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Consumers' willingness to pay for natural food: evidence from an artefactual field experiment

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Abstract

Among foods with credence attributes, food with “natural” components have received in the last years particular attention by consumers. This study applies the BDM incentive compatible mechanism to explore young (18–35 years old) consumers' interest and willingness to pay for chewing gums having the natural attribute. Our analysis shows that over 68% of consumers are interested in the natural attribute and are willing to pay a price premium. We also find that consumers' higher age and interest in the environment have significant impacts on consumers' preferences for the natural attribute.

Keywords: Credence attributes, Chewing gum, BDM, Willingness to pay, Information effect

Introduction

Drivers of food choices have been investigated by different authors, revealing that credence attributes play an important role in consumers' purchase decisions (Vermeir and Verbeke 2008; Bolling Johansen et al. 2010; Dentoni et al. 2014; Moor et al. 2014; Cembalo et al. 2016; D'Amico et al. 2016). Credence attributes are a category of attributes related to a wide range of intangible elements that cannot be verified by consumers, even after consumption (e.g., environmental safety, food healthiness, product origin, producing condition, social advantages) (Torjusen et al. 2001; Grunert et al. 2004; Moser et al. 2011). Among the large set of credence attributes, food healthiness and environmental concern are getting a significant attention in the economic literature due to their relevant power to influence consumers' food choices (Steptoe et al. 1995; Roininen et al. 1999). Consumers' specific attention to food healthiness and environmental concern has increased the demand for food with the attribute “natural” (Lunardo and Saintives 2013; Dominick et al. 2018). On the one hand, natural products are perceived “good and safe” as free of chemical substances (Rozin et al. 2004; Rozin 2005; Franchi 2012; Li and Chapman 2012). Perceived risks related to additives and other synthetic substances in food have received considerable interest in recent years (Evans et al. 2010) because consumers' perception of food healthiness is influenced by the mode of processing raw materials and use of additives and synthetic substances (Bech-Larsen and Grunert 2003; Chen 2009).

Furthermore, the idea of natural seems to nurture a perception of overall well-being, both from the physical health and emotional perspectives (Moscato and Machin 2018). On the other hand, the other credence attribute that motivates consumers to “natural choice” is the environmental concern (Rozin et al. 2004; Moscato and Machin 2018). To illustrate, different concepts related to the preservation of the environment (e.g., biodiversity conservation) have become related to natural (Descola 2013). The growth in environmental awareness over the last years drives consumers’ food choice towards natural ingredients, diverting their purchasing decisions to natural products (Steptoe et al. 1995; Rozin et al. 2012; Asioli et al. 2017). The absence of synthetic substances in food, aforementioned as the main factor of the perceived healthiness of natural food, entails at the same time the environmental protection. Consumers believe to protect the environment by choosing natural products and rejecting products containing synthetic substances (Dickson-Spillmann et al. 2011).

The preference for nature, and related attributes, has a long history in the sociological and psychological literature. It has initially been defined as biophilia by Kellert and Wilson (1995) to describe the hypothesis that humans have an unconscious, genetically based need and inclination to affiliate with other living organisms. Therefore, naturalness is perceived as an attribute which enhances the consumer’ positive perception of the products to which it is applied, making products more desirable than the correspondent “non-natural” ones (Lockie et al. 2004; Rozin et al. 2004; Rozin 2005; Siipi 2013).

Previous studies by Rozin et al. (2004) focused the attention on the motivation that drives consumers to eat natural. They describe this phenomenon as “natural preference,” supporting a distinction between instrumental and ideational beliefs, which are the basis for such preference. Instrumental beliefs have to do with the inherent superiority of nature through which what is natural is perceived healthier, tastier, and more environmentally friendly. Ideational beliefs are independent of human welfare and they are based on the moral superiority of nature, allowing natural products to be perceived inherently better or right. Results show that the main driver in preferring natural products is more ideational (moral), than instrumental (healthiness/effectiveness or superior sensory properties) (Rozin et al. 2004; Rozin 2005).

Another line of research focused on the factors, such as content and production process, that have a bearing on consumers’ perception of naturalness of a food product, and results are often conflicting. Evans et al. (2010) found that both content and process influence the perceived naturalness in similar ways. On the contrary, Rozin (2005) emphasized that consumers’ perception of the naturalness of a product is more influenced by its production process than by its content.

However, from the literature on consumer studies, what is still unclear is which credence attribute, between perceived healthiness and environmental concern, is considered the most important by consumers when they choose natural food products. Consumers’ preference for the two credence attributes is related to different consumers’ attitudes (Cicia et al. 2016). Food healthiness, in fact, is considered to satisfy more (perceived) hedonistic/personal attitudes of consumers, while environmental sustainability is associated to more altruistic/collective attitudes.

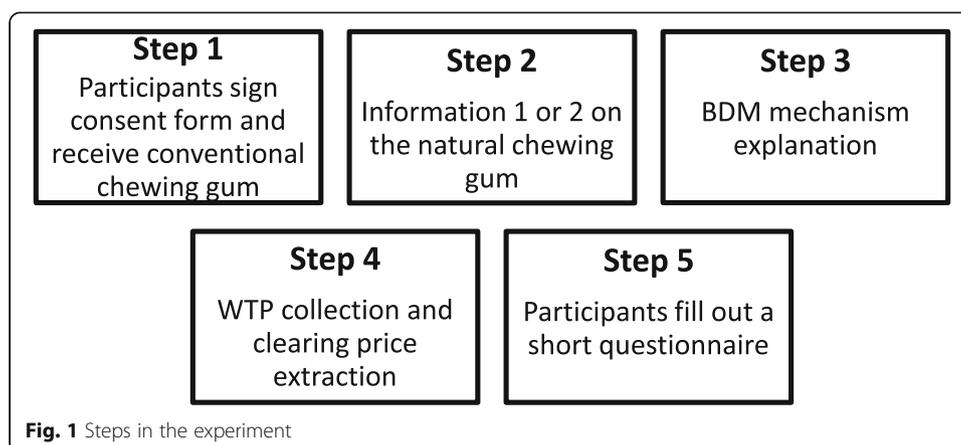
The aim of this study was to fill this gap analyzing consumers’ interest and willingness to pay (WTP) for natural food in a non-hypothetical setting and understand

whether such interest is driven by hedonistic/personal (i.e., related to food healthiness) or altruistic/collective (i.e., related to environmental sustainability concern) reasons. Moreover, the effect of different codification of information on consumers' WTP has been tested. To illustrate, consumers were invited to declare their WTP after reading a brief script. The script was randomly assigned and described the natural chewing gum in two diverse ways: "obtained from gum tree" and "produced without artificial synthetic gum." In the economic literature, only recently scholars have started to investigate consumer preferences for natural food (Gifford and Bernard 2011; McFadden and Huffman 2017; Dominick et al. 2018); furthermore, to the best of our knowledge, no research has used incentive compatible elicitation mechanisms with product-related information treatments to study consumer WTP for natural food in Italy.

To tackle the research question, natural chewing gum was selected as a food product holding two main characteristics: it is familiar and well known to consumers; consumers show low involvement when they buy chewing gums; thus, the attribute 'natural' can be considered isolated from other possible choice motivations. As for the methodology adopted, this study applies the BDM incentive compatible mechanism to a sample of young consumers (18–35 years old).

Materials and methods

The study was performed with consumers of chewing gum in Italy and involved 201 participants in 25 experimental sessions (7 ± 2 individuals per session), lasting approximately 20 min each. The experiment was conducted in a laboratory over a 2-week period in November 2016. The recruitment criterion was to involve only young adults (between 18 and 35 years old) who purchased and consumed chewing gum at least once a month. The sample of young individuals was selected since they constitute a relevant share of the national chewing gum market (Euromonitor 2016). Thereby, they represent the most likely consumers of the product under investigation. The final sample was composed of 74 females (37%) and 127 males (63%), with a mean age of 22 (± 3 years). The frequency of chewing gum consumption was collected by means of a scale ranging from 1 (once a month) to 5 (everyday). The Becker–DeGroot–Marschak (BDM) incentive compatible mechanism¹ (Becker et al. 1964), with product-related information treatments, was applied in a laboratory, laid out in a classroom-style with a display table in the front of the room. To minimize experimenter-induced heterogeneity, one researcher handled all the sessions. The specific products used in the experiment were two identical nine-chewing gum packages (17 g, standard commercial size), with no trademark, brand, or other information. The BDM endow-upgrade approach mechanism was followed. Figure 1 presents the architecture of the experiment, which was composed of five consecutive steps. In the first step, prospective participants read and signed the consent forms; then, they were endowed with the conventional chewing gum package and informed of its average market price (i.e., reference price of 1€). In the second step, in order to test the effect of different types of information on participant decisions, the sample was split into two groups and a brief script described the natural chewing gum in two diverse ways (randomly assigned to half sample each): (1) obtained from gum tree and (2) produced without artificial synthetic gum. Subsequently, experimenter explained the BDM mechanism. Particularly, participants were informed that a clearing price (contained in a dice cup) would have been randomly



extracted by one participant from a box and used for the entire experimental session. Then, all participants interested in upgrading to the natural product would have had two alternatives: those with bids equal or greater than the randomly selected price, would have purchased the natural version of the product for the market-clearing price and returned the endowed package; those with bids inferior to the selected price would not have paid and would have kept the conventional chewing gum package. Participants were also informed that they could only have bid once and it was in their best interest to offer an amount equal to the real price they were willing to pay for the product. After this explanation, in the fourth step, participants were asked whether they were interested in upgrading to the natural product and the monetary value they were willing to pay for this exchange (i.e., individual sealed bids were collected). Next, the market-clearing price was randomly selected from a uniform distribution, ranging from €0.10 to €3.00 in increments of €0.20. Lastly, a short questionnaire was administered, collecting socio-demographic data and investigating individuals' attitudes towards health (General Health Index scale, GHI—adapted from Roininen et al. 1999) and towards the environment (New Ecological Paradigm scale, NEP—from Dunlap et al. 2000). GHI includes eight items, on a seven-point Likert scale, concerning the respondent's interest in eating healthily and specific statements on fat and cholesterol intake. This scale ranges from 1 to 7: the higher the score the higher the interest towards eating healthily. NEP includes 15 items, on a five-point Likert scale, concerning respondents' attitudes towards the environment. This scale ranges from 15 to 75: the higher the score the higher the pro-environmental attitude.

Participants were required to use their own money when providing their bids, to avoid windfall effects (Lusk and Shogren 2007). The BDM mechanism has the advantage of equally penalizing over- and underbidding (Lusk and Shogren 2007). Furthermore, unlike other auction mechanisms, the BDM endow-upgrade is easy to explain and usually allows participants to understand the procedure after that only one example is provided (Combris et al. 2009).

Results

The average frequency of monthly chewing gum consumption resulted to be 3.15 (S.D. 0.9), being more frequent within the females group (3.36 vs. 3.03). Overall, the frequency of consumption scores ranging from 3 to 5, accounted for 77.5%.

Overall 138 participants (68.6%) showed an interest for natural food deciding to upgrade to the natural chewing gum. Taking into account the bids of individuals willing to upgrade, mean WTP was € 1.48 (± 0.84). The distribution of WTP is depicted in Fig. 2, where a Kernel density is reported together with a normal density distribution. The median value (1.50 €/package) resulted to be very close to the mean.

The mean WTP for the whole sample was computed accounting also for the zero bids (Reiser and Shechter 1999; Vecchio et al. 2016). The mean WTP for upgrading to the natural chewing gum, including zero values, can be calculated by pre-multiplying the WTP stated by the upgraders per $1-p$ (p being the relative frequency of zero WTP response). Thus, the mean WTP for the whole sample is €1.01 euro/package to upgrade from the conventional chewing gum to the natural counterpart. Furthermore, around 25% of respondents would be willing to pay a price premium of around €2.50, and about half of respondents are willing to pay a premium price lower than €1 per package.

To understand whether the interest in natural gum is driven by hedonistic/personal or altruistic/collective reasons, GHI and NEP scales were collected. The internal reliability of the two applied scales was very high, i.e., GHI scale Cronbach's $\alpha = 0.72$ and for the NEP scale Cronbach's $\alpha = 0.68$. The mean value of GHI was 4.74, while NEP mean value was 59.78.

To analyze participants' willingness to upgrade to the natural chewing gum, and see the functional relationships with GHI and NEP, the exact logistic regression model was performed (King and Ryan 2002). This model overcomes the potential unreliability of (unconditional) logistic regression in presence of small sample size (< 200). The rationale behind the exact logistic regression is to base the inference on exact permutational distributions on fixing the sufficient statistics of the remaining parameters at their observed values. Parameter estimates and standard errors are calculated on the basis of permutation without recourse to asymptotic assumptions and results. This is due to the fact that asymptotic estimation, by maximum likelihood, is, in unbalanced

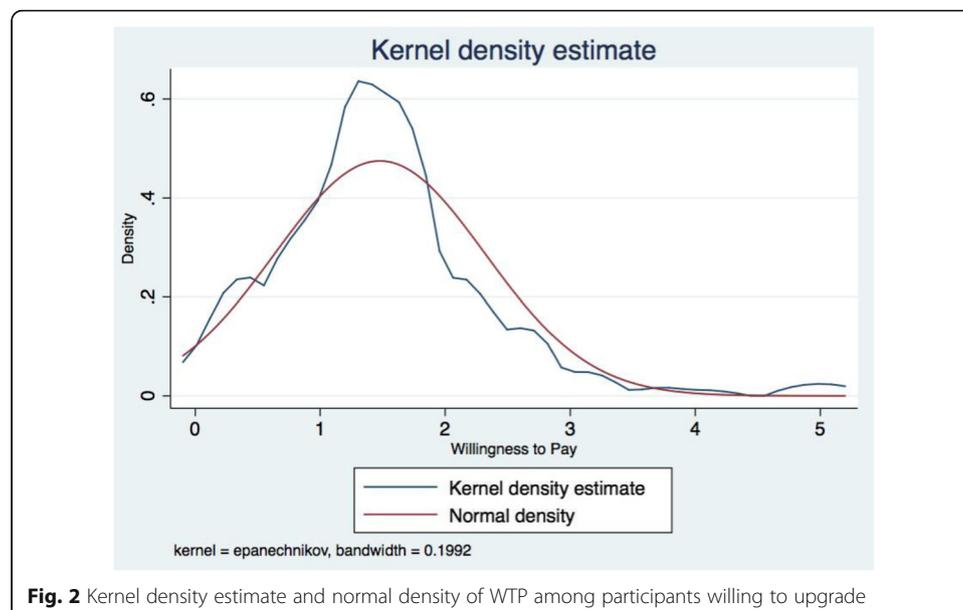


Fig. 2 Kernel density estimate and normal density of WTP among participants willing to upgrade

distribution of the dependent variable or small sample size, unreliable and inaccurate. The conditional likelihood function is given by (King and Ryan 2002):

$$Pr(Y_1 = y_1, Y_2 = y_2, \dots, Y_n = y_n | m) = \frac{\exp\left(\sum_{j=1}^n y_j x_j' \beta\right)}{\sum_R \exp\left(\sum_{j=1}^n y_j x_j' \beta\right)}$$

where the outer summation in the denominator is over the set:

$$R = \left\{ (y_1, y_2, \dots, y_n) : \sum_{j=1}^n y_j = m \right\}$$

and where Y_1, Y_2, \dots, Y_n are independent binary random variables, β s are unknown parameters to be estimated, x s are explanatory variables, and m is the value to which the likelihood function is conditioned on the observed value of its sufficient statistic:

$$m = \sum_{j=1}^n y_j$$

Results in Table 1 reveal that, among the examined variables, only age and the NEP score exert a positive and significant effect on willingness to enter in the natural chewing gum market. In particular, individual positive attitude towards the environment increases the possibility to be willing to exchange the conventional product for the natural counterpart. Similarly, older respondents are more willing to enter the natural gum market. Instead, the GHI score did not influence consumers' willingness to upgrade to the natural product.

Finally, the type of information provided (obtained from gum tree or without artificial synthetic gum) did not significantly affect WTP (one-way ANOVA results, $F = 1.40$, $df = 1$; $\text{prob} > F = 0.24$), nor the choice of upgrading (one-way ANOVA results, $F = 0.68$, $df = 1$; $\text{prob} > F = 0.41$).

Discussion and conclusion

Studies investigating consumers' choice reveal that credence attributes, such as food healthiness and environmental concerns, play an important role in consumers' purchase decision (Bolling Johansen et al. 2010; Moor et al. 2014; Migliore et al. 2015, 2017). Particularly, consumers' increasing interest in health and environmental issues has been progressively translated into a bigger attention to natural products. In the context of consumers' choice for natural products, the aim of this study was to analyze consumers' interest and willingness to pay (WTP) for natural food, understanding whether such interest is driven by hedonistic/personal or altruistic/collective reasons, and to test the effect of different types of information on natural chewing gum.

Table 1 Exact logistic regression coefficients, scores, and statistical significance

	Coefficient	Score	Significance [^]
NEP score	0.044	3.059	***
Age	0.121	4.423	***
Model score		7.418	***

[^]Significance at p value < 0.10 (*); < 0.05 (**) and < 0.01 (***). Software used: STATA v14. Only statistically significant variables are reported

Findings reveal that a large share of chewing gum consumers (over 68%) is willing to pay a price premium for the attribute “natural,” thus revealing a significant interest for the natural variation of chewing gum.

Several previous studies identified food healthiness as predictor of consumers' attitudes for natural products (Rozin et al. 2004; Franchi 2012; Ares et al. 2014). Particularly, a recent study conducted by Moscato and Machin (2018) reveals that natural is perceived by consumers as enhancing not only physical healthiness, but also emotional well-being. The same study supports other health-related reasons for consuming natural, such as the ideas that perceived positive attributes of natural foods transfer to the food recipient and that natural food are trustworthy since they have not been altered. In contrast with these studies, in our results, healthiness did not influence the consumers' willingness to upgrade to the natural product. This finding might relate to the fact that chewing gum is a product very likely perceived by consumers as scarcely affecting their diet and, thus, their health. In fact, consumers' interest in nutrition attributes related to chewing gum has been recently shown as relatively low (Hieke et al. 2018). On the contrary, our results have shown that environmental concerns have a significant impact on participants' willingness to upgrade to the natural product. Consumers are thus willing to pay more for natural chewing gum with the scope to protect and safeguard the environment. This result is coherent with previous works suggesting that consumers associate natural products with environmental protection (Dickson-Spillmann et al. 2011; Rozin et al. 2012; Descola 2013). Therefore, our results suggest that altruistic/collective motivations are more relevant than hedonistic/personal ones for consumers' choice of purchasing natural products.

As for demographic characteristics, in our study, gender is not statistically significant, despite that this variable has been previously assumed important for predicting food consumption choices. Previous studies have found a significant relationship between gender and interest in natural foods. In particular, Dickson-Spillmann et al. (2011) and Dominick et al. (2018) revealed that women were more interested in natural products than men, since women are more sensitive to food hazards. However, our result may be ascribed to the relatively small prevalence of females (37%) in the experiment.

The analysis on the type of information provided (obtained from gum tree or without artificial synthetic gum) did not significantly affect WTP. Previous consumer studies reported, on the contrary, a significant influence of the type of information on consumers' food preferences, and in particular, on consumers' products evaluation, purchase intention, and willingness to pay (Chandon and Wansink 2007; Gifford and Bernard 2011; Chrysochou and Grunert 2014; Berry et al. 2017). Such discrepancy might relate to the specific carrier used in current study. Chewing gum was chosen, among other reasons, for its low emotional involvement. This might explain why different type of information had low influence on consumers' preferences.

Some limitations of the study require to be mentioned. More in detail, this study was conducted with a convenience sample of chewing gum consumers in the age cohort 18–35 years old, and therefore, the results may not generalize to the Italian population of chewing gum consumers. However, the targeted sample represents a substantial proportion of the entire national chewing gum market (Euromonitor 2016). Other limitations stems from the auction mechanism adopted. First, the BDM endow-upgrade has the disadvantage of lacking an active market environment (Shogren et al. 2001).

Second, it generates biased responses due to the endowment effect, coherent with loss aversion effects (Kahneman et al. 1991). Third, in BDM auctions, the bids are highly dispersed and slowly converging towards the true WTP value (Noussair et al. 2004). Fourth, the BDM approach is prone to anchoring effect, leading participants to associate a good bid to the extremes of the market-clearing price distribution (Rousu and Corrigan 2008). To further develop the insights generated from this study, future research should devote particular attention to four specific issues: try to control (and limit) the social desirability bias, verify whether findings hold also when consumers face a greater number of options and express their WTP with a different elicitation mechanism (as a full bidding experimental auction), use different types of carrier to assess whether the findings of this study remain consistent also with food having different characteristics, and test the effect of different type and sources of information on final preferences, as the information provided in an experimental setting is generally interpreted differently than information received by consumers through usual communication channels.

Endnotes

¹A mechanism in which all respondents' weakly dominant strategy is to reveal their true value for the good sold.

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Availability of data and materials

The data that support the findings of this study can be obtained from the corresponding author upon request.

Authors' contributions

GM conceived of the study and carried out the "Materials and methods" section and data collection. MB carried out results section. AL carried out the "Introduction" section. GS carried out the "Discussion and conclusion" section. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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