from removing existing trade restrictions between the US and the EU. These results are also similar to those reported by Lewis et al. (2017) who report that UK consumers on average required a discount of 60 percent on US labelled beef.

7. Implications

In terms of the wider issue of food production and consumer choice several interesting implications arise from the results reported here.

First, in much of the existing research that has looked at the costs and benefits of new trade deals between the EU and US there is an apparent aversion to using the estimates of value expressed by consumers derived using stated preference methods. This issue regarding the value attached to stated preference estimates is important as it can dramatically change the resulting balance of how a change in trade arrangements is assessed. For example, Arita et al (2017) observe that stated preference research yields estimate of consumer value that are frequently considered to be on the high side which in turn leads researchers to employ values significantly lower than those reported. Similarly, as noted above, Soon and Thomson (2019) employed a price discount of 15 percent for hormone-treated beef if entering the EU and an even bigger discount for a smaller group of consumers. Both studies are useful as they provide potential magnitudes of welfare gains from a trade deal. However, questions can be raised as to whether the level of price reduction is sufficient, given stated preference regarding hormone-treated beef. Also, assuming that consumers will buy hormone treated beef if the price is low enough significantly downplays the general view reported that consumers will simply not buy hormone treated beef no matter how low the price is. Finally, the general lack of support for stated preference estimates within trade models maybe explains why the price reductions modelled are smaller than suggested by the stated preference results reported in the literature. It is also interesting that this negative attitude to stated preference estimates is at odds with how many governments openly endorse and support the use of stated preferences estimates especially in the area of environmental policy evaluation (e.g., H.M. Treasury 2018).

Second, an examination of existing UK trade data for meat confirms that currently the majority of trade occurs with countries that are physically close. For example, Poppy et al. (2019) note that 99.8 percent of pork imports and 95.5 percent of poultry imports come from the EU. These findings are also supported by economic studies using gravity models that confirm that trade declines with distance (Carrère et al., 2020).[11] However, if these existing supply chains are disrupted for any reason, Poppy et al. (2019) observe that other countries (e.g., US and beef, New Zealand and Australia for lamb) could make up the short fall in supply. But the results of our analysis indicate the consumer preferences for alternative sources of meat are not homogenous. For example, we find that there is a preference for EU over non-EU sourced produce. Putting this aside, in principle, both Brazil and Thailand could provide significant imports of poultry meat. However, these imports are not fresh poultry for which there is considerable retail demand from UK domestic consumers. Also, there are aspects of poultry farming in Brazil that have serious consequences for animal welfare and it clear from our results that consumers have strong preferences for high welfare standards. There is also the issue of carcass balance and how the EU poultry sector has organised itself to move different cuts of meat to different countries based on consumer preferences (Cowen and Morrin, 2018). The importance of understanding carcass balance not only relates to the cuts of meat that the UK would need to import to satisfy consumer preferences but also how the UK poultry sector would deal exporting the cuts of meat that are not demanded in the UK.

Third, it is unclear if the UK will retain the same CoO regulations or whether they will change the way in which CoO is used once the UK leaves the EU (Fraser and Balcombe, 2018; Millstone et al, 2019). This matters if we believe that consumer welfare is enhanced if consumers can make more informed food choices. If as a result of specific types of trade deals being agreed, consumers are allowed to choose between types of meat product that have been produced using different production methods, then providing information such as CoO could be seen as being fundamental to support informed consumer choice. However, any meat products that enter the UK that are going to be used in processed food do not need to declare CoO. Thus, unless method of production becomes a required piece of information to provide to consumers they will not be able to make an informed choice regarding specific meat products. However, existing WTO rules would appear to rule out the use of labels indicating method of production or process under what is sometimes referred to as the "consumers right to know" (Hobbs and Kerr, 2006; Smyth et al., 2017). In this context, especially if

[11] In addition, not only is the UK heavily reliant on the EU in relation to trade in food, much of this trade passes through the Dover Strait (see Garnett et al. (2020) for details).

consumers express a strong dislike of specific production methods, it is unclear how consumers can make an informed choice at the point of purchase.

One potential solution to this dilemma is for an increase in the use of information technology so that consumers can be informed about the food they are consuming. For example, Fraser and Balcombe (2018) discuss the potential benefits from employing blockchain technology and the use of SmartLabels initiatives. With the development of trusted information technology there is less reason for food products to be offered to consumers without full disclosure of the source, method of production and supply chain to final product be made available. Thus, any asymmetric information that has given rise to sub-optimal food choice can be corrected even for processed food that meets the demands of consumers for convenience. However, unless the provision of this is made mandatory there appears to be little reason to see why importers would adopt this approach to information provision. Furthermore, as noted by Hobbs and Kerr (2006) the use of mandatory labelling is restricted by the WTO. Therefore, in a situation in which the existing barriers to trade are removed it is far from clear how UK consumers will be able to identify food products that have been produced using alternative modes of production unless they are allowed to be brought to the attention of consumers in any resulting bilateral trade agreement. Indeed, there may well be benefits to consumers from the UK being able to pursue bilateral trade agreements in part because of the limitation of the WTO in terms of consumer protection as opposed to producers (Hobbs and Kerr, 2006). But, even if two countries could agree a bilateral trade agreement and include labels that support consumers' right to know a third country could challenge the agreement and the costs of actual implementing this type of policy will be substantial (Smyth et al., 2017).

Finally, the importance of meat within the diet of consumers appears to be declining for a number of reasons. For example, González et al. (2020) comments on how excess meat consumption yields animal welfare, public health and environmental problems and as result they call for policies to bring about reductions. At the same time, it is reported by Frontier Economics (2020) that growth in veganism is associated with a decline in weekly expenditure on meat products in the UK declining from 3.7 percent of total spend in 2013 to 3.2 percent by 2017. Therefore, it is far from clear if a trade deal that reduces the real cost of meat to consumers can be supported once the wider societal economic costs associated with meat consumption are taken into considerations whilst there is also an apparent decline in the relative importance of meat in UK consumers' diets which reduces any welfare gains from a trade deal that removes existing NTMs.

8. Concluding Comments

In this paper, we report the results of a DCE designed to examine consumer preferences with regard to food and associated forms of food production i.e., hormone implants in beef; Ractopamine in pig feed; chlorine washed chicken; and Atrazine pesticide used in corn production. The need to undertake this analysis stems from the need to understand and to take account of consumer preferences for food produced using prohibited production methods matters if welfare of analysis of potential trade deals is to be considered meaningful. The DCEs yielded results that are internally consistent and, in every case, the production methods have yielded negative mean WTP estimates whereas all other attributes have produced positive mean WTP estimates. Interestingly, for all food products examined the negative mean WTP estimates for production are not absolutely larger than the positive mean WTP estimates reported for the most highly valued attributes.

For one of the production methods examined, chlorine washed chicken, our results also reveal that a minority of consumers view this practice positively. As we have already discussed, this result may well be capturing attitudes towards food safety and hygiene. This aspect of our results potentially warrants further detailed research. The importance of food safety is also explicitly observed for the other three food products examined. In terms of CoO, we find that UK production is highly valued, especially so for beef, pork and corn and that non-EU production is not valued even relative to generic EU CoO. Taken together these results indicate the potential balance of requirements that UK trade negotiators should be seeking post Brexit if they are attempting to produce a trade deal that aligns with UK consumer preferences. Specifically, not matter what trade deals are concluded by the UK government in the future, it is clear that UK consumers display strong preferences for the use of clear and transparent food labelling that removes uncertainty with respect to purchase decisions. Almost certainly, it is the ability of consumers to make an informed choices that matters most and the economic costs associated with any food related trade deals that ignore this likely to lead to substantial losses of welfare for UK consumers.

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Table 1: Summary of Attributes and Levels for All Products

Product:	Attribute	Description and Levels
500grams breast chicken	Price	2.00, 3.00, 3.99, 4.75, 6.50, 9.25
	Country of Origin	UK, EU, Non-EU
	Organic	Yes/No
	Food Standards	Meet EU and Does not meet EU
	Quality Assurance	None, RSPCA, QAI, Red Tractor
	Chlorinated Chicken	Yes/No

Product:	Attribute	Description and Levels
250 grams beef sirloin steak	Price	2.50, 2.95, 3.40, 4.00, 5.00, 6.25
	Country of Origin	UK, EU, Non-EU
	Organic	Yes/No
	Food Standards	Meet EU and Does not meet EU
	Quality Assurance	None, Red Tractor
	Hormone Implants	Yes/No

Product:	Attribute	Description and Levels
1kg pork loin joint	Price	4.00, 5.50, 6.99, 8.00, 11.99, 15.50
	Country of Origin	UK, EU, Non-EU
	Organic	Yes/No
	Food Standards	Meet EU and Does not meet EU
	Quality Assurance	None, Red Tractor
	Hormone in Feed	Yes/No

Product:	Attribute	Description and Levels
2 pack of corn on the cob	Price	0.85, 0.99, 1.24, 1.50, 2.00, 2.50
	Country of Origin	UK, EU, Non-EU
	Organic	Yes/No
	Food Standards	Meet EU and Does not meet EU
	Quality Assurance	None, Red Tractor
	Pesticide Use (Atrazine)	Yes/No

Table 2: WTP Estimates Chicken

	Mean	SE Mean	Stdv	Median	25%	75%	Prop>0
Logged Negative Price *	-0.71	0.03	0.64	-0.67	-1.11	-0.2	0.17
Chlorine Wash	-0.81	0.11	2.29	-0.49	-2.38	0.66	0.4
EU Food Safety	2.24	0.06	1.25	2.16	1.36	2.97	0.98
Organic	0.9	0.03	0.68	0.86	0.43	1.35	0.92
EU COO vs Non EU	0.74	0.01	0.28	0.71	0.55	0.91	1
UK COO vs Non EU	2.18	0.06	1.25	1.97	1.31	2.88	1
Red Tractor	2.36	0.03	0.61	2.32	1.97	2.65	1
RSPCA	2.27	0.02	0.35	2.23	2.03	2.47	1
QAI	1.69	0.01	0.2	1.68	1.56	1.79	1
Opt-out	-1.23	0.14	2.99	-2.75	-3.64	1.17	0.34

Note: SE – Standard Error; Stdv –Standard Deviation; Prop –Proportion.

Table 3: WTP Estimates Corn

	Mean	SE Mean	Stdv	Median	25%	75%	Prop>0
Logged Negative Price**	0.71	0.02	0.45	0.88	0.43	1.07	0.91
Atrazine Pesticide	-0.46	0.02	0.48	-0.57	-0.87	-0.12	0.18
EU Food Safety	0.45	0.01	0.28	0.42	0.22	0.65	0.97
Organic	0.38	0.01	0.27	0.36	0.17	0.53	0.95
EU COO vs Non EU	0.21	0.01	0.16	0.21	0.11	0.32	0.92
UK COO vs Non EU	0.63	0.01	0.28	0.62	0.42	0.79	1
Red Tractor	0.39	0.02	0.35	0.34	0.12	0.63	0.88
Opt-out	-0.64	0.03	0.62	-0.97	-1.1	-0.29	0.19

Note: SE – Standard Error; Stdv –Standard Deviation; Prop –Proportion.

Table 4: WTP Estimates Pork

	Mean	SE Mean	Stdv	Median	25%	75%	Prop>0
Logged Negative Price**	-0.81	0.04	0.85	-0.74	-1.36	-0.03	0.24
Hormone in Feed	-3.24	0.15	3.17	-3.7	-5.68	-1.04	0.17
EU Food Safety	3.27	0.09	1.83	3.2	1.86	4.37	0.99
Organic	2.03	0.09	1.96	1.92	0.73	2.94	0.88
EU COO vs Non EU	0.58	0.02	0.47	0.54	0.29	0.86	0.91
UK COO vs Non EU	2.97	0.08	1.69	2.82	1.82	3.88	0.98
Red Tractor	2.67	0.1	2.14	2.48	1.12	3.93	0.9
Opt-out	-3.48	0.2	4.11	-5.2	-6.79	-0.37	0.23

Note: SE – Standard Error; Stdv –=Standard Deviation; Prop –=Proportion.

Table 5: WTP Estimates Beef

	Mean	SE Mean	Stdv	Median	25%	75%	Prop>0
Logged Negative Price**	-0.14	0.04	0.73	-0.07	-0.64	0.44	0.45
Hormone Implants	-1.07	0.04	0.83	-1.1	-1.74	-0.49	0.11
EU Food Safety	1.3	0.03	0.65	1.27	0.81	1.72	0.99
Organic	0.83	0.03	0.62	0.8	0.41	1.15	0.93
EU COO vs Non EU	0.58	0.02	0.4	0.58	0.34	0.8	0.94
UK COO vs Non EU	1.61	0.03	0.58	1.56	1.2	1.93	1
Red Tractor	1.34	0.04	0.82	1.32	0.72	1.93	0.97
Opt-out	-1.78	0.05	1.01	-2.28	-2.53	-1.13	0.09

Notes: SE – Standard Error; Stdv – Standard Deviation; Prop - Proportion.

*,** - The logged negative price is the mean logged coefficient of the negative of price(β_1) in equations (5) and (6)

Figure 1: DCE Text Describing the Prohibited Production Methods

Chlorine Washed Chicken

If chicken is labelled as chlorine washed this means that the carcass has been treated with a chlorine solution to prevent the meat from carrying bacteria such as Campylobacter and Salmonella. Alternatively, a 'farm to fork' approach can be employed which concentrates on reducing the risks of contamination at all stages of the food supply chain as well as being viewed as positive for animal welfare. So we have either: Chlorine Washed or Not Chlorine Washed

Hormone Treated Beef

If beef is labelled as hormone treated, this means that hormone implants have been used in production. The use of hormones allows the animal to grower faster, consuming less feed and resulting in a leaner carcass that is less fatty. But there is disagreement about the safe levels of hormone to apply and so some countries ban the use of hormones. So we have either: Hormone Treated (Yes) or Not Hormone Treated (No)

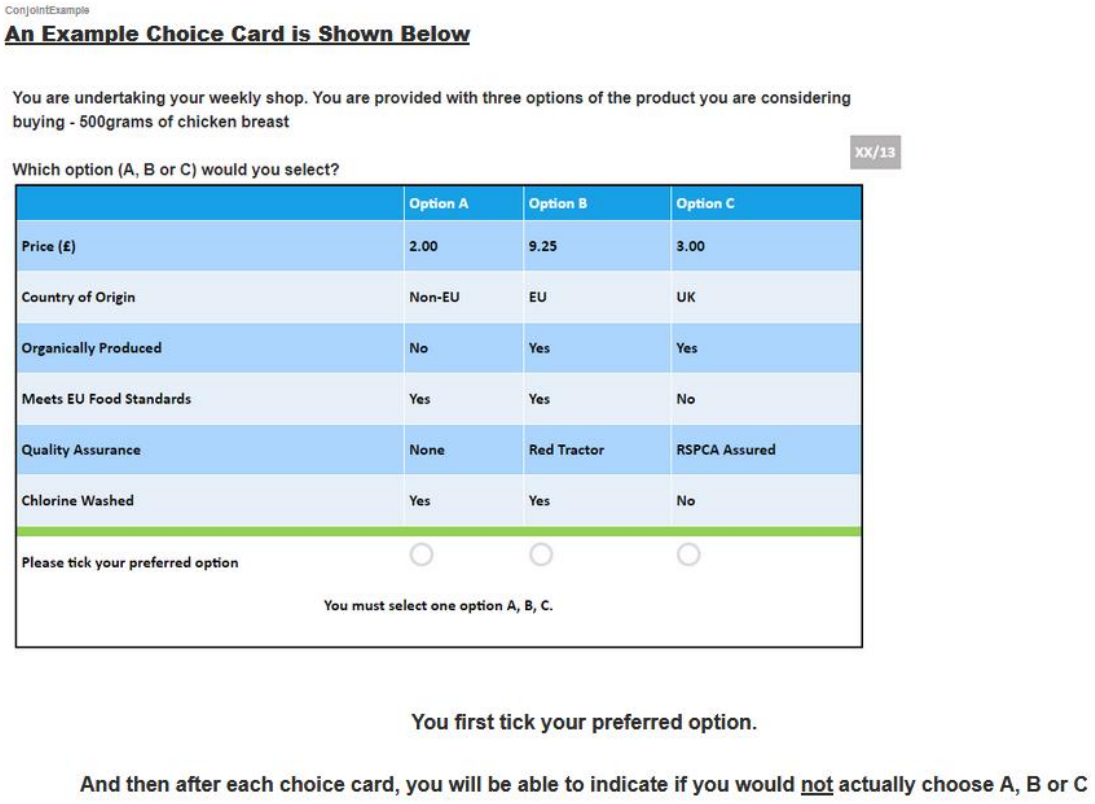
Hormone-Treated Feed in Pork Production

Pork producers sometimes use hormone feed additives to increase the rate of animal growth. For example, Ractopamine is used to make animals more muscular, reducing the fat content of the meat and increasing the return per animal. However, Ractopamine is banned in some countries as there is insufficient evidence to declare the product safe, and it has also been linked to negative animal welfare effects. So we have either: Hormone Feed Used (Yes) or Hormone Feed Not Used (No)

Pesticides use and corn on the cob

Producers of corn on the cob in some countries frequently use pesticides such as Atrazine to deal with weed infestations. However, this pesticide is banned in several countries because of environmental impacts such as the contamination of ground water. So we have either: Atrazine is Used (Yes) or Atrazine is Not Used (No)

Figure 2:WTP Online Example



ConjointExample

An Example Choice Card is Shown Below

You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - 500grams of chicken breast

XX/13

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	2.00	9.25	3.00
Country of Origin	Non-EU	EU	UK
Organically Produced	No	Yes	Yes
Meets EU Food Standards	Yes	Yes	No
Quality Assurance	None	Red Tractor	RSPCA Assured
Chlorine Washed	Yes	Yes	No
Please tick your preferred option	○	○	○

You must select one option A, B, C.

You first tick your preferred option.

And then after each choice card, you will be able to indicate if you would not actually choose A, B or C

Appendix A

Table A1: WTP Estimates (Per 100 grams of meat)

	Mean	SE Mean	Stdv	Median	25%	75%
Chlorine Wash	-0.162	0.022	0.459	-0.099	-0.477	0.132
EU Food Safety	0.448	0.012	0.25	0.432	0.271	0.593
Organic	0.179	0.006	0.136	0.173	0.085	0.271
UK COO vs Non EU	0.437	0.012	0.249	0.393	0.262	0.575
UK COO vs Non EU	0.437	0.012	0.249	0.393	0.262	0.575
Red Tractor	0.472	0.006	0.121	0.464	0.394	0.531
RSPCA	0.453	0.003	0.069	0.447	0.406	0.495
QAI	0.337	0.002	0.04	0.335	0.311	0.359

Note: SE – Standard Error; Stdv - Standard Deviation; Prop - Proportion.

Table A2: WTP Estimates Pork (Per 100 grams of meat)

	Mean	SE Mean	Stdv	Median	25%	75%
Hormone in Feed	-0.324	0.015	0.317	-0.37	-0.568	-0.104
EU Food Safety	0.327	0.009	0.183	0.32	0.186	0.437
Organic	0.203	0.009	0.196	0.192	0.073	0.294
EU COO vs Non EU	0.058	0.002	0.047	0.054	0.029	0.086
UK COO vs Non EU	0.297	0.008	0.169	0.282	0.182	0.388
Red Tractor	0.267	0.01	0.214	0.248	0.112	0.393

Note: SE – Standard Error; Stdv – Standard Deviation; Prop – Proportion.

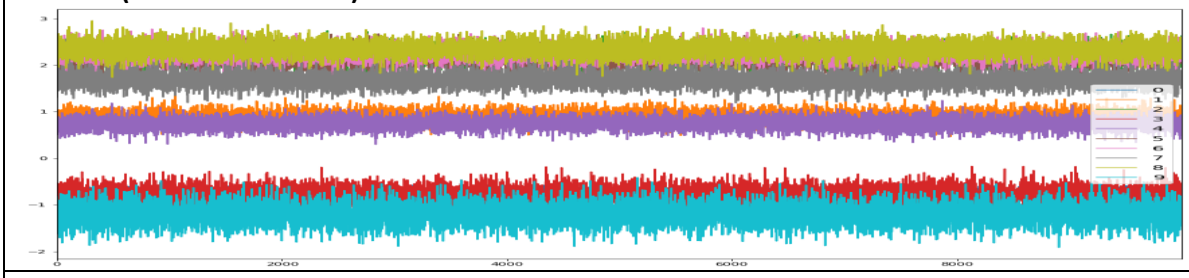
Table A2: WTP Estimates Beef (Per 100 grams of meat)

	Mean	SE Mean	Stdv	Median	25%	75%
Hormone Implants	-0.428	0.016	0.332	-0.441	-0.695	-0.195
EU Food Saftey	0.52	0.013	0.262	0.51	0.324	0.69
Organic	0.332	0.012	0.247	0.318	0.162	0.462
EU COO vs Non EU	0.232	0.008	0.159	0.231	0.134	0.319
UK COO vs Non EU	0.643	0.011	0.23	0.624	0.479	0.771
Red Tractor	0.534	0.016	0.326	0.529	0.289	0.77

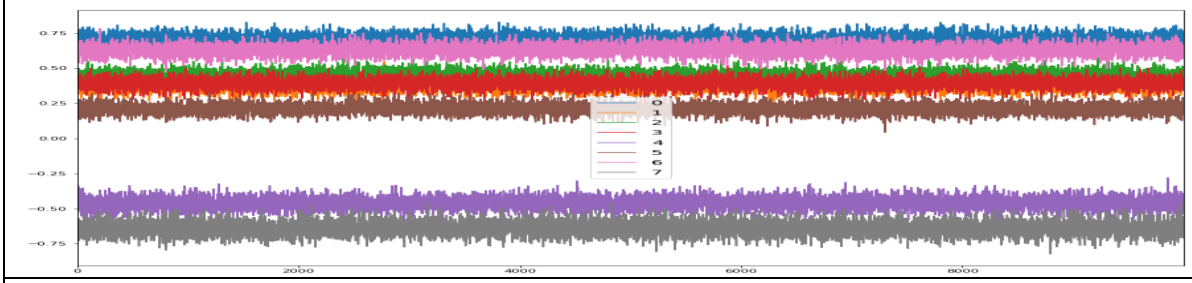
Note: SE – Standard Error; Stdv – Standard Deviation; Prop - Proportion.

Appendix B: Traceplots for MCMC Convergence

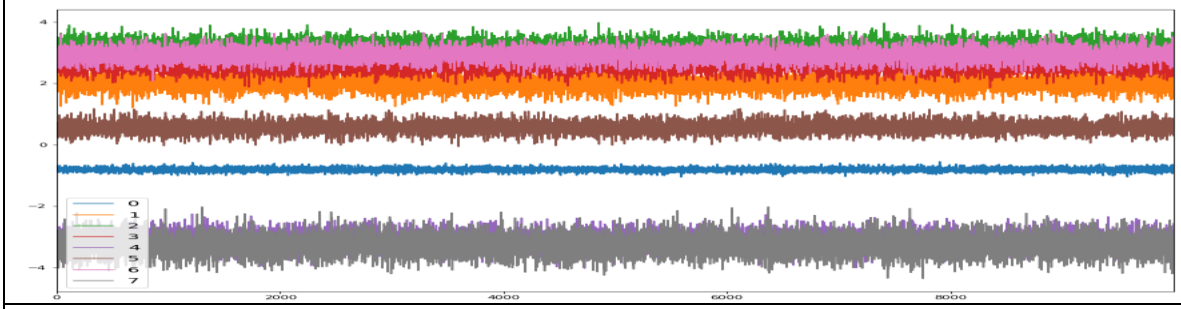
Chicken (Mean Coefficients)



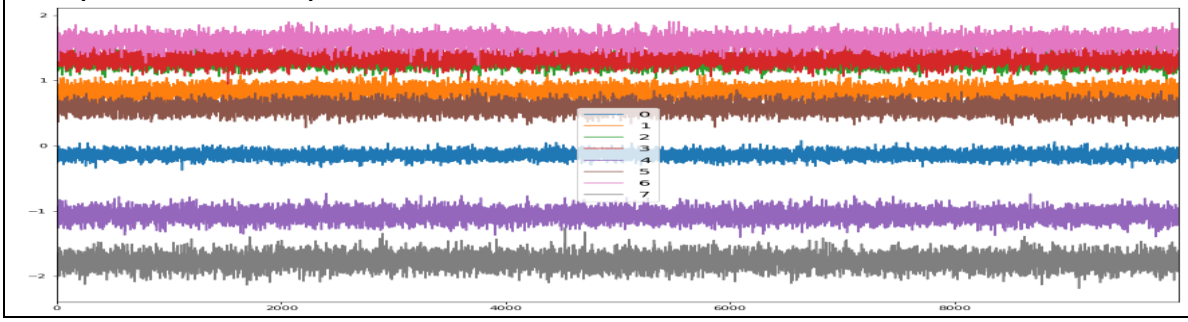
Corn (Mean Coefficients)



Pork (Mean Coefficients)



Beef (Mean Coefficients)



Appendix C: Survey Instrument Example

Understanding Consumer Values[12]

The XXXXX has a key objective of understanding consumer values about the food they buy and eat. To achieve this objective the XXXX are continuously looking to improve their understanding of consumer attitudes towards all types of food.

In this survey we will ask you to consider food items with different characteristics.

We want you to select the product you most prefer.

There are no right or wrong answers

All we need is for you to **imagine** you are shopping for these products and to tell us which you would be most likely to buy.

The questionnaire will take 15 minutes to complete.

Important

We would like the person who usually does the food shopping for the household to answer the questionnaire.

Lead Researcher:
XXXXXXX

Ethical Conduct of Research

Completion and submission of the questionnaire will be accepted as an expression of consent. The conduct of this research does not involve the collection, access and/or use of identified personal information. All information collected is confidential and your anonymity will at all times be safeguarded.

[12] Version 1 of 4

Overview

When the UK leaves the EU, the UK will be able to make its own decisions about what foods are considered risky or not. Currently these decisions are taken in Europe.

Importantly, before any new type of food can be imported or produced here – the XXXX will apply scientific risk assessment to ensure public safety.

To make informed decisions, the XXXX needs to collect evidence that will allow it to make policy recommendations about which new types of food will be allowed to be imported or produced here.

This evidence includes understanding what you and other consumers think and value in relation to the food they buy and eat. This is an essential part of the evidence that will inform these policy decisions.

In the survey, we are going to look at your consumer values for specific food items. All of the scenarios presented to you and other participants in the course of this survey are hypothetical. However, **please** answer all questions as if you are making real choices. Only by providing **truthful responses** will your participation in this research provide meaningful and positive data.

Section A: Your Normal Food Shopping Habits

Q1a. What is your gender?

[ ] Male
[ ] Female

Q2a. What is your age?

[ ] 18-25
[ ] 26-35
[ ] 36-45
[ ] 46-55
[ ] 56-65
[ ] Over 65

Q3a. Where do you currently live?

[ ] North East (England)
[ ] North West (England)
[ ] Yorkshire and the Humber (England)
[ ] East Midlands (England)
[ ] West Midlands (England)
[ ] East of England
[ ] London
[ ] South East (England)
[ ] South West (England
[ ] Wales
[ ] Northern Ireland

Q4a. How many people are there currently living in your household?

[ ] 1
[ ] 2
[ ] 3
[ ] 4
[ ] 5
[ ] More than 5

Q5a. Do you have children?

[ ] Yes
[ ] No

Q6e. What is your employment status?	[ ] Self employed [ ] In paid full-time employment (30+ hours per week) [ ] In paid part-time employment (less than 30 hours per week) [ ] Unemployed [ ] Retired from paid work altogether [ ] In full-time education [ ] Looking after family or home [ ] Other

Section B: Your Normal Food Shopping Habits

Next, we would like to ask you some questions about your shopping habits.

Q1b. Thinking about food and grocery shopping, over a typical week, which of these best describes the level of responsibility you have for the shopping [in your household]?

Responsible for all or most of the food/grocery shopping	☐
Responsible for about half of the food/grocery shopping	☐
Responsible for less than half of the food/grocery shopping	☐
Not responsible for any of the food/grocery shopping[13]	☐
Each person is responsible for their own food/grocery shopping	☐

Q2b. Do you eat meat?

Yes	☐
No	☐

Q3b. If you answered "No", Do you buy meat for other members of your household?[14]

Yes	☐
No	☐

[13] If answer with response terminate the survey
[14] Only request answer to this if answer no to question Q2a

Q4b. For food/grocery shopping which of the following supermarkets do you shop at?

Aldi	☐
Tesco	☐
Budgens	☐
Sainsbury	☐
Asda	☐
Waitrose	☐
Morrisons	☐
Booths	☐
Spar	☐
Iceland	☐
Lidl	☐
Co-op	☐
Marks and Spencer	☐
Other	☐

Section C: Survey Overview

In this survey, we are interested in your preferences regarding specific food products.

We would like you to imagine that you are doing your weekly shop at your local supermarket. On your shopping list is 500grams of chicken breast. This product is described using a number of characteristics.

We have three options to choose from.

We would like you to choose the one you are most likely to buy just as if you were in a ***real*** shopping situation. We will repeat this process **13** times.

Please answer all choice tasks **truthfully**.

Before we ask you to start, we will give you some information about the food characteristics.

1. **Price**

   For any specific product you are shown the prices presented are based on those currently found in food retail outlets in the UK.

2. **Country of Origin (COO)**:

   Country of Origin informs consumers clearly about the origin of food they may or may not choose to buy.

   In this survey we will indicate Country of Origin with the following information:
   - UK
   - EU
   - Non-EU

3. **Organic Production**

   We describe production as either:

   - **Organic** – this describes a farming system that does not use various forms of chemicals in the production process.

- **Conventional** – this describes a farming system that employs intensive livestock production, using fertilizer, pesticides and chemicals, with an emphasis on production and profit.

4. **Food standards**

All the food for sale in the UK meets the required legal standards with regard to food safety. However, there are differences in standards in different countries of the world. To reflect this we label food standards as either Meets EU standards or doesn't meet EU standards:

- Meets EU food standards (Yes)
- Doesn't meet EU food standard (No)

5. **Quality Assurance Standards**

This attribute indicates if the food was produced to recognised industry quality standards for food safety, hygiene, animal welfare and the environment, and reflects best industry practice – remember, food always meets UK legal minimum quality standards.

- No quality assurance standard indicated (None)
- RSPCA Assured

- Quality Assurance International (QAI)

- Red Tractor

6. **Chlorine Washed Chicken**

If chicken is labelled as chlorine washed this means that the carcass has been treated with a chlorine solution to prevent the meat from carrying bacteria such as Campylobacter and Salmonella. So we have either

- Chlorine Washed
- Not Chlorine Washed

Please take your time and be familiar with the attributes being used in this survey.

Section C: The Choice Questions

We are going to show you 13 choice sets

For the **500grams of chicken breast** the product information is presented in a table

Please consider each choice set carefully and make your preferred choice based on the option you would most likely buy.

There are no wrong answers – please answer truthfully

An Example Choice Card is Shown Below

You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	6.50	3.99	3.00
Country of Origin	UK	Non-EU	UK
Organically Produced	Yes	No	No
Meets EU Food Standards	Yes	No	Yes
Quality Assurance	Red Tractor	None	QAI
Chlorine Washed	No	Yes	No
Please tick your preferred option			

You must select option A, B or C

After this choice, you will be able to indicate if you would **not** actually choose A, B or C

Choice Card 1

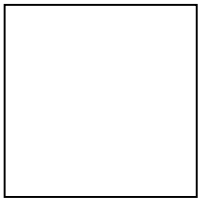
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	9.25	3.00	2.00
Country of Origin	EU	Non-EU	UK
Organically Produced	No	Yes	No
Meets EU Food Standards	No	Yes	Yes
Quality Assurance	None	RSPCA Assured	QAI
Chlorine Washed	No	Yes	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 2

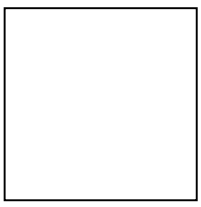
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	2.00	6.50	6.50
Country of Origin	EU	UK	Non-EU
Organically Produced	Yes	No	No
Meets EU Food Standards	No	Yes	Yes
Quality Assurance	None	RSPCA Assured	QAI
Chlorine Washed	No	No	Yes
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 3

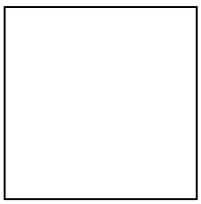
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	3.99	6.50	3.99
Country of Origin	UK	EU	Non-EU
Organically Produced	Yes	No	Yes
Meets EU Food Standards	No	Yes	No
Quality Assurance	QAI	None	RSPCA Assured
Chlorine Washed	Yes	No	Yes
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 4

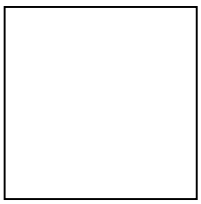
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	3.00	9.25	3.00
Country of Origin	EU	Non-EU	UK
Organically Produced	Yes	No	No
Meets EU Food Standards	Yes	No	Yes
Quality Assurance	None	RSPCA Assured	QAI
Chlorine Washed	No	Yes	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 5

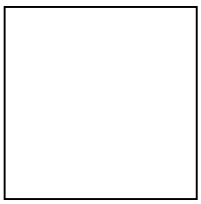
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	2.00	9.25	3.00
Country of Origin	EU	Non-EU	UK
Organically Produced	No	Yes	Yes
Meets EU Food Standards	No	Yes	No
Quality Assurance	RSPCA Assured	Red Tractor	QAI
Chlorine Washed	Yes	No	Yes
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 6

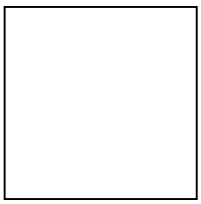
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	3.99	2.00	9.25
Country of Origin	Non-EU	UK	EU
Organically Produced	Yes	No	Yes
Meets EU Food Standards	No	Yes	No
Quality Assurance	Red Tractor	RSPCA Assured	QAI
Chlorine Washed	Yes	No	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 7

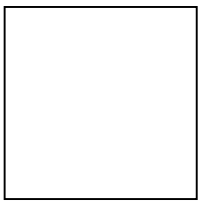
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	6.50	3.99	2.00
Country of Origin	UK	UK	UK
Organically Produced	Yes	Yes	Yes
Meets EU Food Standards	No	No	No
Quality Assurance	None	None	None
Chlorine Washed	No	No	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 8

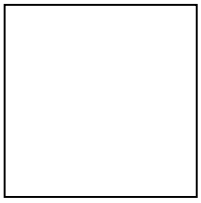
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	4.75	3.99	6.50
Country of Origin	UK	Non-EU	EU
Organically Produced	Yes	Yes	No
Meets EU Food Standards	No	Yes	Yes
Quality Assurance	QAI	Red Tractor	None
Chlorine Washed	Yes	No	Yes
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 9

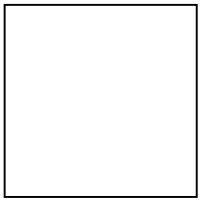
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	4.75	3.00	6.50
Country of Origin	EU	Non-EU	UK
Organically Produced	Yes	No	Yes
Meets EU Food Standards	Yes	No	No
Quality Assurance	RSPCA Assured	QAI	None
Chlorine Washed	Yes	No	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 10

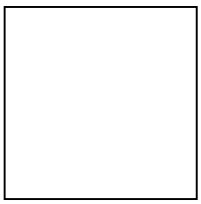
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	2.00	3.99	9.25
Country of Origin	EU	UK	Non-EU
Organically Produced	No	Yes	Yes
Meets EU Food Standards	Yes	No	Yes
Quality Assurance	QAI	RSPCA Assured	None
Chlorine Washed	No	Yes	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 11

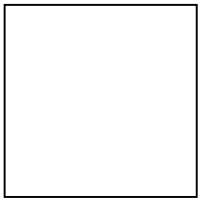
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	9.25	2.00	3.99
Country of Origin	EU	UK	Non-EU
Organically Produced	No	Yes	No
Meets EU Food Standards	No	No	Yes
Quality Assurance	Red Tractor	None	QAI
Chlorine Washed	Yes	No	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 12

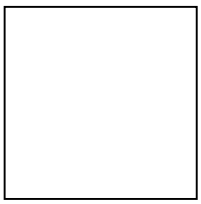
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	3.00	6.50	4.75
Country of Origin	EU	UK	Non-EU
Organically Produced	No	Yes	No
Meets EU Food Standards	Yes	No	Yes
Quality Assurance	RSPCA Assured	None	Red Tractor
Chlorine Washed	No	Yes	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Choice Card 13

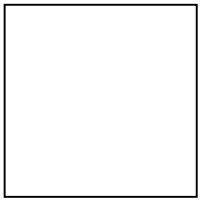
You are undertaking your weekly shop. You are provided with three options of the product you are considering buying - **500grams of chicken breast**

Which option (A, B or C) would you select?

	Option A	Option B	Option C
Price (£)	6.50	3.99	3.99
Country of Origin	Non-EU	EU	UK
Organically Produced	No	No	Yes
Meets EU Food Standards	Yes	Yes	No
Quality Assurance	RSPCA Assured	None	Red Tractor
Chlorine Washed	Yes	Yes	No
Please tick your preferred option			

You must select option A, B or C

BUT, if you believe that you would not buy any of these options then tick here:



Section E: Debriefing Questions

We would now like to understand how you made your choices.

Q1e. Which, if any, of the following food characteristics did you ignore when completing the choice task?

(You can tick none or as many as required)

Price	☐
Country of Origin	☐
Organic	☐
Food Standards	☐
Quality Assurance	☐
Chlorine Washed	☐
Used All Attributes	☐

Q2e. Please rank the food characteristics (attributes) in terms of importance to you when making your choices?

To do this click and drag the options to the correct order such that 1 = most important attribute and 6 = least important attribute

Price	☐
Country of Origin	☐
Organic	☐
Food Standards	☐
Quality Assurance	☐
Chlorine Washed	☐

Q3e. The quality of food can usually be judged by its price. [ ] Agree
[ ] Disagree
[ ] Neither

Section F: Respondent Information

Finally, we would like to get some additional information about you. This will help us understand your responses.

Q1f. What is your highest level of education that you have achieved?

[ ] School education to 16
[ ] A-level or equivalent
[ ] Further education qualification
[ ] Undergraduate degree
[ ] Post-graduate degree
[ ] Higher

Q2f. What is the annual income of the chief income earner in your household before deductions for income tax, National Insurance etc.?

The chief income earner is the person in your household with the largest income

[ ] Up to £5,199
[ ] £5,200 up to £10,399
[ ] £10,400 up to £15,599
[ ] £15,600 up to £20,799
[ ] £20,800 up to £25,999
[ ] £26,000 up to £31,199
[ ] £31,200 up to £36,399
[ ] £36,400 up to £51,999
[ ] £52,000 and above

Finally, if there are any comments that you would like to share with us about the survey please provided these in the box below: