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Bundling food labels: What role could the labels "Organic," "Local" and "Low Fat" play in fostering the demand for animal-friendly meat

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Abstract

This study investigates whether and how the demand for animal-friendly pork can benefit from the individual and joint use of the label "Animal Friendly," "Organic," "Local," and "Low Fat." A choice experiment was conducted to collect the data. The data were analyzed using the random parameter logit and the latent class models. Three consumer segments were identified. Consumers in Segment 1 (pro-welfare consumers—39% of all respondents) were found to highly value the four labels. The results showed that their price premium for animal-friendly pork could be increased significantly if the product is also labeled as "Local" or "Low Fat." The members of Segment 2 (Welfare-reluctant consumers—41% of all respondents) were found to negatively value the use of the label "Animal Friendly." For "welfare-reluctant" consumers, label bundling is of marginal effect. The rem1 aining 20% of respondents ("Indifferent" "consumers") were found to be indifferent to whether the labels "Animal Friendly," "Organic," and "Local" are used or not. However, their demand for animal-friendly pork could significantly increase if the pork is also labeled as "Organic." [EconLit Citations: C35, C83, D12, Q13, Q18].

KEYWORDS

animal welfare, consumer, local, organic, willingness to pay

1 | INTRODUCTION

The interacting forces of rising demand for cheaper meat products, increasing competition in the global market and a shift to mechanization and automation in agriculture have encouraged livestock farmers to adopt intensive livestock systems (e.g., indoor housing systems) to maximize their production given limited resources (Blount, 1968; Cronin et al., 2014). These systems helped farmers to lower their production costs, thus increasing the supply of meat to satisfy the growing demand for meat. However, farmers have come under increasing pressure to address public concern about negative externalities of intensive livestock systems, especially in terms of animal welfare (e.g., confinement and related health problems, tail docking, beck trimming, castration, mixing aggression) and environmental effects (e.g., soil and underground water pollution) (Norwood & Lusk, 2011).

If society wishes to improve the level of animal welfare, it may ban livestock farming practices that compromise the minimum level of farm animals' wellbeing (e.g., EU Action Plan to improve animal welfare [IP/05/698]), modify market conditions to incentivize producers to use more animal-friendly farming practices (e.g., through subsidies) or help them marketing animal-friendly products (e.g., through certification). Adopting any of these three strategies is likely to result in an increase in production costs and, hence, prices paid by consumers (Stott et al., 2005). If consumers are expected to bear the additional costs,[1] it is necessary to investigate whether they are willing to pay a price premium for animal-friendly food products.

Considerable research work has been conducted to investigate consumers' attitudes, preferences, and willingness to pay (WTP) for animal-friendly food products using both hypothetical and nonhypothetical surveys (e.g., Akaichi et al., 2019; Carlsson et al., 2007; Chang et al., 2010; Gerini et al., 2016; Glass et al., 2005; Gracia et al., 2014; Kehlbacher et al., 2012; Lagerkvist & Hess, 2011; Liljenstolpe, 2008; Norwood & Lusk, 2011). Overall, most studies have agreed on the fact that there is a potential market for animal-friendly food products among consumers who are concerned about farm animals' welfare and are willing to pay higher prices to compensate farmers who opt to use more animal-friendly farming practices.

These encouraging signals on consumers' high interest in animal welfare may, however, not fully translate into actual purchases of animal-friendly products, partly due to the trade-offs consumers make when choosing between food products with different desirable attributes (e.g., animal-friendly meat vs. local or organic meat). For example, a meat consumer who is willing to pay a price premium for the labels “Local” and “Animal-friendly,” with the price premium being higher for the former label, is likely to end up buying meat labeled as “Local” if the meat carrying the label “Animal Friendly” is offered at the same or a higher price than the local meat.

While extensive research has been devoted to assessing consumers' preferences and WTP for animal-friendly meat, relatively little research has assessed how consumers weigh high animal welfare against other desirable food attributes of *meat*[2] such as organic, local, low fat, carbon footprint, and fair-trade. The exceptions are Lusk et al. (2007), Tonsor et al. (2009), Van Loo et al. (2014), and Eldesouky et al. (2020). This article provides the first known examination of whether and how consumers in the UK value and trade-off four pork attributes: animal welfare, organic, local, and low fat.

In addition to assessing consumers' attitudes and WTP for animal-friendly food products and their determinants, previous studies have also investigated different marketing strategies to help producers and marketers of animal-friendly meat price and position their products. The strategies that have received researchers' major attention are information and communication (e.g., Cornish et al., 2020; Napolitano et al., 2007), labeling animal welfare (e.g., Kehlbacher et al., 2012; Powers et al., 2020), and consumer segmentation (e.g., Miranda-de la Lama et al., 2019; Verbeke, 2009). This study went a step further investigating whether bundling animal welfare with other desirable food attributes could increase the desirability of animal-friendly meat in the eyes of UK

[1]It is noteworthy that these additional production costs could also be paid taxpayers, if, for example, the government decided to subsidize husbandry practices that can help improving animal welfare. However, the role of subsidies is beyond the scope of this paper.
[2]Please notice that the literature on other animal product, especially eggs, is more abundant.

consumers. To the best of our knowledge, this is the first known examination of the effect of bundling the label "Animal Friendly" with the labels "Organic," "Local," and "Low Fat" on consumers' preferences and WTP for animal-friendly pork.

Several previous studies (e.g., Gerini et al., 2016; Gracia et al., 2014; Vanhonacker et al., 2007) have found that preferences and WTP for animal welfare and other desirable food attributes are heterogeneous across consumers. This implies that using average consumers' WTP could be misleading as it may obscure the existence of consumer segments with significantly different preferences and WTP. The identification of market segments with common characteristics is essential for positioning higher animal welfare products and developing effective communication strategies (Vanhonacker & Verbeke, 2014). In this study, the heterogeneity was examined carrying out a latent class analysis. Three different consumer segments were identified: "pro-welfare" consumers, "welfare-reluctant" consumers, and "indifferent consumers.

To sum up, this study aims to answer four empirical questions. (1) Do consumers in the UK value the use of the labels "Animal Friendly," "Organic," "Local," and "Low Fat"? (2) Do they perceive these labels as unrelated or do they consider them as substitutes or complementary; (3) How do they value the bundling of these labels? (4) How do the answers to the first three questions vary across consumer segments (i.e., "pro-welfare" consumers, "welfare-reluctant" consumers, and "indifferent consumers)?

2 | METHODS

2.1 | Sample and experimental design

A lab choice experiment was conducted to collect the data. In the choice experiment, participants were first asked to participate in a choice task. Then, they were required to complete a questionnaire about their attitudes toward animal welfare and related issues as well as their socio-demographic characteristics. In the choice task, participants were successively provided with eight different choice sets and were repeatedly asked to choose between four different alternatives of fresh pork (300 g of pork loin steaks) and an opt-out alternative. Each alternative of fresh pork is a combination of different levels of five attributes: animal welfare (two levels: "Animal Friendly"/"No label"),[3] type of production (two levels: "Organic"/"Not organic"), locality of the pork (two levels: "Local"/"Not local"), fat content (two levels: "Low Fat"/"No label") and the price (four levels: £3.19, £3.79, £4.49, £5.29). The selected price levels cover the range of the retail prices of fresh pork at the time of the survey design. Participants were told that, apart from these attributes, the alternatives of fresh pork are identical in appearance. The description of the attributes and their levels is given in Appendix 1.

It is noteworthy that before designing the choice experiment, we conducted a shelf audit in the major UK supermarket (Tesco, Asda, Sainsbury's, Waitrose, Morrisons, Aldi, and Lidl) to collect information on meat attributes. We found that "Freedom Food" (i.e., animal welfare label assured by the Royal Society for the Prevention of Cruelty to Animals [RSPCA]) is the only UK farm assurance and food labeling scheme solely dedicated to improving farm animal welfare. However, we decided to use a hypothetical but more self-explanatory label ("Animal-Friendly"). The decision was based on the results from a large online survey carried out by YouGov in November 2012. The results showed that 76% of UK consumers did not recognize "Freedom Food" logo as an animal welfare label. In its report "Farm Animal Welfare Past, Present and Future," published in September 2014, RSPCA echoed YouGov's findings and recognized that the use of the label "Freedom Food"

[3]Other labels such as "Organic" and "Red Tractor" that have been monitored by the UK Soil Association and Assured Food Standards, respectively, and although they are commonly related with improved animal welfare standard compared with the minimum legal requirements, are not mainly used to promote the higher animal welfare quality of the food product that caries them.

was not as effective as the organization had hoped (Farm Animal Welfare, 2014). In 2015, RSPCA announced that the label "Freedom Food" would be replaced by the label "RSPCA Assured." The organization also announced that the rebranding would be completed by May 2016. Consumer awareness of the brand "RSPCA Assured" has increased since its launch in 2015. Based on an online survey conducted in the UK in 2017, Hartmann et al. (2019) reported that 35% of the 800 interviewed consumers recognized the label "RSPCA Assured." In 2019, RSPCA announced that UK consumers' awareness of the label "RSPCA Assured" increased from 15% in 2015 to 51% in 2019 (RSPCA, 2021).

Given all the attributes' levels, a full factorial design of 64 profiles was generated. Since presenting participants with 64 profiles would be time-consuming and cognitively challenging, the approach proposed by Street and Burgess (2007) was followed to generate an optimal fractional factorial design that is statistically efficient and allows the estimation of all the main and two-way interactions effects[4] (i.e., consumers' preferences and WTP for the five attributes as well as the interactions between these attributes). The most efficient design (96.29% of statistical efficiency) that could be generated consisted of 32 choice sets. This design was obtained using the following generators: (00111), (10102), and (01110). The design was then blocked in four blocks of eight choice sets each. Thus, each participant was asked to complete eight choice sets. Since it is unrealistic to force participants to choose one of the provided alternatives of fresh pork, we included an opt-out alternative (i.e., fifth alternative) in each choice set. An illustration of a typical choice set is presented in Figure 1.

In total, 120 consumers were recruited from the city of Edinburgh and its metropolitan area (March 2014).[5] Participants were randomly assigned to 12 experimental sessions with 10 individuals each. Each participant could participate in only one session of approximately 1 h and was paid a £35 participation fee. Participants in all the experimental sessions received the same information. After welcoming them, participants received a brief description of the study, and they were reassured that their answers would be treated confidentially. Then, the different sections of the survey were described starting with the choice section. For the choice task, participants were first given a brief description of the different attributes of fresh pork as well as their corresponding levels (see Appendix 1). Then using an example of a choice card, participants were given a detailed explanation of what they were required to do to complete the choice task. During the explanation, participants were free to ask questions to dissipate any doubts about the process. The actual choice experiment started only after being sure that all participants had fully understood their task. To reduce the effect of a possible hypothetical bias, a cheap talk was used, and participants were asked to respond to all the choice questions exactly as they would do if they were in a grocery store and they had to use real money to pay for their choices.[6]

A market research company was contracted to recruit 120 respondents. The company was also charged to obtain an informed consent signed by all respondents. The company was asked to recruit a sample that is representative of the UK population in terms of age and gender. The shares of gender and age groups in the sample as well as in the UK population are presented in Table 1. We used the "Z-test for two proportions" to test whether the differences between the characteristics of the sample and the population are statistically significant. The results in Table 1 show that the apparent divergence between the sample and the population in terms of gender and age is not statistically significant. However, it is noteworthy that we intentionally inflated the percentage of female

[4]The estimation of interactions effects is necessary to answer the research questions 2–4.

[5]Since March 2014, the consumption of pork in the UK has remained constant (16.04 Kg/capita and 16.05 Kg/capita in 2014 and 2019, respectively) (OECD, 2020). Furthermore, the EU legislation for labeling animal-friendly products has not changed since 2014. In the EU, animal welfare labeling is still compulsory only for table eggs. In the UK, RSPCA' scheme is still the only voluntary UK farm assurance and food labeling scheme that is solely dedicated to improving farm animal welfare. As aforementioned, RSPCA replaced its original "Freedom Food" logo by the logo "RSPCA Assured," which is still in use.

[6]The cheap talk reads as follows: "From previous similar research studies, we know that people often respond in one way but act differently. In studies where people do not actually have to pay money for a product, people often overestimate their preferences and willingness to pay, which often results in biased scientific findings. So please respond to each of the following choice questions just exactly as you would do in a real grocery store and had to use real money to pay for your choice."

Choice set 3.2		Identification number:			
Attributes	**OPTION 1**	**OPTION 2**	**OPTION 3**	**OPTION 4**	**OPTION 5**
Animal Welfare	Animal friendly	No label	Animal friendly	No label	None of them
Type of production	Not organic	Not organic	Organic	Organic	
Locality of the product	Not Local	Local	Local	Not local	
Fat content	Low fat	No label	No label	Low fat	
Price	£4.49	£3.19	£5.29	£4.49	
	☐	☐	☐	☐	☐
Please mark the option you would choose.					

FIGURE 1 Example of a choice set used in the choice experiment

TABLE 1 Demographics of the sample and the population

Characteristic	Group	Sample (%)	UK population (%)	Z-test *p*-value
Gender	Female	59	51	0.19
	Male	41	49	0.19
Age	(18–29)—Young adults	13	19	0.16
	(30–59)—Middle-aged adults	62	54	0.23
	(≥60)—Older adults	26	27	0.88

respondents to account for the fact that the majority of the main food shoppers in UK households are female. The market research company was also required to adhere to the following criteria when recruiting participants: (1) each participant must be the main responsible for purchasing food products in her/his household, and (2) she/he must be a meat consumer. Since each participant completed eight choice sets, the total number of observations used in the analysis is 960 (i.e., 120 × 8).

2.2 | Data analysis

2.2.1 | Estimation of participants' preferences

The data collected were analyzed within a random utility framework (McFadden, 1974). Thus, an individual *n* presented with *j* alternatives at a choice occasion *t* is expected to choose the alternative that maximizes his/her utility. Following Lancaster's (1966) concept that any product is a bundle of attributes, the utility that individuals derive from the consumption of a product is assumed to be equal to the sum of their marginal utility for each of the attributes that constitute the product of interest. Consequently, if we assume a sample of *N* respondents who are

presented with T choice occasions of J alternatives each, individual n's utility (U_{njt}) from choosing the jth alternative at a tth choice occasion takes the form:

$$U_{njt} = V_{njt} + \varepsilon_{njt}, \tag{1}$$

where V_{njt} is the deterministic component and ε_{njt} is the random component. ε_{njt} is assumed to be independent and identically distributed. Assuming that the deterministic component of the utility is linear-in-parameter, Equation (1) can be written as:

$$U_{njt} = \beta X_{njt} + \varepsilon_{njt}, \tag{2}$$

where β denotes the $K \times 1$ vector of unknown utility parameters. As described in more detail further below, X_{njt} represents the following level of attributes "Animal Friendly," "Organic," "Local," "Low Fat," "Price" as well as the six two-way interactions ("Animal Friendly * Organic," "Animal Friendly * Local," "Animal Friendly * Low fat," "Organic * Local," "Organic * Low Fat," "Local * Low Fat").

If individuals' preferences are homogenous, a conditional logit (CL) choice model (McFadden, 1974) can be applied. While the CL is the workhorse model for analyzing discrete choice data, its assumptions (i.e., homogeneity of respondents' preferences and the independence of the alternatives included in any choice set) do not generally hold (Hensher et al., 2015). Revelt and Train (1998) proposed a less restrictive model (Random Parameter Logit [RPL]) that allows individuals' preferences to be heterogeneous and the assumption of the independence of alternatives to be relaxed. In the RPL, at least one parameter is specified as random. In other words, each individual is considered to have a unique set of preferences, reflected in the individual parameters β_n. In the RPL, the choice probability that individual n chooses alternative j at a choice occasion t, conditional on knowing β_n, is specified as:

$$L_{njt}(\beta_n) = \frac{\exp\left(\beta_n' X_{njt}\right)}{\sum_{j=1}^{J} \exp\left(\beta_n' X_{njt}\right)}. \tag{3}$$

In choice experiments, individuals are generally shown a sequence of choice cards (S) and are asked to indicate their most preferred alternative in each choice card. Therefore, conditional on knowing β_n, the choice probability of the observed sequence of choices (S) is given by:

$$S_n(\beta_n) = \prod_{t=1}^{T} L_{nj(n,t)t}(\beta_n), \tag{4}$$

where $j(n, t)$ is the alternative chosen by individual n on choice occasion t.

The unconditional choice probability is the expected value of the logit probability integrated over all possible values of β and weighted by the density of β:

$$P_n(\Omega) = \int_{\beta} S_n(\beta) f(\beta|\Omega) d\beta. \tag{5}$$

The log-likelihood for the RPL model is given by:

$$LL(\Omega) = \sum_{n=1}^{N} \ln P_n(\Omega). \tag{6}$$

Since the unconditional choice probability $P_n(\Omega)$ does not have a closed-form solution; simulation methods are used to estimate the parameters Ω. For example, to estimate the values of parameters β, R draws of β are taken from the distribution $f(\beta \mid \Omega)$. For each draw, the choice probability is calculated. Then the resulting probabilities from the R draws are averaged. The simulated log-likelihood (SLL) for all respondents, which is estimated via maximum likelihood procedures, is calculated as:

$$\mathrm{SLL} = \sum_{n=1}^{N} ln\left(\frac{1}{R}\sum_{r=1}^{R} S_n(\beta^r)\right). \tag{7}$$

In this study, the parameters for all the nonprice attributes as well as the six two-way interactions were assumed to be normally distributed. Theoretically, the estimated coefficient for the price is expected to be negative. Therefore, to avoid obtaining unrealistic positive values for the parameter price, we first multiplied the price variable by −1. Then, a lognormal distribution was imposed on the variable price instead of a normal distribution (Hensher & Greene, 2003). Finally, since each participant was asked to complete eight choice sets (panel data setting), we allowed the error components in different choice situations from a given individual to be correlated.

2.2.2 | Estimation of participants' WTP

In choice experiments, the standard approach to determine respondents' WTP is to compute the ratio of the nonmonetary attribute coefficient and the (negative of the) price coefficient. Nonetheless, using this approach can lead to heavily skewed WTP distributions and thus result in very large WTP values. To address this problem, we estimated the RPL models in WTP space following Train and Weeks (2005). This involves estimating the distribution of willingness to pay directly by re-formulating the model in such a way that the coefficients represent the WTP measures.

The deterministic component of the utility in preference space is written as follows:

$$\begin{aligned}\beta X_{njt} = {} & \beta_{\mathrm{price}}\mathrm{Price} + \beta_{\mathrm{None}}\mathrm{None} + \beta_{\mathrm{AF}}\mathrm{AnimalFriendly} + \beta_{\mathrm{Org}}\mathrm{Organic} + \beta_{\mathrm{Loc}}\mathrm{Local} + \beta_{\mathrm{LF}}\mathrm{Low{*}Fat} \\ & + \beta_{\mathrm{AFOrg}}\mathrm{AnimalFriendly{*}Organic} + \beta_{\mathrm{AFLoc}}\mathrm{AnimalFriendly{*}Local} + \beta_{\mathrm{AFLF}}\mathrm{AnimalFriendly{*}LowFat} \\ & + \beta_{\mathrm{OrgLoc}}\mathrm{Organic{*}Local} + \beta_{\mathrm{OrgLF}}\mathrm{Organic{*}LowFat} + \beta_{\mathrm{LocLF}}\mathrm{Local{*}LowFat}.\end{aligned} \tag{8}$$

βX_{njt} in WTP space is written as follows:

$$\begin{aligned}\beta X_{njt} = \beta_{\mathrm{price}}\Bigg[& \mathrm{Price} + \frac{\beta_{\mathrm{None}}}{\beta_{\mathrm{price}}}\mathrm{None} + \frac{\beta_{\mathrm{AF}}}{\beta_{\mathrm{price}}}\mathrm{AnimalFriendly} + \frac{\beta_{\mathrm{Org}}}{\beta_{\mathrm{price}}}\mathrm{Organic} + \frac{\beta_{\mathrm{Loc}}}{\beta_{\mathrm{price}}}\mathrm{Local} + \frac{\beta_{\mathrm{LF}}}{\beta_{\mathrm{price}}}\mathrm{LowFat} \\ & + \frac{\beta_{\mathrm{AFOrg}}}{\beta_{\mathrm{price}}}\mathrm{AnimalFriendly{*}Organic} + \frac{\beta_{\mathrm{AFLoc}}}{\beta_{\mathrm{price}}}\mathrm{AnimalFriendly{*}Local} + \frac{\beta_{\mathrm{AFLF}}}{\beta_{\mathrm{price}}}\mathrm{AnimalFriendly{*}LowFat} \\ & + \frac{\beta_{\mathrm{OrgLoc}}}{\beta_{\mathrm{price}}}\mathrm{Organic{*}Local} + \frac{\beta_{\mathrm{OrgLF}}}{\beta_{\mathrm{price}}}\mathrm{Organic{*}LowFat} + \frac{\beta_{\mathrm{LocLF}}}{\beta_{\mathrm{price}}}\mathrm{Local{*}LowFat}\Bigg].\end{aligned} \tag{9}$$

Equation (9) can be rewritten as:

$$\begin{aligned}\beta X_{njt} = {} & \beta_{\mathrm{price}}[\mathrm{Price} + \theta_1\mathrm{None} + \theta_2\mathrm{AnimalFriendly} + \theta_3\mathrm{Organic} + \theta_4\mathrm{Local} + \theta_5\mathrm{LowFat} + \theta_6\mathrm{AnimalFriendly} \\ & {*}\mathrm{Organic} + \theta_7\mathrm{AnimalFriendly{*}Local} + \theta_8\mathrm{AnimalFriendly{*}LowFat} + \theta_9\mathrm{Organic{*}Local} + \theta_{10}\mathrm{Organic} \\ & {*}\mathrm{LowFat} + \theta_{11}\mathrm{Local{*}LowFat}].\end{aligned} \tag{10}$$

The theta coefficients (θ_1 to θ_{11}) are the WTP estimates. In the estimation, the variables "Animal Friendly," "Organic," "Local," and "Low Fat" were effects coded. The price was entered as a continuous variable. The RPL model was estimated using Modified Latin Hypercube Sampling draws with 1200 simulations, taking into account the panel nature of the data. All the estimations were conducted using the software Biogeme 2.4. The results from the estimation of the RPL model are displayed in Table 2.

TABLE 2 Estimated respondents' willingness to pay from the RPL model

Parameters	Estimated willingness to pay
Random parameters	
Animal Friendly	1.94***
Organic	0.75***
Local	1.38***
Low Fat	1.31***
Animal Friendly * Organic	−0.15***
Animal Friendly * Local	−0.29***
Animal Friendly * Low Fat	−0.27***
Organic * Local	0.00
Organic * Low Fat	0.00
Local * Low Fat	−0.33***
Nonrandom parameter	
Opt-out alternative	−0.85***
Standard deviations	
Animal Friendly	1.16***
Organic	0.00
Local	−0.05***
Low Fat	−1.07***
Animal Friendly * Organic	−0.43***
Animal Friendly * Local	0.00
Animal Friendly * Low Fat	−0.41***
Organic * Local	−0.16***
Organic * Low Fat	0.06***
Local * Low Fat	−0.31***
Number of observations	960
Log-likelihood (constant only)	−1514.686
Final Log-likelihood	−773.308
McFadden's Pseudo R^2	0.44

Note: ***denote statistical significance at 1%level.

2.2.3 | Latent class model

While the RPL model controls and accounts for heterogeneity, it does not explain the source of the heterogeneity of respondents' preferences and WTP. To better understand the heterogeneity of consumers' WTP for the different meat attributes considered in this study, the latent class model (LCM) for discrete choice analysis was estimated (Greene & Hensher, 2003). LCM assumes that individuals can be intrinsically sorted into a number of latent classes. It also assumes that individuals' preferences and WTP are homogeneous within each class but are heterogeneous across classes.

In LCM, the deterministic component (V_{njt}) of utility can be separated into a component related to the product's attributes considered in the study and a latent component related to the individuals' socio-demographic and psychometric characteristics. The log-likelihood of the LCM can be expressed as follows:

$$\ln L = \sum_{n=1}^{N} \ln \left[\sum_{q=1}^{Q} H_{nq} \left(\prod_{t=1}^{T_n} P_{nt|q}(j) \right) \right]. \tag{11}$$

Where H_{nq} denotes the prior probability of individual n to be assigned to class q. The probability H_{nq} is unknown to the analyst and various formulations have been used. For this study, the convenient multinomial logit is assumed (Greene & Hensher, 2003):

$$H_{nq} = \frac{\exp\left(z_n' \theta_q\right)}{\sum_{q=1}^{Q} \exp\left(z_n' \theta_q\right)}, q = 1, \ldots, Q, \theta_Q = 0. \tag{12}$$

Where z_n denotes a set of observable characteristics which enter the model for class membership. The variables used in the specification of the prior probability are described in Table 3. Notice that the Q^{th} parameter vector is normalized to zero to secure identification of the model (Greene, 2003, Chapter 21).

$P_{nt|q}$ is the choice probability that individual n, conditional to belonging to class q ($q = 1, \ldots, Q$), chooses alternative j from a particular choice set t. $P_{nt|q}$ can be expressed as follows:

$$P_{nt|q}(j) = \frac{\exp\left(x_{nt,j}' \beta_q\right)}{\sum_{j=1}^{J} \exp\left(x_{nt,j}' \beta_q\right)}, \tag{13}$$

β_q, θ_q are the parameters to be estimated.

To determine the number of classes, the Consistent Akaike Information Criterion (CAIC) and the Bayesian Information Criterion (BIC) were used. CAIC and BIC were computed for LCM with 2, 3, and 4 classes. The results are displayed in Table 4.

The results in Table 4 show that the estimated LCM with three classes has the lowest CAIC and BIC values. Therefore, in this study, only the results from the estimation of the LCM with three classes are presented and discussed.

The estimated WTPs and θ_q coefficients are presented in Table 5. Notice that in Tables 2 and 5, estimated coefficients that are not statistically different from zero are set equal to zero. The profile of the members of each segment is summarized in Table 6. Table 6 is elaborated based on the results on class membership included in Table 5.

3 | RESULTS

The results presented in Tables 2 and 5 show that the random parameter logit model and the latent class model fit the data reasonably well based on McFadden's Pseudo R^2 of 0.44 and 0.48, respectively (Louviere et al., 2000). In this section, the results from the estimation of the RPL model (main effect and

TABLE 3 Description of the segment membership variables

Variables	Description
Concerned	Dummy variable that is coded as 1 if respondent revealed to be concerned or very concerned about farm animal welfare, and 0 otherwise.
Aware	Dummy variable that is coded as 1 if respondent revealed to be aware of the conditions under which animals are farmed in the UK, and 0 otherwise.
Government	Dummy variable that is coded as 1 if respondent agreed with the statement "The government has to ban animal production systems that do not guarantee high welfare levels for farm animal even when such a policy leads to an increase in animal product prices," and 0 otherwise.
Citizens	Dummy variable that is coded as 1 if respondent agreed with the statement "The government should, first, ask the citizens, through a referendum, whether they want animal production systems that do not guarantee high welfare levels for farm animals to be banned. If the majority of citizens opt for the ban, then the government can decide to outlaw production practices that do not guarantee high animal welfare standards," and 0 otherwise.
Young adults	Dummy variable that is coded as 1 if respondent's age is between 18 and 29 years, and 0 otherwise.
Middle-aged adults	Dummy variable that is coded as 1 if respondent's age is between 30 and 59 years, and 0 otherwise.
Older adults	Dummy variable that is coded as 1 if respondent's age is 60 or over, and 0 otherwise.
Female	Dummy variable that is coded as 1 if the respondent is female, and 0 if he is male.
Secondary	Dummy variable that is coded as 1 if respondent has, at most, high school diploma or General Educational Development diploma (GED), and 0 otherwise.
University	Dummy variable that is coded as 1 if respondent revealed to have finished at least some college or university studies, and 0 otherwise.
Employed	Dummy variable that is coded as 1 if the respondent revealed to be employed, and 0 otherwise.
Low income	Dummy variable that is coded as 1 if respondent's household income is less than £25000, and 0 otherwise.
Medium income	Dummy variable that is coded as 1 if respondent's household income is between £25000 and £60000, and 0 otherwise.
High income	Dummy variable that is coded as 1 if respondent's household income is more than £60000, and 0 otherwise.

TABLE 4 Information on the converged latent segment models[a]

Number of classes	Log likelihood at convergence (LL)	Number of parameters (P)	CAIC[b]	BIC[c]
2	−989.17	37	2192.48	2155.48
3	**−898.62**	**62**	**2156.06**	**2094.06**
4	−844.68	87	2192.87	2105.87

[a]960 observations from 120 individuals (N).

[b]CAIC (Consistent Akaike Information Criterion) is calculated using: $-2 \times LL + (\ln(N) + 1) \times P$.

[c]BIC (Bayesian Information Criterion) is calculated using: $-2 \times LL + \ln(N) \times P$.

TABLE 5 Results of the latent class analysis

Parameters	Segment 1 "Pro-welfare" consumers	Segment 2 "Welfare-reluctant" consumers	Segment 3 "Indifferent" consumers
Willingness to pay			
Animal Friendly	3.92***	−0.58**	0.00
Organic	1.23**	0.00	0.00
Local	2.37***	0.00	0.00
Low Fat	1.52**	1.00***	2.51**
Animal Friendly * Organic	−1.15**	0.34**	1.14**
Animal Friendly * Local	0.00	0.36*	0.00
Animal Friendly * Low Fat	0.00	0.00	−2.01***
Organic * Local	0.58*	−0.41**	0.00
Organic * Low Fat	0.67*	0.00	0.00
Local * Low Fat	−0.84*	0.00	0.00
Parameters on the segment membership variables for the three-class model			
Constant	−1.865***	4.464***	0
Concerned	0.648***	−2.909***	0
Aware	0.000	0.000	0
Government	1.550***	1.206***	0
Citizens	0.000	0.890**	0
Young adults (18–29 years)	1.964***	2.067***	0
Older adults (≥60 years)	0.000	−1.093***	0
Female	0.000	−1.714***	0
University	0.000	0.000	0
Employed	0.000	−0.837**	0
Low income (<£25,000)	0.000	2.626***	0
High income (>£60,000)	−1.355**	2.721***	0
Class share	39%	41%	20%
Total number of observations		960	
Log-likelihood (constant only)		−1420.00	
Final Log-likelihood (full model)		−891.78	
McFadden's Pseudo R^2		0.48	

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% level, respectively.

interactions effects) are presented first. Then, the results from the estimation of LCM are described. The results will be discussed in Section 4.

By main effects, we refer to respondents' WTP for the individual labels "Animal Friendly," "Organic," "Local," and "Low Fat." Interaction effects measure respondents' WTP for the coexistence of the following labels: "Animal

TABLE 6 Consumers' profile (based on results from Table 5)

Segment 1 "Pro-welfare" consumers	Segment 2 "Welfare-reluctant" consumers	Segment 3 "Indifferent" consumers
▪ The most concerned respondents about animal welfare. ▪ Supporters of governmental intervention to outlaw animal-unfriendly production practices. ▪ Higher number of young adults (18–29 years) compared with Segment 3. ▪ More female respondents that Segment 2. ▪ More employee respondents that Segment 2. ▪ Less people with high income than Segments 2 and 3.	▪ The least concerned respondents about animal welfare. ▪ Supporters of governmental intervention to outlaw animal-unfriendly production practices IF approved by the majority of UK citizens in a referendum. ▪ Higher number of young adults (18–29 years) compared with Segment 3. ▪ More male respondents than Segments 1 and 3. ▪ Less employee respondents than Segments 1 and 3. ▪ More respondents with low income than Segments 1 and 3. ▪ More respondents with high income than Segments 1 and 3.	▪ Less supporters of governmental intervention to outlaw animal-unfriendly production practices. ▪ Higher number of older adults (≥60 years) compared with Segments 1 and 2. ▪ More female respondents than Segment 2. ▪ More employee respondents than Segment 2. ▪ More respondents with high income than Segment 1 (but less than Segment 2).

Friendly & Organic," "Animal Friendly & Local," "Animal Friendly & Low Fat," "Organic & Local," "Organic & Low Fat," and "Local & Low Fat." Note that the total WTP for a bundle of two labels (e.g., "Animal Friendly & Organic") is equal to their WTP for the individual labels (e.g., "Animal Friendly" and "Organic") plus their WTP for the coexistence of the two labels, which is equal to the value of the interaction between the two labels (e.g., "Animal Friendly*Organic").

3.1 | Main effects

The results in Table 2 show that the coefficients corresponding to the *main effects* are significant and with the expected sign, suggesting that the findings are consistent with a priori expectations. The negative sign of the coefficient "opt-out alternative" suggests that participants tended to choose one of the alternatives of fresh pork than the opt-out alternative.

Furthermore, the results show that respondents are more likely to buy fresh pork labeled as "Animal Friendly" as opposed to fresh pork that does not carry this label. Sampled consumers are willing to pay, on average, a substantial price premium of £1.94 per 300 g of fresh pork (pork loin steaks) labeled as "Animal Friendly." The results also suggest that respondents favor organic pork over nonorganic pork, and they are willing to pay for it a price premium of £0.75.

The results also show that the sampled consumers have higher WTP for local pork and low-fat pork than pork that does not carry the labels "Local" and "Low Fat." In particular, the results show that respondents are willing to pay price premiums of £1.38 and £1.31 for pork labeled as "Local" and "Low-Fat," respectively. Note that among the four labels considered in this study, "Animal-Friendly" is the most valued label while "Organic" is the least valued label.

3.2 | Interaction effects

One of the main contributions of this study to the literature on consumers' preferences and WTP for farm animal welfare is the assessment of whether bundling the label "Animal Friendly" with other desirable meat labels such as

"Organic," "Local," and "Low Fat" can significantly foster the desirability of animal-friendly pork in the eyes of consumers. To answer this question, the two-way interactions between the labels "Animal Friendly," "Organic," "Local," and "Low Fat" were estimated. The results of the estimated interaction effects are presented in Table 2. Note that four out of the six bundles considered in this study were not explored in previous studies. These bundles are "Animal Friendly & Organic," "Animal Friendly & Low Fat," "Organic & Low Fat," "Local & Low Fat."

The results, displayed in Table 2, show that the interaction effect between the labels "Animal Friendly" and "Organic" is negative and statistically significant. This implies that both labels are perceived by consumers as partial substitutes. The overlapping effect is described as partial because the estimated interaction effect is not large enough to cancel out consumers' positive premiums for at least one of the individual labels. For example, in the case of the copresence of the labels "Animal Friendly" and "Organic," the discount effect is equal to -£0.15, which is not large enough to cancel out consumers' premiums for one of the two labels (£1.94 and £0.75, respectively). It is possible that consumers perceived the labels "Animal Friendly" and "Organic" as partial substitutes because they consider some of the benefits associated with animal-friendly production methods to be implicit in the organic production system. The results also show that compared with pork that does not carry the labels "Animal Friendly" and "Organic," the combined price premiums for pork labeled as "Animal Friendly" and "Organic" would be £2.54[7] instead of £2.69.

Furthermore, the results show that the negative and significant interaction effects "Animal Friendly * Local" and "Animal Friendly * Low Fat" indicate that the coexistence of the two labels (i.e., "Animal Friendly" and "Local," and "Animal Friendly" and "Low Fat") on the same pork had a negative impact on the joint consumer valuation for the two labels. The discounts in total WTP for the bundles "Animal Friendly & Local" and "Animal Friendly & Low Fat" are £0.29 and £0.27, respectively.

The interaction effect between the claims "Local" and "Low Fat" is another interaction between two desirable food claims that has not been explored in previous studies. Bundling the claims "Local" and "Low Fat" could be of great interest for producers and marketers who are interested in labeling their *reduced-fat* pork as *local* when marketed in local markets or those who are keen to produce and market a *healthier* version of their *local* pork. The results show that when pork claimed to be "Local" is also labeled as "Low Fat" (or vice versa), consumers were willing to pay £0.33 less than the total premiums for both labels.

Previous studies on the effect of food labeling on consumer choices (e.g., Akaichi et al., 2020; Bond et al., 2008; Costanigro et al., 2011, Gracia et al., 2011) also found that the coexistence of some desirable food attributes generally suffer discounted total premiums compared to the sum of premiums from individual attributes. This discounting effect can be due to consumers' misunderstanding of the bundled attributes, or overlapping information conveyed to consumers, which nudge them to place less value on the attributes when bundled (Gracia et al., 2014; Meas et al., 2015; Quan et al., 2018; Viegas et al., 2014). It has also been found that consumers discount desirables food attributes when they are bundled (e.g., "Organic" and "Low fat") because they perceive the bundle as less tasty (James et al., 2009; Maimaran & Fishbach, 2014). The discounting effect can also be due to a budgetary consideration given the high price premium for each single attribute.

Finally, the results show that the estimated interactions "Organic*Local" and "Organic*Low Fat" are statistically insignificant, suggesting that consumers' WTP for the labels "Organic" is independent of their WTP for the labels "Local" and "Low Fat." Nonetheless, the estimated standard deviations of the two interaction effects are statistically significant, suggesting that consumers' preferences for these bundles "Organic & Local" and "Organic & Low Fat" are heterogeneous.

This heterogeneity can be the cause of the nonstatistical significance of the estimated means of the two interaction effects if consumers are equally split into both positive and negative sides of the preference scale. If this is the case, the positive and negative effects can cancel each other out, resulting in a statistically insignificant mean of the investigated effect. To test this hypothesis, we followed the approach mentioned in Train (2003) to

[7]This is equal to the sum of a £1.94 price premium for the label "Animal Friendly", a £0.75 price premium for the label "Organic," and a negative interaction effect of -£0.15.

compute the percentage of respondents who placed a positive (or negative) value on the estimated effect using the following formula:

$$100^{*}\Phi\left(\frac{-\beta_k}{S_k}\right),$$

where Φ is the cumulative standard normal distribution, and β_k and S_k are the mean and the standard deviation of the kth interaction parameter, respectively. Note that this formula is only applicable if the random parameter of interest has a symmetric normal distribution.

We found that in the case of the bundle "Organic & Local," 52% of respondents perceived the labels "Organic" and "Local" as substitutes, while 48% of respondents perceived them as complementary. In the case of the bundle "Organic & Low Fat," we found that while 40% of respondents positively valued the coexistence of the labels "Organic" and "Low Fat," 60% of them valued it negatively. These results suggest that the heterogeneity of consumers' WTP is possibly behind the nonsignificance of the estimated interaction parameters for the bundles "Organic & Local" and "Organic & Low Fat." However, we recommend using these results with caution due to the strong assumptions (i.e., symmetric normal distribution) of the approach proposed by Train (2003) and used here.

The results displayed in Table 2 show that 8 of 10 estimated standard deviations are significant, suggesting that consumers' WTP for most of the estimated effects are heterogeneous. To better understand the heterogeneity of consumers' WTP, a latent class analysis was carried out, and the results are presented in Table 5 and commented in the next subsection.

3.3 | Consumer segments

Using the latent class analysis, three segments of consumers were identified. They can be described based on their preferences for animal welfare as "pro-welfare" consumers, "welfare-reluctant" consumers, and "indifferent" consumers (Table 5).

Segment 1 (pro-welfare; 39% of all respondents) corresponds to respondents with positive and significant marginal WTP for the pork labeled as "Animal Friendly" (£3.92), "Organic" (£1.23), or "Local" (£2.37) as opposed to respondents' preferences and WTP in the other two segments. The results also show that respondents in Segment 1 prefer the pork to be low in fat and are willing to pay for it a price premium of £1.52. However, Segment 1 is not the segment with the highest price premium for low-fat pork.

Respondents belonging to Segment 1 were found to heavily discount the copresence of the labels "Animal-Friendly" and "Organic" and the labels "Local" and "Low Fat" on the same pork by as much as £1.15 and £0.84, respectively. The results also show that the members of Segment 1 perceived the labels "Animal-Friendly" and "local" and the labels "Animal-Friendly" and "Low Fat" as independent, suggesting that their total WTP for the bundle is equal to the sum of their WTP for the individual labels that constitute the bundle. Interestingly, the results for Segment 1 also show that labeling organic pork as "Local" or "Low Fat" generated an added positive effect to the combined main effects of the two labels. The added value for the simultaneous use of the labels "Organic" and "Local" is equal to £0.58 and is equal to £0.67 for the copresence of the labels "Organic" and "Low Fat." Therefore, the total respondents' WTP for the bundles "Organic & Local" and "Organic & Low Fat" is equal to £4.18 and £3.42, respectively.

The estimated interactions "Animal Friendly * Local" and "Animal Friendly * Low Fat" were found to be statistically insignificant. This suggests that, in Segment 1, respondents' WTP for animal-friendly pork is independent of whether the pork is labeled as "Local" (or "Low Fat") or not. Therefore, labeling "Animal Friendly" pork as "Local" or "Low Fat" will increase the total price premium for the products by as much as £2.37 and £1.52, respectively.

In comparison with respondents in Segments 2 and 3, members of segment 1 were found to be more concerned about animal welfare and showed a higher level of support for the government to ban animal production systems that do not guarantee a high level of welfare for farm animals. The results also show that Segment 1 is characterized by a higher number of young adults [18–29 years] than Segment 3 and a lower number of respondents with high income (>£60,000) relative to Segments 2 and 3 (see Tables 5 and 6).

Segment 2 (welfare-reluctant consumers; 41% of all respondents) is composed of respondents who negatively valued the use of the label "Animal Friendly." The results also show that they are not willing to pay a premium for the use of the labels "Organic" and "Local." They positively value only the use of the label "Low Fat." Despite their *unwillingness* to pay a price premium for the use of the labels "Animal Friendly," "Organic," and "Local," the results of the estimated interactions show that respondents belonging to Segment 2 are willing to pay a price premium of £0.34 and £0.36 for animal-friendly pork that is also labeled as "Organic" and "Local," respectively. The statistical insignificance of the estimated WTP for the bundles "Animal Friendly & Low Fat," "Organic & Low Fat," and "Local & Low Fat" suggests that the members of Segment 2 perceive the labels constituting these bundles as unrelated. Finally, the significant and negative interaction between the labels "Organic" and "Local" indicates that respondents in Segment 2 discount the simultaneous use of these two labels on the same pork.

In contrast with respondents in Segments 1 and 3, members of Segment 2 are the least concerned about the welfare of farm animals. They are also the respondents with the highest level of support for the idea that *animal-unfriendly* husbandry practices can be banned by the government only if the ban is approved by the majority of British citizens (e.g., through a referendum). The results also show that compared to Segments 1 and 3, Segment 2 has a higher number of male respondents and a higher number of respondents with high income. However, Segment 2 has a significantly lower number of older adults (≥60 years) than the other two segments.

Finally, Segment 3 ("indifferent" consumers; 20% of all respondents) is composed of respondents who are indifferent to whether the pork is labeled or not as "Animal Friendly." They are unwilling to pay a price premium for the use of the labels "Organic" and "Local." Nonetheless, the members of Segment 3 are the respondents with the highest price premium for pork that carries the label "Low Fat." Interestingly, respondents in Segment 3 were found to be willing to pay a significant price premium for animal-friendly pork if it is also labeled as organic (and vice versa). Furthermore, despite they highly valued the individual use of the label "Low Fat," they heavily discounted its simultaneous use with the label "Animal Friendly." The results also show that respondents in Segment 3 perceived the labels constituting the bundles "Animal Friendly & Local," "Organic & Local," "Organic & Low Fat," and "Local & Low Fat" as unrelated. In comparison with Segments 1 and 2, Segment 3 has a lower number of young adults (18–29 years) and a lower number of respondents who support governmental intervention to outlaw animal production practices that do not guarantee high animal welfare.

4 | DISCUSSION AND CONCLUSIONS

In line with several previous studies on consumers' preferences and WTP for farm animal welfare (e.g., Gerini et al., 2016; Gracia et al., 2014; Kehlbacher et al., 2012; Norwood & Lusk, 2011), this study found that, on average, the sampled consumers are willing to pay a significant price premium for fresh pork labeled as "Animal Friendly." The positive and substantial WTP for animal-friendly pork suggests that there is a potential demand for animal-friendly pork and that consumers are willing to bear, at least partially, the additional cost that may result from producing animal-friendly pork. This is an encouraging signal for pig farmers who are considering differentiating their products through significantly improving their pigs' welfare and labeling the final product as animal friendly.

Nonetheless, we think that this unsurprisingly positive and high WTP for animal welfare should be interpreted and used, having in mind the effect of other factors that warrant being mentioned here. First, in this study, we used

the label "Animal Friendly" to label animal-friendly pork instead of using one of the few labels that were used in grocery retail stores at the time of the data collection, mainly the label "Freedom Food." As mentioned above, this decision was motivated by the few reports that were published before the data collection, and that pointed out that the majority of UK consumers do not recognize the label "Freedom Food." We opted for a more self-explanatory animal welfare label (i.e., "Animal Friendly"). Therefore, the average price premium of £1.94 that the sampled UK consumers were willing to pay is for pork (300 g) that carries the label "Animal Friendly" and not any of the currently used animal welfare labels (e.g., "RSPCA assured," "Free Range," and "Red Tractor") in UK grocery retail stores.

Second, it is noteworthy that there is an increasing number of studies that have shown that consumers overstate their concern about farm animal welfare, such that WTP estimates are biased upwards (e.g., Chang et al., 2010; Norwood & Lusk, 2011). However, we agree with Harper and Makatouni (2002), who pointed out that the low demand for animal-friendly food products in the real market does not necessarily imply that consumers are not concerned about animal welfare, but that factors such as lack of information (e.g., information overload, especially on products' packages), lack of availability, lack of belief in personal influence (e.g., consumers believe that they are powerless), disassociation (e.g., lack of awareness due to the separation of the food product from the animal of origin), and cost seem to prevent consumers from fully exercising their strong and positive animal welfare preferences. These factors should be further investigated, and effective solutions should be found and implemented if we want to capture most of the consumer demand for animal-friendly foods.

Another aspect that may explain why animal welfare-minded consumers do not walk their talk when shopping in a real market is the fact that animal welfare is competing with other desirable food attributes for consumer awareness. To control for the trade-offs that consumers may make when they are faced with pork alternatives with competing attributes, we considered the use of the labels "Organic," "Local," and "Low Fat." We found that in line with the finding from several previous studies (e.g., Akaichi et al., 2012, 2016; Gerini et al., 2016; Meas et al., 2015; Romagny et al., 2017), UK consumers are willing to pay a significant price premium for the use of the labels "Organic," "Local," and "Low Fat." Although the label "Animal Friendly" is the most valued label by the sample respondents, the results suggest that consumers' positive values for other desirable food attributes should be taken into account when pricing and designing positioning strategies for animal-friendly pork products.

The results showed that the labels "Animal Friendly," "Organic," "Local," and "Low Fat" are positively valued by UK consumers but are competing if they are individually used on different pork alternatives. However, could bundling the label "Animal Friendly" with the labels "Organic," "Local," and "Low Fat" improve the desirability of animal-friendly pork in the eyes of UK consumers? Or would the substitution and overlapping effects offset the effect of consumers' price premiums for the labels "Animal Friendly," "Organic," "Local," and "Low Fat" when these are bundled? These questions have been overlooked in most of the previous studies on similar topics, and answering them is the main contribution of this study to the literature on consumers' preferences and WTP for animal-friendly food products. Furthermore, since the estimated WTPs for the individual and the joint use of the labels "Animal Friendly," "Organic," "Local," and "Low Fat" were found to be heterogeneous across consumers, a latent class analysis was carried out to account for and explain this heterogeneity. The analysis resulted in three consumer segments: "pro-welfare" consumers, "welfare-reluctant" consumers, and "indifferent" consumers.

The results showed that there is a potential market for animal-friendly pork. This market is most likely to comprise the members of the first consumer segment (i.e., "pro-welfare" consumers), which includes 39% of the sampled respondents. They are the only respondents who were found to be willing to pay a price premium (£3.92/300 g) for animal-friendly pork. Therefore, we think that this is the group of consumers that producers and marketers who are interested in fostering the demand for animal-friendly pork should target first. Furthermore, the results shed light on three points that we think producers and marketers of animal-friendly pork should consider when designing marketing strategies tailored to the need of this consumer segment.

First, "pro-welfare" consumers were found to positively value the use of the labels "Organic," "Local," and "Low Fat." This indicates that the labels "Animal Friendly," "Organic," "Local," and "Low Fat" are likely to be competing if they are individually used on different pork alternatives. Therefore, "pro-welfare" consumers may trade-off animal-

friendly pork for organic, local, or low-fat pork. This trade-off is likely to happen if the retail pricing of animal-friendly pork fails to take into account not only the maximum WTP that "pro-welfare" consumers are willing to pay for pork labeled as "Animal-friendly" but also their WTP for pork alternatives that carry the labels "Organic," "Local," or "Low Fat."

Second, the results showed that bundling the label "Animal Friendly" with other sustainability labels such as "Organic," "Local," or "Low Fat" could increase the desirability of animal-friendly pork in the eyes of "pro-welfare" consumers. We learned from the results that "pro-welfare" consumers perceive the labels constituting the bundles "Animal Friendly & Local" and "Animal Friendly & Low Fat" as unrelated. This implies that when animal-friendly pork is also labeled as "Local" or "Low Fat," "pro-welfare" consumers' total price premium increases from £3.92 to £6.29 (i.e., 3.92 + 2.37) and £5.44 (i.e., 3.92 + 1.52), respectively. These results are in line with the finding from previous studies of consumers preferences for different sustainability labels. For example, Janßen and Langen (2017) found that German consumers (label chooser segment: 47.5% of all respondents), who positively value the individual use of the labels animal welfare and local, do not value the coexistence of these two labels on milk packages. A similar result was also found by Gracia et al. (2014) using a large sample of Spanish consumers. Janßen and Langen (2017) argued that the zero-value for the coexistence of the labels animal welfare and local is due to the detailed knowledge that sustainability-minded consumers have on the difference between the sustainability labels such as animal welfare, local, and organic.

Notice that the option of additionally labeling animal-friendly pork as "Local" is of particular interest due to the expected minor additional cost of designing and displaying the label "Local" on the product's package. However, since this bundling strategy is useful only for pork marketed locally, the bundling cost will also depend on how large the demand for local animal-friendly pork in the targeted local market is.

The option of simultaneously labeling the pork as "Animal Friendly" and "Low Fat" is more challenging due to the additional processing work (and cost) needed to produce low-fat pork (e.g., by removing the subcutaneous and intermuscular fats). However, this bundling strategy has the advantage of the possibility of selling the low-fat pork in both local and nonlocal market, as opposed to animal-friendly pork that is labeled as "Local."

The results also showed that "pro-welfare" consumers largely discount the coexistence of the labels "Animal Friendly" and "Organic." In particular, the discount effect is expected to offset 93% of the price premium that "pro-welfare" consumers were willing to pay for organic pork. This indicates that "pro-welfare" consumers perceive the labels "Animal Friendly" and "Organic" as redundant (i.e., by definition or because consumers associate one label with the other). Consequently, the results suggest that labeling "Animal Friendly" pork as "Organic" is not a promising strategy to increase the demand for animal-friendly pork by "pro-welfare" consumers. In fact, "pro-welfare" consumers were found to heavily discount (i.e., -£1.15) the coexistence of the two labels on the same pork. After accounting for the discount, the additional benefit of labeling "Animal Friendly" pork as "Organic" is reduced to £0.08 (i.e., £1.23–£1.15), which might be insufficient to offset the considerable additional production costs that producers of animal-friendly pork are likely to incur if they convert to organic farming. Akaichi and Revoredo-Giha (2016) reported that, in the UK, the retail price difference between animal-friendly fresh pork (£7.94 per kg) and organic pork (£6.72 per kg) is as much as £1.22.

It is noteworthy that the bundling strategy that should be used to increase the desirability of animal-friendly pork does not only depend on whether the bundled labels are perceived as complements, independent or substitutes, but also on the additional costs that producers and marketers may incur when bundling the labels and how they compare to the total price premium that consumers are willing to pay for the proposed bundles (i.e., "Animal Friendly & Organic," "Animal Friendly & Local," or "Animal Friendly & Low Fat").

Third, the results showed that "pro-welfare" consumers constitute the group of UK consumers with the highest level of concern about animal welfare and the highest level of support for governmental interventions to ban production methods that do not guarantee high animal welfare standards. The results are in line with the findings from Janßen and Langen (2017). They found that consumers who positively value the use of sustainability labels have positive attitudes toward the environment and social aspects of sustainability, such as organic, local, and animal welfare.

The results showed that as much as 41% of the sampled meat consumers ("welfare-reluctant" consumers) negatively valued the use of the label "Animal Friendly," indicating this segment of "welfare-reluctant" consumers has higher preferences for conventional pork than animal-friendly pork. These findings confirm those observed by Nocella et al. (2012), who conducted a choice experiment in the UK, France, Spain, Italy, and Germany to assess consumers preferences for different sustainability labels. They found that 26% of respondents from the five countries prefer conventional to animal-friendly meat.

Interestingly, the segment of "welfare-reluctant" consumers was found to positively value the copresence of the label "Animal Friendly" and the labels "Organic" and "Local." However, the added value of the bundles "Animal Friendly & Organic" and "Animal Friendly & Local" (£0.34 and £0.36, respectively) was found to be not large enough to offset "welfare-reluctant" consumers' negative value (-£0.58) for animal-friendly pork. We think that producers and marketers of animal-friendly pork should first understand the drivers of the reluctance of this group of consumers to positively value animal-friendly pork. Then, policies and marketing strategies tailored to the needs of "welfare-reluctant" consumers could be more effective to reverse their unwillingness to pay a premium for animal-friendly pork.

The findings on the determining factors of class membership (Tables 5 and 6) showed that "welfare-reluctant" consumers are the least concerned respondents about the welfare of animals that are raised in UK farms. To understand the reasons that are possibly behind the reluctance of this segment of consumers to positively value animal-friendly pork, we analyzed their answers to some attitudinal questions included in the questionnaire used in this study. We found that 80% of "welfare-reluctant" consumers said to know little or nothing about the conditions under which animals are farmed in the UK. Furthermore, their answers to the question whose responsibility is to ensure that farm animals in the UK are raised to the highest standards of animal welfare showed that 92% and 72% of them mentioned farmers and government, respectively, as the main responsible. However, only 6% of them mentioned that it is the responsibility of consumers to ensure that farm animals are raised to high welfare standards (e.g., through purchasing only animal-friendly food products whenever available).

Therefore, "welfare-reluctant" consumers' unwillingness to pay a premium for animal-friendly pork may partially be explained by their lack of awareness of how animals are raised in conventional UK farms and their reluctance to accept responsibility for animal welfare. Policies that are designed to address this problem should provide consumers with more (and trusted) information on how farm animals are actually farmed in UK farms, and encourage them to acknowledge their role in improving farm animals' welfare (e.g., higher demand for animal-friendly meat is likely to encourage farmers to increase their supply of animal-friendly meat, and consequently improving the welfare of a larger number of farm animals).

The third segment (20% of respondents) constitute the group of consumers who are indifferent to whether the labels "Animal Friendly," "Organic," and "Local" are used or not. However, they were found to be the consumers with the highest price premium for pork labeled as "Low Fat." Nonetheless, producers and marketers of animal-friendly pork should be aware that despite the high price premium that "indifferent" consumers were willing to pay for low-fat pork, they highly discounted the use of the label "Low Fat" on pork that is also labeled as "Animal Friendly." The discount could offset as much as 80% (i.e., £2.01/£2.51) of "indifferent" consumers' price premium for the label "Low Fat."

Interestingly, the results showed that despite "indifferent" consumers do not derive higher utility from the exclusive use of the labels "Animal Friendly" and "Organic," they positively value the existence of these two labels, even though the two attributes animal welfare and organic are, to some extent, redundant by definition (i.e., organic implies that the meat is more animal friendly than conventional meat). In particular, their WTP for animal-friendly pork could significantly increase (from £0 to £1.14) if it is also labeled as "Organic." Janßen and Langen (2017) argued the positive utility that consumers derive from the coexistence of redundant sustainable labels such as animal welfare and organic could a result of poor knowledge or understanding of the detailed meaning of the labels.

Consequently, the results suggest that the labeling strategy that should be used by the producers and marketers of animal-friendly pork when targeting the segment of "indifferent" consumers is the joint labeling of pork as "Animal Friendly" and "Organic." However, it is noteworthy that the final decision must account for the cost of implementing the two labels and how it compares to consumers' price premium for the bundle.

Notwithstanding the interesting results of the study, a few limitations are worth noting. First and foremost is the use of a hypothetical choice experiment that does not involve physical products and real money. We decided to use a hypothetical choice experiment mainly because the label combinations considered in the study (e.g., "Animal Friendly & Low Fat," "Organic & Low Fat" were not available on the UK market when the data were collected. Second, our study is also limited by the choice of attributes entering the choice experiments. For example, we asked consumers to blank out the classical pork attributes in the choice decision, such as freshness, appearance, and type of pork cut. However, there is a growing body of literature (Kessels et al., 2011) suggesting that consumers are able to assume certain product attributes to be constant when participating in a choice experiment. Third, our study was limited to a specific European country and should be replicated in other countries to further validate the results and provide more valuable insights into the related literature. Last but not least, the sample size used in this study is relatively small compared to previous studies on similar topics. We opted for the use of a lab choice experiment which allowed us to (1) have more control over the experimental conditions and (2) have more time to provide respondents with a detailed explanation of the causes of hypothetical bias and why it is in the best interest of the research that they report their real preferences. However, conducting a lab choice experiment required paying participants a high participation fee (£35) to attend a one-hour experiment session. This, in turn, limited the number of participants that we could recruit. Therefore, future replication of our study using a large sample is needed to validate our results further.

DATA AVAILABILITY STATEMENT

The data will be available from the authors upon request (The data are propriety of the funder and will be made available only for the replication of the analysis and the results).

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APPENDIX 1: DESCRIPTION OF THE ATTRIBUTES AND THEIR CORRESPONDING LEVEL

The fresh pork (300 g of pork loin steaks) alternatives that we will show you in the eight choice questions differ only in five attributes:

1. Animal welfare
2. Type of production
3. Locality of the product
4. Fat content
5. Price

We will now tell you a bit more about each of the five attributes.

Animal welfare: This attribute has two levels.

- ***Animal friendly***: The fresh pork is labeled as "Animal Friendly" if it is derived from a pig that, compared to a pig raised in a conventional farm, has more space allowance, more floor solid area, and comfortable and absorbent bedding. The pig can also roam freely outdoors (free range) and has access to an outdoor shelter.
- ***No label:*** This label is used to indicate that the pork does not carry the label "Animal Friendly."

Type of production: This attribute has two levels.

Organic: The fresh pork is labelled as "Organic" if it is derived from a pig that was born and raised on organic pasture, and that during his entire life (1) had never received antibiotics and growth hormones, (2) had been fed certified organic feed, and (3) had have unrestricted outdoor access.

Not organic: This label is used to indicate that the pork does not carry the label "Organic."

Locality of the pork: This attribute has two levels.

- ***Local***: The fresh pork is labelled as "Local" if it is derived from a pig that was raised and slaughtered in Scotland.
- ***Not local:*** This label is used to indicate that the pork does not carry the label "Local."

Fat content: This attribute has two levels.

- ***Low fat***: The fresh pork is labelled as "Low Fat" if its fat content per 100 g serving is equal to or less than 3 g (3 g is equivalent to 5% of your daily intake of fat).
- ***No label:*** This label is used to indicate that the pork does not carry the label "Low Fat."

Price: This attribute refers to the price that would have to be paid to buy a package of 300 g of fresh pork. The fresh pork alternatives we will ask you to choose from may cost you: £3.19, £3.79, £4.49, or £5.29).