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Malleability of food values amid the COVID-19 pandemic

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Abstract

Food values are supposed to be stable. This paper tests this assumption by comparing food values before and during the coronavirus-19 pandemic. While the ranking of food values remains very similar, there are some interesting differences in the relative importance that consumers attached to food values before and during the pandemic. A substantial decrease in the importance that consumers attach to food safety was observed during the pandemic, while there was a moderate increase in the importance attached to taste, nutrition, appearance, convenience and origin. The changes in food values vary across sociodemographic groups. Implications of the results are discussed.

Keywords: food values, COVID-19, pandemic, stay-at-home orders, best–worst scaling

JEL classification: C83, D12, Q10

1. Introduction

The COVID-19 pandemic has significantly affected many aspects of people's daily life activities. In the USA, statewide stay-at-home and lockdown orders were in place in the vast majority of member states in the first few months of the pandemic. These directives have impacted US households in several ways (Holmes *et al.*, 2020), including job losses. The pandemic has also profoundly changed individual habits and household behaviour, especially in terms of food consumption and dietary habits (e.g. Cranfield, 2020). In the USA, a tendency

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towards panic buying and hoarding behaviour was observed in March 2020, with a 90 per cent increase in grocery store sales compared to the previous year (Lusk and McCluskey, 2020). Online buying increased during the lockdown period, and, more generally, modifications of the composition of peoples' food baskets and expenditures were observed, which were partially due to a general increase in food prices in March and April 2020 (Lusk and McCluskey, 2020).

This paper focuses on the impact that early policy responses to COVID-19 had on US consumers' food values using data collected from a survey administered in late April 2020. While changes in food purchasing patterns can be analysed in real time with data from online or in-store purchases, this type of analysis is not informative of the underlying behavioural factors (other than sociodemographic drivers) that may drive these changes in food purchasing patterns.[1] Among others, these factors include consumers' worldviews, beliefs associated with the pandemic and food values.

Building on the notion of value formulated by Rokeach (1973), Gutman (1982) developed the means-end chain theory for marketing research, which claims that stable underlying values motivate consumers' purchasing decisions. These values are different from preferences. While standard economic theory postulates that preferences are stable, empirical evidence suggests otherwise, given that preferences may depend on many factors such as the context upon which the decision is made (e.g. Alekseev, Charness and Gneezy, 2017) or the framing of the choice (e.g. Tversky and Kahneman, 1989). In contrast, 'underlying preferences' or values are stable by definition as they represent 'fundamental aspects of life' (Becker, 1976). Rokeach (1973) developed a set of 18 values (or 'enduring beliefs'), while Schwartz (1992) reduced this set to 10. More recently, Lusk and Briggeman (2009) developed a set of 11 values underlying food choices and applied the best–worst scaling (BWS) approach, developed by Finn and Louviere (1992), to investigate the importance that US consumers attach to each food value. Lusk and Briggeman (2009) argued that measuring the importance that consumers associate with food values is equivalent to understanding the underlying factors driving consumers' preferences for food products, which may then help us understand consumers' food choice behaviour more parsimoniously. They also asserted that food values can help explain consumers' food choices across a variety of food products and that they do not depend on the specific context under investigation. Since then, a number of studies have used Lusk and Briggeman's (2009) food values alongside the BWS approach to investigate food quality attributes (e.g. Lagerkvist, Okello and Karanja, 2012; Lagerkvist, 2013). More recently, Bazzani *et al.* (2018) (hereafter BGNR) explored differences in food values between US and Norwegian consumers.

In this paper, we replicated the BGNR survey in the USA in late April 2020 to explore whether the COVID-19 pandemic and early policy response put in place to limit the spread of the virus had an impact on food values of consumers. Importantly, this paper challenges the Rokeach's (1973) and

1 Unless survey based-methods are associated with this data.

Becker's (1976) idea that values are fully stable and Lusk and Briggeman's (2009) suggestion that food values do not depend on the specific context under investigation, by exploring whether food values can change in the face of extraordinary events, such as the COVID-19 pandemic. To this end, a comparison of our and BGNR's results is discussed.

The stability of food values has been scarcely investigated in the literature. A noticeable exception is the work conducted by Lusk using the Food Demand Survey (FooDS 2018). This research shows that US consumers' food values were fairly stable over the period 2013–2018. More recently, Ellison *et al.* (2021) also found that food values remained fairly stable during the first phase of the COVID-19 pandemic, from mid-March, when early school closures were enforced and stockpiling behaviour among consumers was observed, up to the end of April 2020, when the reopening phase was starting in a few states. They focused on a reduced set of five food values (i.e. how easy the food is to prepare, nutrition, price, how well the food keeps after it is bought and taste) that were elicited using Likert scales. Similarly, Tonsor and Lusk (2020) found that food values related to the purchasing of protein items did not change much during the period between February and June 2020. Preferences for food values were elicited using a survey asking respondents to indicate the four 'most important' and four 'least important' values when purchasing protein items in a set of 12 food values.

Our paper contributes to this literature by exploring whether the importance that US consumers attached to the usual set of 12 food values (as per Lusk and Briggeman 2009) remained stable before and during an epochal event such as the COVID-19 pandemic. To this end, we compare results on the importance that consumers attach to food values before (2015) and during the COVID-19 pandemic (April 2020) obtained using the BWS method. As food values have been observed to remain stable over time, we presume that potential differences in the importance attached to food values are mainly related to the COVID-19 pandemic. However, it is important to acknowledge that any such differences may be related to other causes, e.g. a series of small marginal shifts in food values that have occurred over time. These potential trends are considered when discussing the main findings of our study.

In addition, this paper explores whether observed shifts in food values are associated with some key sociodemographic factors (gender, age, education, income, presence of children in the household, living in rural or urban areas and perceived rate of infection). An understanding of how food values change across sociodemographic groups amid a pandemic could be used as a guide in the development and implementation of food policies during catastrophic events such as pandemics. For example, this information could guide policymakers in the design of policy interventions geared to mitigate irrational behaviours such as hoarding or decrease in the level of concern for food values such as food safety. A decrease in the level of consumer attention on food safety risks during a pandemic can worsen people's health and the national healthcare systems that are already under a huge amount of pressure.

Finally, as previous research shows that food values can explain the demand for food products (i.e. organic eggs and milk) (Lusk, 2011), this paper explores whether observed shifts in food values are correlated with observed shifts in food purchases during the COVID-19 pandemic. This is important in assessing the impact that food values had on purchasing decisions during the pandemic. Information on food purchases were elicited in our survey by asking respondents to report whether their purchases of specific categories of food increased, decreased or remained unchanged during the lockdown. These data were then examined along with evidence on food purchases during the lockdown reported in the extant literature.

2. Background

2.1. The impact of COVID-19 on food purchasing behaviour in the USA

In the recent past, few Black Swan events have affected western societies and their food markets—for example, the 2003 North American bovine spongiform encephalopathy crisis, the 2008–2009 financial crisis and the 2009 H1N1 pandemic. However, none of these events have caused the shutdown of entire sectors of the economy or led to drastic changes in lifestyles that are nearly comparable to those induced by the COVID-19 pandemic. Inevitably, COVID-19 has generated enormous short-term impacts on food markets worldwide.

A few studies have reported that while the pandemic and stay-at-home orders have forced the entire food service sector in the USA to practically shut down, there was an increase in expenditures for food groceries and food delivery services during the lockdown period (e.g. Alexander and Karger, 2020; Baker *et al.*, 2020; Grashuis, Skevas and Segovia, 2020; Ellison *et al.*, 2021). However, apart from US consumers' tendency to stockpile non-perishable goods, it is still not evident how the food basket of the average US consumer has changed. General figures that vouch for an increase in the amount of non-perishable goods and primary ingredients such as rice, pasta, flour and meat are reported in the literature (e.g. Lusk and McCluskey, 2020; Ellison *et al.*, 2021); however it is not clear whether this was due to an excess of demand or shortage of supply. This paper contributes to this literature by conducting a survey in which respondents were asked to report if their purchases of specific food products increased, decreased or remained unchanged during the lockdown period using 5-point Likert scales.

2.2. The impact of COVID-19 on behavioural drivers of food purchasing in the USA

Food purchasing decisions can be complex and mediated by a number of factors that may range from systemic drivers like policy and economic systems to environmental drivers such as food supply chains and marketing. They can also be influenced by environmental moderators and behavioural factors such as beliefs (e.g. Lusk, Shroeder and Tonsor, 2014; Cerroni, Notaro and Raffaeli, 2019) and food values (e.g. Lusk, 2011).

Food values are defined as stable underlying preferences for broad categories of food attributes such as nutritional value, taste and price. The relative importance that consumers associate with these food values can help explain their food purchasing and consumption decisions (Lusk and Briggeman, 2009; Lusk, 2011). The literature exploring the stability of these underlying preferences when consumers are exposed to exogenous shocks is scarce. Ellison *et al*. (2021) recently tested whether food values remained stable during the first phase of the COVID-19 pandemic in the USA (from mid-March to late April), while Tonsor and Lusk (2020) explored whether consumers' protein values changed before and during an epochal event such as the COVID-19 pandemic. We contribute to this literature by comparing US consumers' food values before (2015) and during the pandemic (2020).

2.3. Eliciting food values

The BWS method was introduced by Finn and Louviere (1992) as a development of Thurstone's paired comparison method (1927). In BWS surveys, respondents are exposed to a number of choice sets, which list a number of items. They are then asked to select what they think are the most and least important items in each choice set. The BWS approach and has been used extensively in many fields of applied economics and has been applied in many contexts like healthcare issues (e.g. Flynn *et al.*, 2007), risk perceptions related to food consumption (e.g. Erdem and Rigby, 2013), food attributes (e.g. Cohen, 2009), food values (e.g. Lusk and Briggeman, 2009) and food policies (e.g. Caputo and Lusk, 2020).

The advantages of using the BWS approach instead of traditional rating and rankings techniques to elicit values are widely discussed in the literature (e.g. Lee, Soutar and Louviere, 2007; Lagerkvist, 2013). BWS can minimise a number of biases produced by rating and ranking approaches such as acquiescence bias (Schwartz and Bardi, 2001), 'edge avoidance' effect (Rubinstein, Tversky and Heller, 1997) and middle bias effect (Attali and Bar-Hillel, 2003). Most importantly, BWS allows the measurement of scales at the individual level, while other methods do not (Lusk and Briggeman 2009). To the best of our knowledge, this paper is the first attempt to use BWS to explore the stability of food values amid the COVID-19 pandemic. The respondents were asked (Ellison *et al*. 2021) to rate the importance they attach to a reduced set of five food values using Likert scales.

3. Methods

3.1. Sample, sampling procedure and survey administration

Our sample consists of 616 US consumers who were recruited using a stratified sampling procedure based on gender and age. The questionnaire was administered online via Dynata using the online survey platform Qualtrics during the period 20–25 April 2020.[2] After the sharp increase in the

2 The full set of survey instructions are available in the online Supplementary Appendix A (Appendix in supplementary data at ERAE online).

number of COVID-19 cases that was observed between mid-March until the first week of April, with a peak of 43,438 new cases on 6 April 2020, there was a reduction in the number of new cases (CDC, 2020). During the period of time when the survey was conducted, the number of new cases of COVID-19 remained approximately constant and oscillated between 25,858 and 37,144 per day. The cumulative rate of hospitalised people since 1 March 2020 (up to 25 April 2020) was 40.4 per 100,000 people, while the percentage of deaths attributed to pneumonia, influenza or COVID-19 was 14.6 per cent during that week (CDC, 2020). Strict stay-at-home and lockdown policies were enforced in the vast majority of US states. Some states like Alaska and Georgia were the first to ease up these policies on 24 April 2020 (NBCNews, 2020).

Our sample aims to be representative of the US population and comparable with BGNR's sample (Table 1). About 56 per cent of our sample is female, compared to 51 per cent for the BGNR's sample and the US population. The average age of our sample (47 years) is slightly higher than the BGNR's sample (40 years) and the US population (39 years). Our sample, on average, also has higher levels of education than the BGNR's sample and the US population. While there are no substantial differences in the marital status and the proportion of people living in rural areas across samples, the average number of children in the household is lower than in the BGNR's sample and the US population. The gross annual income in our sample is slightly higher than the BGNR's sample and the US population. Given some differences in the samples, we also conducted a multivariate weighting procedure to make our sample more comparable to the BGNR's sample and check the robustness of our results.[3,4]

3.2. The best–worst scaling survey

The survey is composed of three sections. In the first section, respondents were exposed to a set of Likert scale type questions regarding whether the amount of different typologies of purchased food decreased, remained unchanged or increased during the lockdown. Scales from 1 (decreased substantially) to 7 (increased substantially) were used. The types of food examined were pasta, rice, flour, olive oil and vinegar, bread and bakery products, meat, fish, eggs, milk and dairy products, frozen foods, canned foods, ready meals, vegetables, fruit, snacks and cookies, organic products, gluten-free and lactose-free products, bottled water and soft drinks, and alcoholic beverages.

3 We balanced our sample for the following variables: gender, age, education, income, presence of children in the household and living in a rural or urban area. A rim weighting procedure was implemented to calculate the weighting coefficient. Probability shares at the individual level were then weighted using the weighting coefficients. The rim weighting procedure is fully described in the online Supplementary Appendix B (Appendix in supplementary data at ERAE online).

4 Tests on the quality and reliability of collected data were performed. Results that are presented in the online Supplementary Appendix C (Appendix in supplementary data at ERAE online) do not raise any major concern. We thank an anonymous referee for this suggestion.

Table 1. Demographic and socio-economic distribution in the samples pre- and post-COVID-19

	COVID-19 sample	Pre-COVID-19 (BGNR) sample	US population[a]
Female (%)	56	51	51
Age (years)	47	40	39
Education (%)			
Less than high school	1	3	17
High school	14	46	55
University degree	61	38	18
Post-university degree	25	13	10
Marital status (%)			
Married	50	48	50
Cohabitant	6	7	NA
Never been married	29	32	31
Separated or divorced	12	12	12
Widow or widower	2	1	7
Number of children in household (%)			
No children	71	55	58
One child	11	19	18
Two children	13	16	16
More than two	5	10	8
Income (gross annual income) (%)[b]			
Less than $15,000	7	12	NA
$15,000–29,000	11	17	NA
$30,000–44,000	12	14	NA
$45,000–59,000	11	13	NA
$60,000–74,000	10	12	NA
$75,000–89,000	12	11	NA
$90,000–119,000	14	10	NA
$120,000–49,000	12	6	NA
$150,000 or more	11	5	NA
Rural area (%)[c]	14	18	19

[a]Values from the United States Census Bureau (2017).
[b]The median value for the US population is $53,718.
[c]In our and Bazzani *et al.* (2018) surveys, we defined rural area as a settlement with a population of less than 1,000 individuals.

In the second section, respondents were asked to complete a BWS survey that replicated the one used by BGNR. The survey included the following food values: naturalness, safety, environmental impact, origin, animal welfare, fairness and nutrition (credence values), taste, appearance, convenience and novelty (experience values) and price (price values) (see Table 2). Each respondent was asked to select the most and least important item (i.e. food value) in each of the 12 choice sets. Each choice set presented a subset of four items. Each item appeared four times in the survey. As discussed by BGNR, the 12 choice sets were generated using a nearly balanced incomplete block design with a D-efficiency score of 98.71 per cent. The order of choice sets

Table 2. Food values presented in the best–worst scaling survey

Value category	Value	Description
Credence	Naturalness	Made without modern food technologies like genetic engineering, hormone treatment and food irradiation
	Safety	Eating the food will not make you sick
	Environmental impact	Effects of food production on the environment
	Origin	Whether the food is produced locally, in USA or abroad
	Animal welfare	Well-being of farm animals
	Fairness	Farmers, processors and retailers get a fair share of the price
	Nutrition	Amount and type of fat, protein, etc.
Experience	Taste	Flavour of the food in your mouth
	Appearance	Food looks appealing and appetising
	Convenience	How easy and fast the food is to cook and eat
	Novelty	Food is something new that you have not tried before
Price	Price	Price you pay for the food

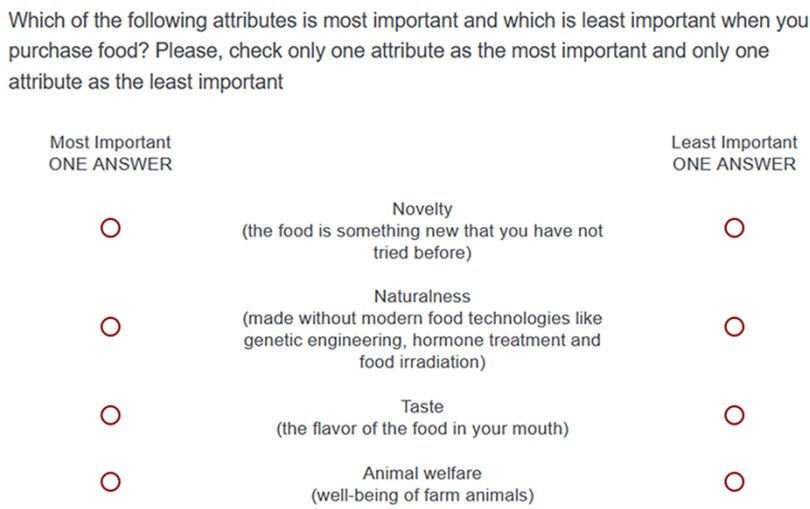

Fig. 1. An example of best–worst scaling choice set in the survey.

was randomised across respondents. An example of the choice set is provided in Figure 1. In the last section of the survey, sociodemographic characteristics were elicited.

3.3. Choice modelling, estimation procedures and preference shares

Following Lusk and Briggeman (2009) and BGNR, we estimated random parameter (RP) maxdiff models. This model was originally proposed by Finn and Louviere (1992) and assumes that respondents simultaneously choose the pair of best (i.e. most important) and the worst (i.e. least important) items that maximise the difference between the two chosen items on an underlying scale of importance.

Assuming that there are J items listed in each choice set t, then the number of possible pairs is $J(J-1)$. The observable level of importance of the item j on the underlying scale is defined as λ_j, while the unobservable level of importance for respondent i is given by $I_{ij} = \lambda_j + \varepsilon_{ij}$, where ε_{ij} is a random error term. The maxdiff model is rooted in random utility theory (McFadden, 1974) and postulates that the probability that respondent i selects item j as the best and item k as the worst in choice set t equals the probability that the difference in utility of the selected items (I_{ij} and I_{ik}) is greater than all the other $M = J(J-1) - 1$ possible differences in the choice set. If the ε_{ij} is assumed to be *iid* type I extreme value, then this probability takes the familiar multinomial logit form.

$$P_{ijkt} = \exp(\lambda_{ijt} - \lambda_{ikt}) \Big/ \sum_{l=1}^{J} \sum_{m=1}^{J} \exp(\lambda_{ilt} - \lambda_{imt}) - J \tag{1}$$

The estimated λ_j represents the importance of the item j relative to some item that is normalised to zero for identification purposes. The item that was normalised to zero was *NOVELTY*.[5]

Our modelling approach allows heterogeneity in preferences for the various food values and assumes that estimated parameters λ_j are distributed according to a multivariate normal distribution with means and standard deviations to be estimated. Therefore, the probability expressed in equation 1 takes the random parameter logit (RPL) form and can be estimated using the maximum simulated likelihood estimator.

Following Lusk and Briggeman (2009) and BGNR, we calculated the share of preference S_j for each item j (relative to the item that was normalised to zero for identification purposes during the estimation procedure) as follows:

$$S_j = \frac{e^{\widehat{\lambda_j}}}{\sum_{k=1}^{j} e^{\widehat{\lambda_l}}} \tag{2}$$

A distribution of 1,000 preference shares for each item j was drawn from a multivariate normal distribution created using the means and standard deviations estimated for each item j from our RPL model. The bootstrapping method proposed by Krinsky and Robb (1986) was used to generate such distributions following Caputo and Lusk (2020).

The share of preference S_j for each item j can be interpreted as the relative importance of the item j with respect to all other items and more intuitively as

5 Novelty was the least important food value, based on the calculation of the per cent of times each item was selected best or worst (as per BGNR).

the forecasted probability that the item j is chosen as the most important. The use of share of preference S_j to interpret results is very convenient because it avoids any potential confounding between the estimated λ_j and potential differences in scale (Train, 2009).

3.4. Comparing preference shares during and before the COVID-19 pandemic

To compare preference shares S_j during and before the COVID-19 pandemic ($S_{j,COVID19}$ and $S_{j,PRE-COVID19}$, respectively), we implemented the following procedure. First, we estimated two RPL models, one using data from our BWS survey and the other using data collected by BGNR in 2015.

Second, we tested the overall equality of preferences estimated using the two data sets via the likelihood ratio test (LRT) proposed by Swait and Louviere (1993). This LRT requires the estimation of a RPL model on the pooled sample while controlling for potential differences in scales across the two data sets. The LRT is based on the test statistic $\lambda = -2[L_\mu - (L_{COVID19} - L_{PRE-COVID19})]$, where L_μ is the log-likelihood value from the estimation of the RPL model using the pooled model, $L_{COVID19}$ is the log-likelihood value from the estimation of the RPL model using the COVID-19 sample and $L_{PRE-COVID19}$ is the log-likelihood value from the estimation of the RPL model using the PRE-COVID-19 sample. The test statistic is asymptotically chi-squared distributed with $K + 1$ degrees of freedom, where K is the number of coefficients estimated in the three models.

Third, if the null hypotheses of overall equality of preferences between the two original samples are rejected, we test whether differences in pairs of preference shares calculated as $\Delta S = S_{j,COVID19} - S_{j,PRE-COVID19}$ are statistically significant or not using Poe *et al.*'s (2005) tests based on the convolution approach.[6]

3.5. The impact of sociodemographics on shares during the COVID-19 pandemic

Following BGNR, we also investigated the effect of some key sociodemographic variables on food values by estimating RPL models with interaction effects. In this modelling approach, each food value is interacted with the following set of sociodemographic variables: (i) *FEMALE*, which is equal to 1 if participants are female (otherwise = 0); (ii) *YOUNGER*, which is equal to 1 if participant's age is lower than the median value (48 years) (otherwise = 0); (iii) *LOW_EDUCATION*, which is equal to 1 if participant's level of education is lower than the median value (4 years college) (otherwise = 0); (iv) *LOW_INCOME*, which is equal to 1 if participant's household annual total gross income is lower than the median value ($74.000) (otherwise = 0); (v) *NO_CHILDREN*, which is equal to 1 if participant's household has no children (otherwise = 0); (vi) *RURAL*, which is equal to 1 if participant lives in a town

6 We thank an anonymous referee for suggesting this testing procedure.

with less than 1000 inhabitants (otherwise = 0); (vii) *HIGH_INFECTION*, which is equal to 1 if participant's perceived rate of infection was very high or high.[7]

Preference shares are computed for each segment of the population using the procedure presented in Section 3.3, and potential differences across different segments are explored using Poe *et al.*'s (2005) tests. More specifically, we focus on the comparisons $\Delta S_{i,j} = S_{i=1,j} - S_{i=0,j}$, where j is the food value and i is the sociodemographic variable, which can take a value equal to 1 or 0. The comparisons that are investigated are as follows: female vs male, youngster vs elderly, lower vs higher levels of education, households with children vs households without children, lower and higher levels of income, rural vs urban households and high vs low perceived infection rate.

4. Results

4.1. Food values and preference shares before and during the COVID-19 pandemic

Results from the estimation of the two RPL models and the estimation of related preference shares using the weighted sample are reported in Tables 3 and 4, respectively.[8] A graphical representation of differences in food values before and during the COVID-19 pandemic is provided in Figure 2. The ranking of food values appears to be similar. The only main difference is that *APPEARANCE* becomes more important than *FAIRNESS* (farmers, processors and retailers get a fair share of the price) and *ENVIRONMENTAL IMPACT* during the COVID-19 pandemic as compared to the pre-COVID-19 situation (BGNR). However, Swait and Louviere's (1993) LRT suggests that preferences estimated using the two data sets are not equal overall ($\lambda = 543.76$; $p < 0.001$, d.f. = 78).[9]

7 We used the same thresholds as BGNR. We could have used the median value of the current US population as thresholds, but we decided to use this approach to make our study comparable with BGNR.

8 Several robustness checks of results were conducted. Results from the estimation of multinomial logit models and related preference shares are presented in the online Supplementary Appendix D (Appendix in supplementary data at ERAE online). Results from the estimation of one RPL model with a set of interaction terms capturing differences in preferences for food values between our survey and the BNGR study are reported in the online Supplementary Appendix E (Appendix in supplementary data at ERAE online). This model is estimated by pooling the two data sets. Results on preference shares from the estimation of the two RPL models using the unweighted sample are presented in the online Supplementary Appendix F (Appendix in supplementary data at ERAE online).

9 The test required the estimation of two RPL models using a data set obtained by pooling the two original data sets. One model controls for potential differences in scales across the two data sets, and the other does not. Estimation results (reported in the online Supplementary Appendix G (Appendix in supplementary data at ERAE online)) show the difference in the scale parameter across groups and indicate that choices in the new survey are slightly more deterministic than those in BGNR ($\tau = 0.109$, $p < 0.01$). This may have implications on the differences in preference shares that we observed as there is a potential confounding between preference and scale heterogeneity (see discussion in Hess and Train, 2017). However, this may not represent an issue but rather an additional interesting result if the possibility that randomness/determinism of choices related to the COVID-19 pandemic is not ruled out. During the early stages of the pandemic, food

Table 3. Random parameter logit models[a,b]

	COVID-19 sample		Pre-COVID-19 (BGNR) sample	
Dep. var: choice	Mean	Standard deviation	Mean	Standard deviation
APPEARANCE	2.103***	1.739***	1.983***	1.657***
	(0.072)	(0.076)	(0.054)	(0.063)
FAIRNESS	1.900***	1.854***	1.996***	1.914***
	(0.069)	(0.072)	(0.053)	(0.056)
ORIGIN	1.597***	1.984***	1.472***	1.682***
	(0.070)	(0.072)	(0.052)	(0.052)
CONVENIENCE	1.614***	1.911***	1.246***	1.437***
	(0.083)	(0.072)	(0.046)	(0.053)
TASTE	3.677***	2.514***	3.759***	2.533***
	(0.115)	(0.081)	(0.065)	(0.066)
ANIMAL WELFARE	2.078***	2.203***	2.458***	2.558***
	(0.075)	(0.075)	(0.059)	(0.063)
NATURALNESS	2.261***	2.478***	2.629***	2.496***
	(0.072)	(0.073)	(0.057)	(0.057)
NUTRITION	3.345***	2.557***	3.359***	2.441***
	(0.080)	(0.077)	(0.061)	(0.060)
PRICE	2.822***	2.889***	3.125***	2.673***
	(0.078)	(0.081)	(0.060)	(0.063)
SAFETY	4.260***	3.090***	4.783***	3.480***
	(0.089)	(0.086)	(0.074)	(0.075)
ENVIRONMENTAL IMPACT	1.675***	2.104***	2.132***	2.204***
	(0.071)	(0.076)	(0.055)	(0.058)
Observations	7,392		12,300	
Log-likelihood	−13,757.89		−22,290.23	
AIC[c]	27,670.12		44,435.22	
BIC[d]	28,202.45		45,306.56	

***$p < 0.01$,
**$p < 0.05$,
*$p < 0.10$.
[a]Standard errors in brackets.
[b]The coefficient related to *NOVELTY* is not present as this food value is used as baseline.
[c]AIC is the Akaike information criterion.
[d]BIC is the Bayesian information criterion.

Hence, we explore whether preference shares of each food value increased, decreased or remained unchanged before and during the pandemic. Interestingly, we observed that some food values gained importance during the lockdown (*TASTE, NUTRITION, APPEARANCE, CONVENIENCE* and *ORIGIN*), while others lost importance (*SAFETY, ENVIRONMENTAL IMPACT* and *NOVELTY*), and some remained unchanged (*PRICE*, *NATURALNESS* and

became an important part of people's daily lives (even more than before) and it is plausible that our respondents were more attentive to the tasks they were asked to complete than in BGNR.

Table 4. Share of preferences before and during the COVID-19 pandemic[a]

Ranking (top-down)	COVID-19 sample	Ranking (top-down)	Pre-COVID-19 (BGNR) sample	Food value	Difference preference share
SAFETY	0.335	*SAFETY*	0.442	*SAFETY*	−0.107***
TASTE	0.189	*TASTE*	0.153	*TASTE*	0.036**
NUTRITION	0.138	*NUTRITION*	0.108	*NUTRITION*	0.030***
PRICE	0.077	*PRICE*	0.082	*PRICE*	−0.005
NATURALNESS	0.051	*NATURALNESS*	0.054	*NATURALNESS*	−0.003*
APPEARANCE	0.043	*APPEARANCE*	0.025	*APPEARANCE*	0.018***
ANIMAL WELFARE	0.043	*ANIMAL WELFARE*	0.043	*ANIMAL WELFARE*	0.000**
FAIRNESS	0.036	*FAIRNESS*	0.027	*FAIRNESS*	0.009*
ENVIRONMENTAL IMPACT	0.029	*ENVIRONMENTAL IMPACT*	0.032	*ENVIRONMENTAL IMPACT*	−0.003**
ORIGIN	0.027	*ORIGIN*	0.017	*ORIGIN*	0.010***
CONVENIENCE	0.026	*CONVENIENCE*	0.013	*CONVENIENCE*	0.013***
NOVELTY	0.006	*NOVELTY*	0.004	*NOVELTY*	−0.002***

***$p < 0.01$,
**$p < 0.05$,
*$p < 0.10$.
[a]Statistical significance levels are related to the results from Poe *et al.*'s (2005) test.

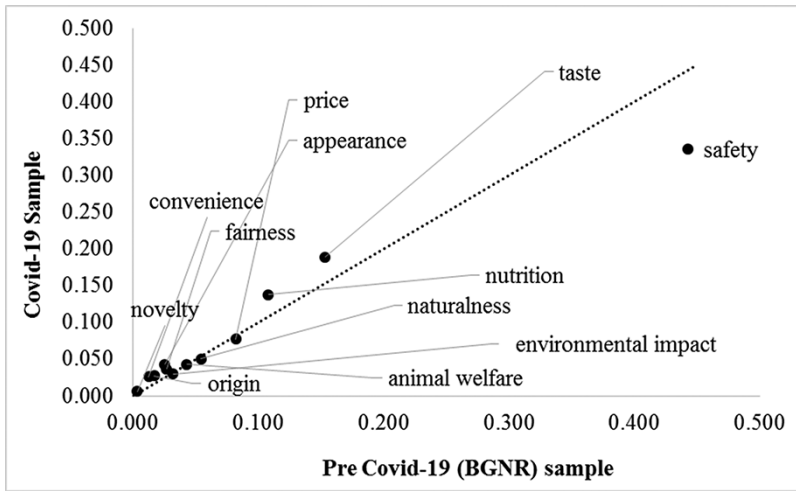

Fig. 2. Preference shares obtained in the COVID-19 and pre-COVID-19 samples (BGNR).

FAIRNESS) as compared to the pre-COVID-19 period. The fact that three out of four experience type food values gained importance during the pandemic and respondents' level of concern regarding most of credence type food values decreased or remained unchanged may suggest an increase in the influence of experiential food attributes on US consumers' purchasing behaviour during the pandemic.

Specifically, we observed that US consumers considerably lost interest in food *SAFETY* during the pandemic ($\Delta S = -0.107$; $p < 0.01$)[10] although it still remained the most important food value for them. A nationwide survey with 1,000 respondents that was conducted by the International Food Information Council (IFIC, 2020a) in the period 6–7 April 2020 indicates that a large part of the sample (82 per cent) was confident or very confident about the safety of the food they eat. Results from the same survey conducted in the period 2013–2019 show that US consumers were not that confident in food safety before the pandemic (IFIC, 2015, 2016, 2018, 2019). The proportion of consumers who were confident and very confident about food safety fluctuated in the period between 2013 and 2019, with a minimum of 61 per cent in 2015 and a maximum of 76 per cent in 2014 and 2016. It was 68 per cent in the 2 years before the pandemic (2018 and 2019). This trend suggests that US consumers were more confident about food safety and hence less concerned about food safety during the early stages of the pandemic than in previous years. This finding could be related to the fact that nearly 50 per cent of the US population declared an increase in eating of home-cooked meals since eating out became much less of an option given stay-at-home orders (IFIC, 2020a). It could be

10 The statistical significance levels reported in brackets in the remaining part of the section are related to Poe *et al.*'s (2005) tests.

possible that having more control on the food they ate made consumers more confident about food safety and hence less concerned about this food value.

While the decrease in the importance that US consumers attached to *ENVIRONMENTAL IMPACT* ($\Delta S = -0.002$; $p < 0.05$) and *NOVELTY* ($\Delta S = -0.002$; $p < 0.01$) is marginal, it shows that consumers might be substituting non-essential and high-price food options and reducing the purchase of some niche and premium-priced food products, as suggested by Cranfield (2020).

The two food values that increased their importance more during the lockdown were *TASTE* ($\Delta S = 0.035$; $p < 0.05$) and nutritional value (*NUTRITION*) ($\Delta S = 0.030$; $p < 0.01$), which were also two of the most important food values before the pandemic (Lusk and Briggeman, 2009; BGNR, 2018). The fact that food *TASTE* gained importance is not surprising as taste changes have been extensively reported in the literature (e.g. Gao, Richards and Kagan, 1997a; Gao, Wailes and Cramer, 1997b). Also, Ellison *et al.* (2021) found that taste was an important food value during the COVID-19 pandemic. Previous research has shown that during uncertain times and when under emotional stress, people change their eating behaviour and often like to find comfort from food that is familiar, reassuring, pleasant and tasty (e.g. Leith and Baumeister, 1996; Zellner *et al.*, 2006). Also, during the lockdown, the majority of people were less affected by time constraints and had more time to spend at home cooking and eating more elaborated and less frugal meals. Lusk and McCluskey's (2020) and the IFIC's (2020a) surveys reported that home cooking increased significantly during the stay-at-home orders. However, a portion of consumers reacted differently to the pandemic. The IFIC survey also suggests that 16 per cent of respondents increased their take-out/delivery meals, and 18 per cent reported an increase in the eating of pre-made meals. Data collected in the first part of our survey indicate that approximately 23 per cent of respondents increased their purchasing of ready meals, while only 13 per cent decreased it. Our survey also shows that approximately 48 per cent of them increased the purchasing of frozen and canned food, while only 9 per cent decreased it.[11] These observed and reported shifts in consumer behaviour may be driven by the increase in the importance that US consumers attached to *CONVENIENCE* ($\Delta S = 0.013$; $p < 0.01$) during the pandemic.

During the early stages of the pandemic, we observed an increase in the consumption of healthier and more nutritious food options. In the IFIC's May survey (2020b), 43 per cent of respondents reported that their eating habits were healthier since the pandemic began. In the first part of our survey, about 40 per cent of respondents reported an increase in the purchasing of fruit and vegetables, while only 10 per cent reported a decrease. This shift in purchasing and eating behaviour can be explained by the greater importance that our respondents attached to the food value *NUTRITION*.

11 Summary statistics regarding the food purchasing behaviour elicited in the first part of the survey are reported in the online Supplementary Appendix H (Appendix in supplementary data at ERAE online).

Our results also suggest that the importance of *APPEARANCE* ($\Delta S = 0.018$; $p < 0.01$) and *ORIGIN* ($\Delta S = 0.010$; $p < 0.01$) increased during the pandemic. These results are not unexpected as these attributes are often used by consumers as proxy for food quality, healthiness and safety (e.g. Umberger, 2010; Lim, Maynard and Goddard, 2014; de Hooge *et al.*, 2017).[12]

4.2. Food values and preference shares by sociodemographic variables

Table 5 shows the results from the estimation of the RPL model with interaction effects, while Table 6 exhibits the differences in preference shares between sociodemographic groups.[13] Here, we only discuss results related to the food values whose importance significantly changed before and during the pandemic, namely *SAFETY*, *TASTE*, *NUTRITION*, *APPEARANCE*, *ORIGIN* and *CONVENIENCE*.

Regarding *SAFETY*, we observed that, during the early stages of the pandemic, females are more concerned than males about this food value ($\Delta S = +0.074$; $p < 0.01$). As in the BGNR's sample before the pandemic, we find that younger consumers gave less importance to *SAFETY* than older consumers ($\Delta S = -0.092$; $p < 0.01$). These results are consistent with previous findings (IFIC, 2016, 2020a), indicating that male and older consumers are more confident about the safety of the food they eat. Similarly, this is consistent with the large literature in risk preferences, indicating than females and the elderly are generally more risk-averse than males and younger people (e.g. Eckel and Grossman, 2002; Dohmen *et al.*, 2017; Cerroni, 2020). In contrast, while BGNR found no difference in the importance attached by consumers with lower and higher levels of education before the pandemic, we observe that consumers with lower levels of education are less concerned about *SAFETY* ($\Delta S = -0.033$; $p < 0.01$) as compared to those respondents with higher levels of education. Overall, these results show that the pandemic had an influence on the importance that some segments of the population attach to *SAFETY*.

Our results also suggest that respondents with lower levels of income attach less importance to *TASTE* than those with higher levels of income ($\Delta S = -0.041$; $p < 0.01$) during the pandemic. Respondents without children are more concerned about *TASTE* than those with children ($\Delta S = +0.043$; $p < 0.01$). These results are consistent with the findings by BGNR, suggesting that these sociodemographic segments did not change their preferences for *TASTE* before and during the pandemic. In contrast to BGNR, however, we find that respondents with lower levels of education attach more importance to *TASTE* than those with higher levels of education ($\Delta S = +0.029$; $p < 0.01$).

12 Results obtained using the unweighted sample are provided in Table B.2. in the online Supplementary Appendix B (Appendix in supplementary data at ERAE online). These results are very similar to the ones calculated using the weighted sample and imply that the slight differences in the composition of our sample and BGNR's sample do not affect our findings.

13 Results from the estimation of multinomial logit models and related preference shares are presented in the online Supplementary Appendix I (Appendix in supplementary data at ERAE online).

Table 5. Random parameter logit model[a,b]

Dep. var: choice	Main effects		Interaction effects						
Mean values	Mean	Standard deviation	Female	Young	Low education	Low income	Rural	No children	High infection rate
APPEARANCE	2.373***	1.411***	0.203**	−0.714***	−0.118	0.027	0.309**	0.130	−0.161*
	(0.119)	(0.075)	(0.064)	(0.069)	(0.074)	(0.067)	(0.099)	(0.070)	(0.066)
FAIRNESS	2.207***	1.773***	0.386***	−0.492***	−0.263***	0.189**	0.405***	0.093	−0.188**
	(0.116)	(0.075)	(0.063	(0.067)	(0.073)	(0.067)	(0.098)	(0.070)	(0.064)
ORIGIN	2.089***	2.060***	0.297***	−0.594***	−0.314***	0.274***	0.397***	−0.120	−0.075
	(0.114)	(0.074)	(0.064)	(0.069)	(0.074)	(0.069)	(0.097)	(0.072)	(0.066)
CONVENIENCE	1.788***	1.768***	0.003	−0.195**	−0.183*	0.276***	0.076	0.075	−0.133*
	(0.110)	(0.069)	(0.061)	(0.065)	(0.073)	(0.065)	(0.093)	(0.068)	(0.064)
TASTE	3.676***	2.098***	0.399***	−0.668***	−0.088	−0.147*	0.139	0.385***	−0.405***
	(0.128)	(0.078)	(0.069)	(0.075)	(0.080)	(0.074)	(0.103)	(0.076)	(0.071)
ANIMAL WELFARE	1.997***	2.176***	0.429***	−0.304***	0.029	0.097	0.208*	0.188*	−0.318***
	(0.116)	(0.077)	(0.067)	(0.071)	(0.076)	(0.071)	(0.098)	(0.074)	(0.068)
NATURALNESS	2.312***	2.513***	0.689***	−0.458***	−0.173*	−0.088	0.032	0.008	−0.096
	(0.115)	(0.076)	(0.065)	(0.070)	(0.075)	(0.068)	(0.096)	(0.073)	(0.067)
NUTRITION	3.408***	2.389***	0.516***	−0.735***	−0.202*	−0.235**	0.006	0.175*	−0.281***
	(0.125)	(0.079)	(0.068)	(0.073)	(0.078)	(0.072)	(0.100)	(0.076)	(0.069)
PRICE	3.016***	2.591***	0.377***	−0.561***	−0.302***	0.303***	0.239*	0.389***	−0.367***
	(0.123)	(0.077)	(0.068)	(0.073)	(0.079)	(0.072)	(0.100)	(0.074)	(0.069)

(continued)

Table 5. (Continued)

Dep. var: choice	Main effects		Interaction effects						
Mean values	Mean	Standard deviation	Female	Young	Low education	Low income	Rural	No children	High infection rate
SAFETY	4.494***	2.859***	0.696***	−0.918***	−0.310***	0.079	0.224*	0.196*	−0.315***
	(0.140)	(0.090)	(0.070)	(0.077)	(0.083)	(0.074)	(0.109)	(0.077)	(0.071)
ENVIRONMENTAL IMPACT	1.865***	2.109***	0.396***	−0.114	−0.298***	0.134*	0.199*	0.194**	−0.124
	(0.115)	(0.076)	(0.065)	(0.069)	(0.075)	(0.068)	(0.096)	(0.072)	(0.066)
Observations	7,392								
Log-likelihood	−13,602.12								
AIC[c]	27,513.01								
BIC[d]	28,576.87								

***$p < 0.01$,
**$p < 0.05$,
*$p < 0.10$.
[a]Standard errors in brackets.
[b]The coefficient related to *NOVELTY* is not present as this food value is used as baseline.
[c]AIC is the Akaike information criterion.
[d]BIC is the Bayesian information criterion.

Table 6. Difference in the share of preferences across sociodemographic groups during the COVID-19 pandemic[a]

Mean values	ΔS (female vs male)	ΔS (younger vs older)	ΔS (lower vs higher education)	ΔS (lower vs higher income)	ΔS (rural vs urban)	ΔS (no children vs children)	ΔS (high vs low infection rate)
APPEARANCE	−0.020***	−0.006**	−0.007**	−0.001	+0.009***	−0.005*	+0.008***
FAIRNESS	−0.006*	+0.010***	+0.004***	+0.011***	+0.016***	−0.008**	+0.006*
ORIGIN	−0.013***	+0.003	−0.008*	+0.018***	+0.016***	−0.024***	+0.015***
CONVENIENCE	−0.023***	+0.022***	+0.001	+0.012***	−0.005	−0.006**	+0.007***
TASTE	−0.018*	−0.006	+0.029***	−0.041***	−0.010	+0.043***	−0.031***
ANIMAL WELFARE	−0.003	+0.025***	+0.018***	+0.005	+0.002	−0.001	−0.004
NATURALNESS	+0.021***	+0.017***	+0.004	−0.012**	−0.015***	−0.019***	+0.017***
NUTRITION	+0.008	−0.019**	+0.002	−0.052***	−0.035***	−0.005	−0.002
PRICE	−0.013*	+0.010	−0.012*	+0.037***	+0.008	+0.026***	−0.013*
SAFETY	+0.074***	−0.092***	−0.033**	+0.016	+0.014	−0.002	−0.014
ENVIRONMENTAL IMPACT	−0.005	+0.034***	−0.006*	+0.006	+0.001	−0.000	+0.009**
NOVELTY	−0.002***	+0.003***	+0.001***	−0.001*	−0.001***	−0.001***	+0.001***

***$p < 0.01$,
**$p < 0.05$,
*$p < 0.10$.
[a]Statistical significance levels are related to the results from the Poe *et al.*'s (2005) test.

Interestingly, respondents who perceive to live in an area where the infection rate is high are less concerned about *TASTE* than those living in an area where the perceived infection rate is low ($\Delta S = -0.031$; $p < 0.01$).

Regarding *NUTRITION*, we find that younger respondents are less concerned about this food value than older ones ($\Delta S = -0.019$; $p < 0.01$). This result contrasts BGNR's findings, showing that the COVID-19 pandemic influenced the concern of this segment of the population for this food value. Also, these results are consistent with information collected in the first part of the survey, which shows that the percentage of younger consumers who increased the purchasing of ready meals and snacks during the lockdown is higher than the percentage of older consumers (29 per cent vs 17 per cent for ready meals, and 49 per cent vs 32 per cent for snacks). In addition, we found that respondents with lower levels of income ($\Delta S = -0.052$; $p < 0.01$) and those living in rural areas ($\Delta S = -0.035$; $p < 0.01$) gave less importance to *NUTRITION* than those with higher levels of income and living in urban areas, respectively. This is consistent with BGNR's findings and can explain some of the results on purchasing behaviour collected in the first part of our survey. Approximately 44 per cent of respondents with high income reported an increase in the purchasing of fruit and vegetables during the pandemic, while 36 per cent of respondents with lower incomes reported the same. Similarly, 41 per cent of respondents living in urban areas reported an increase in the purchasing of fruit and vegetables during the pandemic, while 36 per cent of respondents living in rural areas reported the same.

Our results on *APPEARANCE* show that females are less concerned than males about this food value during the pandemic ($\Delta S = -0.020$; $p < 0.01$). This is the only significant and substantial difference we observe for *APPEARANCE* across sociodemographic groups.

Regarding *ORIGIN*, we find that females are less concerned about this food value than males ($\Delta S = -0.013$; $p < 0.01$). In addition, our results indicate that respondents without children are less concerned about *ORIGIN* than those with children ($\Delta S = -0.024$; $p < 0.01$), while those respondents living in rural areas ($\Delta S = +0.016$; $p < 0.01$) and having lower levels of income ($\Delta S = +0.018$; $p < 0.01$) attach more importance to this food value than their respective counterparts. These results differ from BGNR who found no significant differences about these food values across these sociodemographic groups. Also, we find that the perceived infection rate has an influence on the importance attached by respondents to this food value; specifically, those who reported to live in an area where the infection rate is high are more concerned about *ORIGIN* than those living in an area where the perceived infection rate is low ($\Delta S = +0.015$; $p < 0.01$).

Finally, our results suggest that females gave less importance to *CONVENIENCE* than males during the pandemic ($\Delta S = -0.015$; $p < 0.01$). Data collected in the first part of the survey suggest that approximately 45, 44 and 18 per cent of female respondents increased the amount of purchased frozen food, canned food and ready meals, respectively, while approximately 52, 51 and 30 per cent of males increased the purchasing of these food products. In

addition, we find that younger respondents are more interested in this food value during the pandemic than older ones ($\Delta S = +0.022; p < 0.01$). The latter result is consistent with previous findings from BGNR and can explain the purchasing behaviour elicited in the first part of the survey, which shows that the percentage of younger respondents reporting an increase in the amount of purchased frozen food, canned food and ready meals was 57, 51 and 29 per cent, respectively, while approximately 40, 42 and 17 per cent of older consumers increased the purchasing of these food products.

5. Discussion

Overall, our results suggest that US consumers' ranking of food values did not change substantially during the COVID-19 pandemic as compared to the pre-COVID-19 period. For example, *SAFETY, TASTE, NUTRITION* and *PRICE* always occupied the first four ranks before and during the pandemic. This finding implies that values are rather stable over time as they were predicted to be by Rokeach (1973) and Becker *et al*. (1976) and that even an epochal event such as the COVID-19 pandemic cannot generate considerable shifts, as also observed by Tonsor and Lusk (2020) and Ellison *et al*. (2021).

However, in contrast to the previous literature, we detected important shifts in some preference shares. For example, we found that the pandemic had a larger impact on the importance that US consumers attached to experience type values as compared to credence type values. Consumers' concern about *SAFETY* decreased considerably, while their concern about other credence type attributes remained virtually unchanged before and during the pandemic with the exception of *NUTRITION* and *ORIGIN*. The importance that US consumers attached to the former increased moderately, while the importance attached to the latter increased slightly.

It is important to note that shifts in food values varied across sociodemographic groups. For example, the decrease in importance observed for *SAFETY*, which has always been a very important food value for US consumers (Lusk and Briggeman, 2009; BGNR 2018), is mainly driven by the fact that males and younger consumers were less concerned about this food value than females and older consumers during the lockdown. In contrast, males gave more importance to experience type food values such as *TASTE, CONVENIENCE* and *APPEARANCE* during the lockdown. Similarly, we found that the increase in importance observed for *NUTRITION* is driven by the fact that younger consumers, those with lower income levels and those living in rural areas were less concerned about this food value during the lockdown.

Regarding experience type food values, we observed a moderate increase in the importance that US consumers attached to *TASTE* during the pandemic. In particular, consumers with lower levels of education and higher levels of income gave more importance to this food value during the lockdown. Interestingly, consumers living in areas where the infection rate was perceived to be high gave less importance to *TASTE*. The concern about *CONVENIENCE*

and *APPEARANCE* increased slightly during the pandemic. Male consumers were particularly concerned about these food values during the pandemic.

The importance that US consumers gave to *PRICE* remained unchanged before and during the COVID-19 pandemic. Previous studies have shown that US consumer expenditures increased sharply in the early stages of the pandemic (e.g. Baker *et al.*, 2020; Ellison *et al.*, 2021), suggesting that, on average, the US population may not have been particularly concerned about *PRICE*. As expected, consumers with a higher household annual total gross income and consumers living in households with children were less concerned about this food attribute than others during the lockdown.

Finally, the observed shifts in food values seem to be consistent with shifts reported by respondents about their purchasing and consumption behaviour. As mentioned above, the IFIC's (2020b) May report indicated that 43 per cent of US consumers reported an increase in the healthiness of their diets during the lockdown. This is also supported by the fact that, in the first part of our survey, 40 per cent of respondents reported an increase in the purchasing of fruits and vegetables. Another potential indicator of an increase in the healthiness of diets could be the reported increase in the amount of purchased raw ingredients that potentially signals an increase in home cooking, likely due to the closure of bars and restaurants and the higher amount of time spent at home. In the first part of our survey, about 23 per cent of the sample reported an increase in the amount of purchased flour. These shifts in purchasing and consumption behaviour are consistent with the increase in the importance that US consumers attached to *NUTRITION* during the pandemic.

Similarly, the increase in the importance that our sample associated with *CONVENIENCE* is consistent with data from the IFIC's (2020a) April survey, indicating that 16 per cent of respondents increased their take-out/delivery meals and 18 per cent reported an increase in the consumption of pre-made meals. In addition, results from the first part of our survey show that approximately 23 and 48 per cent of respondents increased their purchasing of ready meals and frozen and canned food, respectively. Regarding the increase in the concern of our sample for *TASTE*, there is a lack of available observational data to show that this shift produced changes in US consumers' purchasing and eating behaviour. However, it is arguable that during the lockdown, with fewer sources of distractions, food became even more important than it usually is in people's daily lives. Consequently, taste, which is a core attribute of food, gained importance as well.

6. Conclusions

This study contributes to the literature on food values in a number of important ways. First, following Tonsor and Lusk (2020) and Ellison *et al.* (2021), it explores whether food values are stable or change when people are exposed to large shocks such the COVID-19 pandemic. Second, it investigates whether shifts in food values differ across sociodemographic groups, and third, it examines whether shifts in food values are associated with changes in purchasing and consumption behaviour during the pandemic.

By conducting a survey on a sample of US consumers and measuring food values using the BWS method, we found that Black Swan events such the COVID-19 pandemic can be related to the change in consumers' food values. While the ranking of food values did not change substantially before and during the pandemic, suggesting that food values are stable over time, we observed significant shifts in the importance that consumers attached to some food values. These shifts could possibly explain observed changes in purchasing and consumption behaviour during the pandemic in the USA and can have important policy implications for policymakers and the food industry. Given that the importance that consumers attached to *SAFETY* decreased considerably during the pandemic, policymakers need to be aware that food safety and contamination-related incidents during a pandemic could potentially have greater negative effects on public health and national healthcare systems. In this regard, our results on preference shares across sociodemographic segments of the US population are illuminating and important. Our study shows that younger consumers and those with lower levels of education gave less importance to food safety than the elderly during the lockdown. These results suggest the need for policy initiatives that can increase the awareness of these groups about the issue of food safety and reduce health risks related to food consumption during a pandemic. Similarly, while younger consumers were more concerned about the healthiness of their diets (i.e. *NUTRITION*) than the elderly before the pandemic, the opposite trend was observed during the pandemic. This result is concerning as the pandemic may have produced a change in the habits of younger consumers that could persist even after the COVID-19 emergency. The national healthcare system should monitor the situation and develop policies to invert this trend in the future, if it will persist.

In addition, our study indicates that there was a general increase in the importance that US consumers gave to experience type food values with respect to credence ones. However, in areas where the perceived rate of infection was high, we observed that food values such as *ORIGIN, NATURALNESS* and *ENVIRONMENTAL IMPACT* were more important than in areas where the perceived rate of infection was low, while the opposite was observed for *TASTE*. This may suggest that credence attributes gained importance in areas where the perceived rate of infection was high. If this trend is confirmed and persists over time, there might be an opportunity for the food industry to exert even more effort to persuade or remind consumers of the importance of these food values, which are important in achieving more sustainable food systems.

A limitation of the study is the relatively large time gap between Bazzani *et al*. (2018) and our study. It may be that other factors other than the COVID-19 pandemic determined the shifts in the importance attached to the different food values over time. Nevertheless, data from previous studies (IFIC 2013–2019) seem to suggest that the pandemic is the main driving force explaining the shifts, especially for food safety, which is the food value that changed the most over time.

Another limitation is that our findings are contingent on the timing of the study. The survey was conducted in late April 2020 when the lockdown measures were mostly still implemented in many US states. It is possible that the relative importance of the different food values could have changed back to pre-COVID-19 values after the stay-at-home orders. An important novel finding of our study is that we have shown that food values could change through time across different demographic groups. Even moderate changes in food values can have significant implications for future research and policy since it suggests that, to some extent, food values can exhibit a dynamic behaviour that should be taken into account when conducting food policy or marketing analysis, especially during unusual times.

Supplementary data

Supplementary data are available at *ERAE* online.

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