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How environmental sustainability labels affect food choices: Assessing consumer preferences in southern Italy

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ABSTRACT

This paper assesses consumer preferences and willingness to pay for three different environmental sustainability labels (EU Organic Farming, Rainforest Alliance, 'Per il Clima-Legambiente') and information cues about the origin displayed on a processed food product, namely tomato purée. Using a choice experiment and conditional logit models, the results show that: i) preferences for the environmental sustainability labelled product increase when consumers have proper knowledge about the meaning of the labels; ii) the information cue about the product's domestic origin is important for all consumers, regardless of their education, unlike environmental sustainability labels that are more appreciated by well-educated consumers; iii) consumers' willingness to pay is higher for labels with greater market penetration, regardless of certification by private or public organisations. Findings suggest that the adoption of environmental sustainability labels by food producers should be combined with effective information policies aimed at increasing consumer awareness.

1. Introduction

Consumer concern about the environmental and social impacts related to the way food is produced has led to a growing need for information on the various aspects of sustainability involving food products. All stages of the food chain, namely agricultural and animal production, fishing, food processing and transport, affect sustainability (Grunert, 2011). Compliance with sustainability principles may help reduce the impact of food production on natural resource depletion (Hashemi et al., 2019) as well as improve the competitiveness of food processing (Grinberga-Zalite et al., 2021).

The properties of food sustainability are credence attributes that cannot be seen or tasted during purchase. Therefore, consumers can take them into account in their decision-making process only if they are properly disclosed by specific information tools. Research has shown that in a purchasing situation where a product is primarily characterised by credence attributes, specific information signals provided by labelling could overcome information asymmetries (Aprile et al., 2012; Verbeke and Ward, 2006).

In recent years, several labelling schemes have been introduced by public and private institutions in the food chain to signal sustainability attributes about products and enable consumers to make more sustainable food choices. Although sustainability is a broad concept that includes environmental, social/ethical and economic features, the communication of sustainable product attributes on packaging or in stores has essentially focused on the environmental and social dimension of sustainability to satisfy consumer interest (Cecchini et al., 2018; Janßen and Langen, 2017).

Most labelling schemes include a graphic or symbolic representation, which ensures that specific product conditions are applied and highlights sustainable product attributes that may be desirable for particular market niches. Some of these labels refer to statements about the ethical or social aspect of sustainability, such as the animal welfare label, which states that animals on the farm behave naturally and are in a state of physical and psychological well-being, and the fair trade label, which assures consumers that their products were grown with care and that farmers and workers were paid appropriate prices and wages. Others address the environmental dimension of sustainability, such as the labelling of organic food, which indicates that the product is grown by respecting natural systems and cycles; carbon reduction labels, which inform consumers that the carbon footprint of the product has been measured and certified; and finally, labels for sustainable aquaculture and fisheries.

The purpose of sustainability labelling is to help consumers looking for sustainable alternatives to traditional food products to identify those products that meet their needs (Weinrich and Spiller, 2016). To meet

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consumer demand, food producers need to know consumer preferences and their willingness to pay for sustainability claims. The use of sustainability labels involves high costs to change production practices and innovate technological systems and supplies, which are able to increase the compatibility of the food product with the environmental dimensions of sustainability (Consuelo, 2020). In this regard, it is important to point out that in comparing the same products with and without sustainability labels, it is found that consumers are willing to pay a premium price for foods with such labels (Annunziata et al., 2019; Lombardi et al., 2017; Van Loo et al., 2015). However, in real-world situations, consumers usually show a low propensity to use sustainability labels. Consistent with this, there is evidence that sustainability labels are not always fully understood by consumers and their impact on food choices is weakly positive (Garnett et al., 2015; Grunert et al., 2014).

In this context, the present paper aims to assess consumer preferences and willingness to pay (WTP) for a set of environmental sustainability labels and information cues about the origin (i.e. domestic provenance/absent) displayed on a processed food product, namely tomato purée. Evaluating consumer preference for labels related to environmental sustainability helps understand their potential synergies and provides food producers and policy makers with the means to develop targeted labelling strategies and regulations.

The selected labels address three different dimensions of environmental sustainability, namely organic food production, agricultural practices for conservation of biodiversity, and carbon footprint. Consumers are becoming increasingly interested in such labels as concerns grow about the environmental impact of food (Caputo et al., 2013; Grebitus et al., 2013). Specifically, we focus on the *EU Organic Farming* label certified by the European Community, which is the most common sustainability claim in use in the European food market (Van Loo et al., 2014). With reference to the sustainability dimension concerning biodiversity conservation and the protection of endangered species, we consider the *Rainforest Alliance* label as certified by an international private association. We then take into account the '*Per il Clima-Legambiente*' label, which informs consumers about the low amount of CO_2 emissions, certified by a well-known environmental association in Italy (i.e. Legambiente). '*Per il Clima-Legambiente*' is the first carbon footprint label tested in Italy exclusively on tomato purée, thus enjoying a distribution limited to a specific product on the domestic food market, compared to both the Rainforest Alliance and EU Organic Farming labels, which are distributed more widely on the market. Moreover, controlling for the product's domestic origin helps provide further insights into the determinants of consumers' purchasing decisions, as country-of-origin labelling could be perceived by consumers as a signal of higher product safety and greater affinity for their home (Jensen et al., 2019; Loureiro and Umberger, 2007).

Our study contributes to the literature in three different ways. First, we design a choice experiment survey to evaluate consumer preferences and WTP for the environmental sustainability labels by using a cheap talk script, included in the questionnaire before the choice questions, which provides a subset of respondents with information about the meaning and content of the labels considered in the experimental design. This information is delivered since there is evidence of low consumer awareness and understanding of the meaning of sustainability labels (Garnett et al., 2015; Grunert et al., 2014). Furthermore, according to Lusk and Briggeman (2009), when people have little knowledge of food product attributes, the corresponding measured preferences may be less reliable (Aprile et al., 2012). Second, we assess whether, and to what extent, consumers would value the simultaneous presence on a processed food of the sustainability labels, which signal three different environmental dimensions linked to food production, and the domestic origin of the product. Although some studies (Apostolidis and McLeay, 2019; McFadden and Huffman, 2017) have documented consumer preferences for the above-mentioned labels, little is known about consumers' evaluation of such labels when the dimensions of environmental sustainability are present concurrently with the country-of-origin label. Third, we evaluate whether and to what extent consumers attribute a different value to labels certified by public institutions, such as the European Community (e.g. EU Organic Farming), and labels certified by private organisations operating internationally and nationally (e.g. Rainforest Alliance and Legambiente) based on previous research (de Magistris et al., 2017; Van Loo et al., 2011, 2014) which found that consumers trust public institutions more than private organisations.

The remainder of the paper is organised as follows. Section 2 shows the theoretical framework on which the present paper is based and the literature review, highlighting the contribution this study makes to the current literature. Section 3 discusses the expected results that we test by: *i*) the choice experiment (subsection 3.1), *ii*) sample survey (3.2), and empirical strategy (3.3). Section 4 goes into the descriptive analyses (subsection 4.1) and the main results of the estimated models (4.2). Section 5 provides discussions and policy evaluations that stem from the results, concluding with suggestions for future studies.

2. Background

The present study builds on the theoretical approach of Caswell and Padberg (1992) which suggests that food labels may contribute to guide consumers' buying decisions by signalling the presence of product attributes that satisfy their preferences. In real situations, consumers choose foods on the basis of specific attributes for which they are willing to pay a premium price reflecting the value placed on the benefits that they derive. Not all product attributes can be ascertained by consumers during their purchasing decision process. With reference to foods, product attributes are usefully categorised as search, experience and credence based on the timing and types of information available to consumers (Caswell and Mojduszka, 1996). In particular, search attributes can be determined by consumers before they buy the product by examining or researching it (e.g. colour). Experience attributes can only be judged after purchasing and using the product (e.g. taste). Credence attributes cannot be ascertained even after purchase and use and must therefore be taken on faith. It is precisely in the category of credence attributes that sustainability aspects of food products fall (Maesano et al., 2020; Loebnitz and Bröring, 2015). Information in the form of labels makes consumers able to assess all three types of attributes and choose foods that meet their preferences (Caswell and Padberg, 1992).

Based on this theoretical approach, several empirical studies analyse consumer preferences and estimate the WTP for different labels that reveal the presence of a specific set of credence attributes related to sustainability aspects of food products (de Magistris and Gracia, 2016; Van Loo et al., 2015). Several studies focus on environmental sustainability, categorised into various attributes related to the presence of process and product certifications, such as carbon footprint, reduction in pesticide use and organic farming labels (Meyerding and Merz, 2018; Janssen and Hamm, 2012). Others investigate social sustainability, taking into account attributes related to animal welfare, social responsibility and fair-trade certification (Ortega and Wolf, 2018; Elbakidze et al., 2013). Further studies explore consumer preferences for more than one label linked to different dimensions of sustainability (see Cecchini et al., 2018, for a review).

Regarding the dimension of environmental sustainability, the most widely investigated claims on the food market are organic farming labels. From the evidence on organic farming labels there emerges a positive attitude of consumers towards such labels and a price premium for organic products compared to conventional ones. Consistent with these findings, Janssen and Hamm (2012), who analysed consumer preferences and WTP for different organic certification logos in six European countries through choice experiments, showed that the WTP for all organic certification logos tested is significantly higher than that of generic labelling. However, the highest price premium is recorded for well-known and reliable logos with perceived organic standards and a

strict control system. Other studies highlighted the importance of information on existing organic farming labels in influencing consumer choices. A laboratory experiment conducted in France to assess the impact of health and environmental information on consumer choices between conventional and organic apples revealed that the introduction of a new organic label providing specific information on pesticides increases the price premium that participants are willing to pay due to the higher quality attributed to organic than conventional products (Marette et al., 2012). Specific studies investigated visual attention and consumer choice preferences for labelled organic foods (Meyerding and Merz, 2018; Krucien et al., 2017; Balcombe et al., 2014). Overall, the results suggested that visual attention plays an active role in building consumer decisions.

Interesting results were found by Van Loo et al. (2015) who explored the importance consumers place on sustainability attributes, identified by four environmental sustainability labels, namely Fair Trade, Rainforest Alliance, USDA Organic and Carbon Footprint, and investigated how this relates to visual attention paid to such labels during the coffee purchase decision and to WTP. The results suggested that consumer segments with differences in the importance of claimed sustainable attributes visually address these labels differently. Consumers who spend more time looking and staring at sustainability labels appreciate them more.

Most studies, like that described above, compare different sustainability attributes by analysing more than one label. For example, de Magistris and Gracia (2016), based on a choice experiment conducted in Spain, assessed consumer preferences and their WTP for sustainable labelled almonds related to two different categories of attributes, namely, remote declarations linked to the locally grown attribute and the organic logo established by the European Union for organic production. Their findings suggested that consumers are willing to pay a positive price premium for locally grown and organically produced almonds, while they are not willing to pay a price premium for almonds that have travelled long distances. Further results showed that consumer preferences for sustainable labels are heterogeneous, with three consumer segments identified.

A stated choice experiment concerning the purchase of chocolate in Flanders (Belgium) was used by Rousseau (2015) to explore the influence of both organic and fair trade labels, and their implicit information, on consumption behaviour. The analysis found that fair trade labels are more likely to impact consumer attitudes and preferences than organic labels in the Flanders chocolate market. Overall, chocolate consumption is mainly influenced by attributes such as taste and price.

Within the strand of literature analysing consumer preferences for different types of sustainability claims, several studies have paid particular attention to the use of environmental sustainability labels that provide carbon footprint information. Van Loo et al. (2014) compared consumer preferences for four types of sustainability claims related to organic meat, free-range, animal welfare and carbon footprint. Using a choice experiment on a chicken breast product, they showed that both the carbon footprint and organic labels are less appealing to consumers, who are less willing to pay for such labels. The vast majority of consumers prefer free-range claims, which are also valued the most highly. Specific studies (McFadden and Huffman, 2017; Peschel et al., 2016) suggested that consumer knowledge (objective, subjective and usage experience) affects consumers' choices of food labelled for environmental sustainability and increases consumers' use of the carbon footprint in their purchasing decision. Other scholars (Grebitus et al., 2015) explored the influence of human values and trust on stated preferences for foods labelled with environmental footprints. In conducting an attribute-based choice experiment in Germany in which product alternatives were described by footprint labels and price, they found that consumer value systems help to understand choices and identify possible markets for footprint-labelled food products. More recently, Apostolidis and McLeay (2019) pointed out that the influence of environmental sustainability labels, such as carbon footprint, organic production method and origin, varies across consumer groups. Consistent with other studies (Grunert et al., 2014; Tobler et al., 2011), they showed that a considerable portion of consumers is still relatively uninformed and sceptical about environmental sustainability labels.

The studies discussed above documented consumer preferences for sustainability labels of foods pertaining to biodiversity conservation, organic farming and carbon footprint. However, little is still known about how consumers value environmental sustainability labels when they are provided with information about the meaning of such labels and when the dimensions of environmental sustainability are present concurrently with the country-of-origin indication. This paper gives more insights into these issues and allows assessment of consumer preferences for environmental sustainability labels as certified by both public and private institutions.

3. Materials and methods

The survey conducted as part of this study aimed to investigate consumer preferences and WTP for a set of environmental sustainability labels and information cues about the origin on a specific processed food product, namely tomato purée, through a discrete choice experiment (DCE).

In this regard, based on the evidence of low consumer awareness and understanding of food labels (Garnett et al., 2015; Grunert et al., 2014), we would expect the providing of information to respondents about the content of sustainability labels to increase their preferences for environmental sustainability labelled products. In order to explore the potential role of information provision, survey participants were divided into two groups of equal size. Those in the first group were made aware of the meaning of the sustainability labels (cheap talk script) they would later encounter during the interview (informed, hereafter), while respondents in the second group were not provided with any information (uninformed, hereafter).

Second, in agreement with previous studies pointing out that consumers add more value to domestic food products since they perceive them to be characterised by higher safety and feel an affinity for their home (Loureiro and Umberger, 2007; Lusk et al., 2006), we would expect a greater effect of the domestic origin cue on consumer preferences than the environmental sustainability labels.

Third, as people are generally more inclined to trust public institutions than private organisations (de Magistris et al., 2017; Van Loo et al., 2011, 2014), we would expect consumers to value the food product certified by the European Community, such as EU Organic Farming, more highly than that certified by private institutions such as Rainforest and Legambiente.

The following subsections illustrate: *i*) the experimental design; *ii*) the sample survey, and *iii*) the empirical strategy.

3.1. Choice experiment

DCEs are a quantitative approach for eliciting individual preferences within a setting context (Louviere et al., 2000). They require respondents to state their choice over sets of hypothetical alternatives with simultaneously varying attribute levels. In so doing, respondents are forced to make a trade-off between preferred and less preferred attribute levels shown in each alternative product. DCEs also allow one to measure consumers' WTP based on their own preferences (Ryan and Gerard, 2003). Therefore, the inclusion of the price is required when each alternative is presented (Willis, 2014; Alpízar et al., 2003). Five main phases are involved: selection of the attributes and levels, assessment of the alternatives and the experimental design, structuring of the questionnaire, the choice of the sampling strategy, and interviews (Hanley et al., 1998).

We conducted a DCE survey on a representative sample of consumers in the metropolitan area of Naples (Campania, southern Italy), using tomato purée as the product of interest. Two main motivations led to our

choosing the above product. First, tomato purée is one of the few processed food products in Italy which has an ecological footprint label. To the best of our knowledge, consumer preferences for labels related to different features of environmental sustainability have been mainly investigated for commodities and fresh products (see Section 2), while they have been unexplored for processed food products. Second, the Italian tomato industry is second worldwide to that of California, with 61,000 ha cultivated and 4.6 million tons of raw materials processed (Heuvelink, 2018). In particular, Campania is the largest production area of processed tomatoes, accounting for over 50% of tomato processing firms nationwide, concentrated mainly in the provinces of Naples and Salerno. Among the products derived from tomato processing, the best-selling product on the national market is tomato purée (56%). With reference to food consumer habits, tomato purée enjoys a high consumption frequency, as one of the chief components of the traditional diet in countries of the Mediterranean basin. Moreover, some surveys (bva-doxa.com) revealed that tomato purée is the first choice when preparing tomato-based recipes. Therefore, an in-depth understanding of tomato purée consumer preferences *vis-à-vis* sustainability labels could lay the basis for market improvement and segmentation (Causse et al., 2010).

In this study, tomato purée is described as a combination of three different attributes: product origin, specific sustainability label, and price. Different levels were selected for each attribute. The first attribute (labelled *Origin*) had two levels depending on whether or not the tomato purée was of Italian origin. The second attribute had four levels depending on the absence (the first level) or the presence on the product of a given sustainability label (the other three levels): 'Rainforest Alliance Certified' (labelled *Rainforest*), 'EU Organic Farming' (*Organic*) and '*Per il Clima-Legambiente*' (*Legambiente*). The 'Rainforest Alliance Certified' label, symbolised by a green frog, ensures that a product comes from a farm or forestry company that meets global standards for protecting the environment and promoting the rights of workers, their families and communities. The 'EU Organic Farming' label indicates that the product was grown under sustainable farming systems, in order to ensure environmental protection, biodiversity conservation and a high standard of animal welfare; foods can only be labelled 'organic' if at least 95% of their agricultural ingredients are organic. The '*Per il Clima-Legambiente*' label, administered by Legambiente, is a voluntary carbon footprint label to inform consumers about the amount of greenhouse gas emissions generated by products or services during one or more stages of their life cycle. The third attribute is price (labelled PRC), which is a quantitative variable with three levels referring to the price of a single item. To mirror the market prices of tomato purée, the price levels start from a slightly lower value than the real average market value for an equivalent product until they reach a slightly higher value according to a constant step size of 0.5.

Table 1 shows an overview of the attributes and their levels used in this study. Although there were other attributes besides those included in the choice experiment (e.g. brand), respondents opt for a choice in the awareness that all other attribute levels are the same in the different product profiles presented to them (Aprile et al., 2012; Van Loo et al., 2011).

The allocation of the attribute levels was designed through the factorial combination (Vega and Alpizar, 2011). Accordingly, using the set of attributes and levels, all potential alternative types of the same food product were obtained. Having three attributes with 2, 4 and 3 levels, respectively, the full fractional design allowed us to obtain 24 potential combinations of choices ($2 \times 4 \times 3$). To avoid respondents being exposed to choice overload from too many scenarios, we used an orthogonal fractional factorial design to generate a valid and representative subset of scenarios (Train, 1998). From the original 24 combinations, we obtained a final set of 12 choice tasks, which were split into two blocks of six choices. With uncorrelated main effects and 12 choice sets, the efficiency optimal design size $m = 2$ was 96.7%.

Table 1
Product attributes and their levels for the choice experiment.

Attributes	Levels	Description of the levels
Origin of the product	2	Italian Not Italian
Sustainability label	4	Nothing Rainforest Alliance Certified  EU Organic Farming  '*Per il Clima-Legambiente*' 
Price (Euros for one piece)	3	1.20 1.70 2.20

3.2. Sample survey

Questionnaires were administered between March and April 2019 through direct (face-to-face) interviews to a sample of 192 consumers (at least 18 years old) randomly selected from a consumer panel managed by the market research company in charge of data collection.

As suggested by Green (1991), in order to determine the appropriate sample size, a statistical power of 80% was considered. We evaluated different sample size scenarios according to the effect size levels, i.e. small, medium, large. In this research, the final sample size of 192 respondents can be considered satisfactory as it was closer to the small effect size (size requirement = 276) than to the medium effect size (size requirement = 38). Since the distribution of the sampled units in the two subgroups of informed and uninformed respondents (96 each) was planned in the survey design, the statistical power of 80% was also preserved in determining the size of the two subsamples. All sampled units successfully completed the questionnaire. Therefore, following Cohen (1988), the above situation can be considered suitable for research on a behavioural science topic.

Cards were used to show participants the 12 choice tasks used in this study. Six different cards were submitted to every interviewee. Each card represented a choice scenario as a function of the different levels of each attribute (including price) with two experimentally designed product alternatives (A and B) and the no-buy option (alternative C). Participants were asked to select the preferred alternative among the three options listed in each choice task.

The interviewees were provided with a concise description of the general purpose of the research to focus their attention and encourage their participation in the survey. After agreeing to participate, respondents were advised to behave exactly as if they were in a real situation, shopping for themselves or their family, and to give real answers (Van Loo et al., 2014). A subgroup of participants (the so-called informed) was provided with cheap talk script about the meaning of the sustainability labels; another subgroup of participants (the so-called uninformed) was given a fact-finding section of the questionnaire to test their knowledge of the three sustainability labels used in the experimental design.

In addition to the choice experiment questions, the questionnaire also sought information on a set of personal characteristics (i.e. gender, age, education, profession, household size, presence of children, and

income). A further section of the questionnaire made it possible to acquire information on all respondents about the factors that guide the process of purchasing food products, food consumption habits, the reasons that lead to the purchase of certain food products, concerns about environmental problems, as well as the various aspects related to personal attitudes towards environmental sustainability labels.

3.3. Empirical strategy

Respondents made choices from a set of tasks, each comprising two buying options (alternatives A and B) and the no-buy option (status quo, alternative C). Response data were modelled within a utility function of the conditional logit (CL) model (McFadden, 1973). CL models are more appropriate when the choice among alternatives is modelled as a function of the characteristics of the alternatives rather than (or in addition to) the characteristics of the individual making the choice (Hoffman and Duncan, 1988). The CL model assumes that variation in the characteristics of the alternatives themselves determines variation in the choice outcomes. CL models fit well into our data structure where each record represents a possible alternative proposed to the respondent. The dependent variable indicates which product alternative from a set of alternatives was chosen by respondent *i*. The utility that respondent *i* gets from choosing one of the product alternatives *j*, within each choice task, is given by:

$$U_{ij} = \beta_0 NoBuy_{ij} + \beta_1 Rainforest_{ij} + \beta_2 Organic_{ij} + \beta_3 Legambiente_{ij} + \beta_4 Origin_{ij} + \beta_5 Price_{ij} + \varepsilon_{ij} \quad (1)$$

where $i = 1, \ldots, N$ is the number of respondents, j is the number of alternatives within choice set J, and β is the vector of the parameters associated with the different attributes considered in the experimental design. In particular, β_0 is an alternative-specific constant representing the no-purchase option (status quo); *NoBuy* is an alternative-specific dummy variable taking the value of 1 for the no-purchase alternative and 0 for all other alternatives in the choice set C_i. The error terms ε_{ij} are assumed to be independent of β and x and identically distributed across the j alternatives and N individuals.

Within the framework of random utility models, the *i-th* consumer faced with j alternatives will choose the alternative with the greatest utility in the choice set C_i. In the CL model, the probability of the *i-th* consumer choosing alternative j of a choice set, C_i, is:

$$Pr_i(j|X_{ij}) = \frac{e^{x_{ij}\beta}}{\sum_{k=1}^{j} e^{x_{ij}\beta}} \quad with\ k \in C_i \quad (2)$$

The CL model assumes: *i*) independence of irrelevant alternative (IIA), implying proportional substitution across alternatives; *ii*) preference homogeneity, i.e. all coefficients of all attributes in the utility function are assumed to be the same across all respondents (Greene and Hensher, 2003); *iii*) error terms are independent and identically distributed across observations.

Consumer willingness to pay (WTP) for attribute k is the price change associated with a unit increase in that attribute and can be computed as the negative ratio of the partial derivative of the utility function with respect to the attribute of interest, divided by the derivative of the utility function with respect to the 'price' variable (Gracia et al., 2009; Morrison et al., 2002). It is equal to the negative ratio of the estimated parameter for attribute k and price parameter:

$$WTP_{Attribute} = \frac{\frac{\partial U_{ij}}{\partial Attribute}}{\frac{\partial U_{ij}}{\partial Price}} = -\left(\frac{\beta_k}{\beta_p}\right) \quad (3)$$

4. Results

In this section, first we show the main results from the sample descriptive analysis concerning the socio-demographic characteristics and food purchasing behaviour. Second, we discuss the findings of the CL models,[1] which were first estimated on the overall sample and then by subgroup of respondents (informed vs. uninformed).

4.1. Sample characteristics and food purchasing behaviour

Information on socio-demographic characteristics allowed us to contextualise the respondents, as well as being important for explaining consumer behaviour *vis-à-vis* the product and for performing separate analyses by subgroup of consumers (Table 2).

Regarding the total sample, about four-fifths of the respondents were women. This may be related to the high female unemployment rates in southern Italy, which lead women to take care of housing and food shopping (Istat, 2020). Approximately two-thirds of the total respondents were aged between 35 and 64, and just over one-quarter were younger than 35 years old. Based on the highest level of formal education (ISCED-2011) successfully acquired, two-thirds of the participants had completed at least upper secondary education; more than 20% of the respondents were educated to tertiary level (i.e. bachelor's, master's, PhD or equivalent). This is perfectly in line with the distribution of formal education levels in Campania. Although just over a quarter of Italians completed tertiary education in 2019 (percentage below the EU average which was around 40%), the tertiary education rate in Campania was just around 20%.

Almost one-half of the participants actively participated in the labour market (full-time or part-time) while a significant portion of the respondents who were inactive in the labour market were housewives. One-half of the participants earned less than €30,000 annually while only 10% earned more than €60,000. This agrees with the income distribution in Italy. The annual household income of Italians in 2019, net of income taxes and social security contributions, was on average just over 30,000 Euros. This value, net of the price change, is substantially similar to that found in the years preceding 2019, which however is approximately 15% lower than that recorded in 2006 before the global financial crisis (Bank of Italy, 2019). Furthermore, beyond the large gap between the richest and poorest (the top 20% of the population earn more than six times as much as the bottom 20%), income distribution is quite different across geographical macroareas. The income of families living in the North East is approximately 35,000 Euros, the highest in the country, against just under 26,000 Euros of net household income in the South (OECD, 2020).

Two-thirds of the participants came from a household with at least one dependent child; most belonged to households with between three and five members, while the share of single-component households is almost negligible (around 5%). The two subsamples of informed and uninformed participants reflect a similar percentage composition of socio-demographic characteristics to that observed for the overall sample.

[1] The IIA assumption was assessed with Hausman's specification test (Hausman and McFadden, 1984), which led to the non-rejection of the null hypothesis, that is, the IIA assumption can be confirmed. Therefore, in our case, omitting the irrelevant alternatives still leads to consistent and efficient parameter estimates.

Table 2
Summary statistics of sample's socio-demographic characteristics.

Socio-demographic characteristics	Overall sample	Informed	Uninformed
Gender			
Male	17.70	15.62	19.79
Female	82.30	84.38	80.21
Age group (*years*)			
18–24	8.60	7.29	9.90
25–34	20.05	22.92	17.19
35–44	23.72	21.88	25.56
45–54	25.00	26.04	23.96
55–64	11.72	11.46	11.99
> 64	10.91	10.41	11.40
Education level			
Less than primary and primary (ISCED: 1)	13.54	14.58	12.50
Lower secondary (ISCED: 2)	19.27	17.71	20.83
Upper secondary (ISCED: 3-4-5)	44.27	41.67	46.88
Tertiary (ISCED: 6-7-8)	22.92	26.04	19.79
Professional status			
Full-time employed	29.17	31.25	27.08
Part-time employed	18.23	17.71	18.75
Unemployed	7.29	10.42	4.17
Student	7.81	6.25	9.38
Retired	10.94	11.46	10.42
Housewife	26.56	22.92	30.21
Annual household income (*Euros*)			
Lower than 15,000	18.75	16.66	20.83
15,000 |– 30,000	32.29	29.17	35.42
30,000 |– 45,000	25.00	28.13	21.88
45,000 |– 60,000	13.54	16.67	10.42
60,000 |– 90,000	7.29	9.38	5.21
90,000 |– 120,000	2.08	–	4.17
Higher than 120,000	1.04	–	2.08
Household size			
1	5.21	4.17	6.25
2	17.19	13.54	20.83
3	27.08	31.25	22.92
4	31.77	35.42	28.13
5	14.06	10.42	17.71
6	4.69	5.21	4.17
Children			
Without	33.85	33.33	34.37
With	66.15	66.67	65.63
Sample size	192	96	96
N	3,456	1,728	1,728

We also gained insight into a variety of topics related to food consumption habits and attitudes to sustainability labels by introducing a set of items on a 5-point Likert scale (from 1 for 'not at all important/totally disagree' to 5 for 'extremely important/completely agree') in the questionnaire.

Table 3 shows how often consumers read product labels when buying food. Although around 60% of respondents claimed they 'often' or 'always' read labels, considering them an essential guide for choosing food products, this propensity can depend on the type of information. 'Use-by-date', 'price', 'brand' and 'quantity' aroused the greatest interest from the consumer, while the different types of certification (ethical, quality, organic) were perceived as less important. Information on geographical origin, nutritional characteristics and benefits 'often' or 'always' drew the attention of about one-third of the respondents.

Table 3
How often consumers read information on product labels.

Information on the label	Never/Occasionally	Habitually	Often/Always
Label (in general)	24.06	18.19	57.75
Price	7.98	14.36	77.66
Quantity	17.55	17.55	64.89
Brand	7.98	23.94	68.09
Use-by-date	3.72	9.57	86.70
Nutritional information	41.49	17.02	41.49
Geographical origin	30.87	18.26	32.17
List of ingredients	57.22	14.97	27.81
Instructions for use	68.62	14.89	16.49
Nutritional benefits	51.34	15.51	33.16
Organic certification	68.62	11.70	19.68
Quality certification	76.06	11.70	12.23
Ethical certification	87.23	4.79	7.98

The percentage distribution of the importance attached by consumers to specific factors when purchasing a food product is shown in Fig. 1. According to the participants, food 'taste' and 'safety' (e.g. the ability of the product not to cause harm to health) were the two most important characteristics when buying a food product. More than half of the consumers considered organic production methods and tradition, understood as the propensity to help preserve traditional consumption patterns, important or extremely important. Similarly, almost two-thirds of respondents perceived animal welfare and naturalness to be important (i.e. products made without modern technologies).

Regarding the degree of concern about environmental issues (Table 4), respondents were mostly concerned about excessive waste production, the use of pesticides and chemicals in food production and consequent land/air quality degradation. Fewer concerns arose about food over-packaging, the lack of responsible forest management and the consequences of environmental accidents, such as disasters involving nuclear power plants or oil tankers at sea. Only one-third of respondents claimed they were seriously concerned about the depletion of natural resources, carbon emissions from food production and distribution, and the loss of biodiversity.

As anticipated above, the respondents belonging to the uninformed sub-sample were asked to answer some questions in order to test their knowledge of the three environmental sustainability labels (Rainforest, Organic, Legambiente). When asked about the knowledge of these labels, only 15% said they knew 'Rainforest Alliance', less than 15% claimed they knew '*Per il Clima-Legambiente*', while about 50% said they knew 'EU Organic Farming'. However, less than half of the respondents, who claimed to know the 'Rainforest Alliance Certified' and '*Per il Clima-Legambiente*' labels, correctly answered a follow-up question about the meaning of the label. Over 50% of the respondents, who stated they knew 'EU Organic Farming', also provided the right meaning of the label. The 'EU Organic Farming' label was therefore familiar to about one-quarter of the uninformed subsample of the respondents.

4.2. Results from CL models

As regards the overall sample (Table 5), the null hypothesis that all coefficients are zero is rejected by the likelihood ratio tests (*p-value* < .01). All three sustainability labels are statistically significant attributes, meaning that their presence on the food product increases the likelihood of purchase. In particular, the positive effect on consumer utility for tomato purée is more sizeable for Rainforest, followed by Organic and finally by Legambiente. The Italian origin of the product also plays a significant role in consumer response, favourably influencing the probability of purchase. As expected, the price coefficient is negative, confirming consumers' preference for lower prices over higher ones. The negative coefficient of the opt-out alternative (no-buy option) shows that, all other things being equal, consumers prefer one of the two tomato purée alternatives rather than having none at all.

With reference to subsamples (informed vs. uninformed), the CL models mostly confirm the results from the overall sample. However, it is worth noting that the role of sustainability labels becomes more crucial and relevant when respondents are provided with *a priori* information about the different type and content of environmental sustainability labels. This is because the respondents generally know little about the three sustainability labels in question (subsection 4.1). Indeed, the coefficients of the Rainforest and Organic labels are higher for the

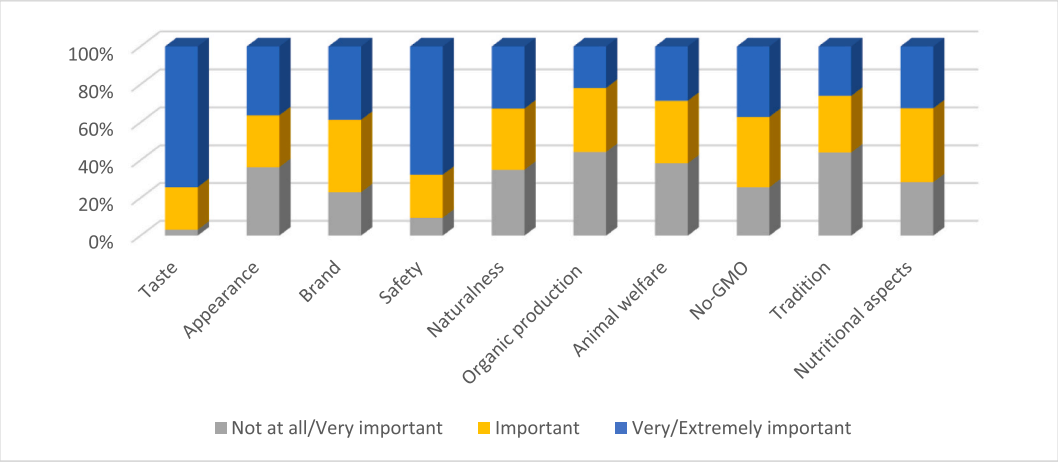

Fig. 1. Importance attached to specific factors when purchasing food.

Table 4
Consumer concerns about environmental issues.

Information on labels	Not worried at all/ little worried	Worried	Very/extremely worried
Pesticides/chemicals in food production	3.13	26.04	56.25
Depletion of natural resources	8.85	32.81	35.94
Land/air quality deterioration due to pollution	5.24	33.51	46.60
Lack of responsible forest management	18.32	32.46	21.47
Climate change	10.99	20.94	53.40
CO_2 emissions from food production	7.81	39.58	33.85
Excessive waste production	2.11	22.63	67.89
Loss of biodiversity	18.95	27.37	33.16
Consequences of environmental accidents	12.04	37.70	25.65
Over-packaging	19.79	26.04	14.58

Table 5
CL model estimates (total, informed vs. uninformed consumers).

Variables	Total	Informed	Uninformed
	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)
No Buy	−0.8375*** (.0609)	−0.7344*** (.0847)	−0.9442*** (.0877)
Label			
Rainforest	0.3400***(.0756)	0.4229***(.1075)	0.2620**(.1065)
Organic	0.2826***(.0814)	0.4245***(.1195)	0.1527(.1119)
Legambiente	0.2502***(.0792)	0.2881***(.1140)	0.2112*(.1103)
Origin (1 if *Italian*)	0.3024***(.0469)	0.3119***(.0673)	0.2953***(.0656)
PRC	−0.3591*** (.0258)	−0.3971*** (.0373)	−0.3245*** (.0359)
Sample size	192	96	96
N	3,456	1,728	1,728
Log likelihood	−2,149.63	−1,070.04	−1,075.21

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 6
WTP estimates of the CL models (total, informed vs. uninformed consumers).

Attribute	Total	Informed	Uninformed
Rainforest	0.9468***	1.0650***	0.8074**
Organic	0.7869***	1.0690***	0.4706
Legambiente	0.6967***	0.7255***	0.6508*
Origin	0.8421***	0.7854***	0.9100***

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

informed group than the uninformed one. Specifically, for the subset of uninformed respondents,[2] the role of Organic label becomes even insignificant in influencing purchasing choices, despite being the best known of the three labels provided.

Table 6 shows the WTPs using first the estimates of the overall CL model and then taking into account the level of information provided (informed vs. uninformed). WTPs suggest that consumers are willing to pay the highest premium price for tomato purée with the Rainforest label, followed by Organic and Legambiente labels. In particular, the magnitude of WTPs becomes greater for informed consumers (except for Legambiente for which the difference is negligible), while significance levels are lower (Organic becomes statistically insignificant) for their uninformed peers.

Moreover, we classified respondents into two groups based on the level of formal education: *i*) low-educated, i.e. lower secondary education or below; *ii*) high-educated, i.e. from upper secondary onwards. We also grouped respondents based on their income level: *i*) low-earners, i.e. income up to 30,000 Euros; high-earners, i.e. income over 30,000 Euros.[3] As shown above (subsection 4.1), the rationale for the proposed

[2] Statistical tests were performed to verify the hypothesis that the regression coefficients of the environmental sustainability labels between the two groups of informed and uninformed respondents significantly differ from each other. In particular, the difference between the coefficients is significant (*p-values* < .01) for Rainforest and Organic, but not for Legambiente.

[3] As shown in Table 2, the groups of consumers by education level are adequately represented: 67.2% (low-educated) and 32.8% (high-educated); similarly, income-based groups: 51% (low earners) and 49% (high earners). The significant role of education and income in explaining consumer behaviour was found in a preliminary analysis, making it possible to estimate separate CL models. Moreover, statistical tests allowed us to verify the hypothesis that, with a few exceptions, the regression coefficients associated with the sustainability labels were significantly higher for well-educated (high-income) respondents than for those with low education (low-income) (*p-values* < .01). This supports the idea of exploring consumer behaviour by controlling for education and income levels.

Table 7
CL model estimates (total, informed vs. uninformed consumers) by education.

Variables	Total		Informed		Uninformed	
	Low education	High education	Low education	High education	Low education	High education
	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)
No Buy	−0.6536***(.0722)	−1.2552***(.1159)	−0.5774***(.0985)	−1.1495***(.1699)	−0.7406***(.1063)	−1.3427***(.1588)
Label						
Rainforest	0.1597(.1315)	0.4368***(.0929)	0.3647*(.1994)	0.4486***(.1286)	−0.0035(.1759)	0.4262***(.1346)
Organic	0.0087(.1352)	0.4445***(.1041)	0.1096(.2103)	0.5657***(.1479)	0.0973(.1775)	0.3176**(.1473)
Legambiente	0.2408*(.1347)	0.2529**(.0986)	0.3959*(.2090)	0.2430*(.1370)	−0.1232(.1771)	0.2620*(.1423)
Origin (1 if *Italian*)	0.2844***(.0813)	0.3194***(.0580)	0.3452***(.1264)	0.3036***(.0804)	0.2401**(.1067)	0.3372***(.0840)
PRC	−0.4300***(.0327)	−0.2308***(.0429)	−0.4581***(.0458)	−0.2643***(.0654)	−0.4010***(.0468)	−0.2076***(.0572)
Sample size	63	129	31	65	32	64
N	1,134	2,322	558	1,170	576	1,152
Log likelihood	−693.76	−1,435.44	−307.48	−754.00	−384.09	−679.49

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

income classification was based on the distribution of Italian household income, which in 2019 averaged around 30,000 Euros (Bank of Italy, 2019). Many previous studies focused on the whole sample of respondents without differentiating between consumer subgroups; estimating separate models based on socio-characteristics can provide added value and capture further nuances that would otherwise remain unexplored (De Magistris et al., 2017).

Based on the likelihood ratio test (*p-value* < .01), the null hypothesis that all coefficients are zero continues to be rejected for each model by education level (Table 7). With a few exceptions, environmental sustainability labels are not relevant in influencing the purchasing behaviour of poorly educated consumers and, even more so, of consumers who have not received any information on such labels (uninformed), whose low level of education probably does not allow them to have prior knowledge, not even of a general nature, about the different labels. Conversely, sustainability labels improve purchasing propensity for highly educated consumers, that is, the utility of environmental sustainability labelled products will be greater than that of unlabelled products when education is higher, thus increasing their likelihood of purchase. However, providing people with information seems to positively affect the role played by environmental sustainability labels. It is worth noting the increased magnitude of the coefficients associated with the Organic label for the well-educated and previously informed consumer group.

Turning to CL models by income group (Table 8), the null hypothesis that all coefficients are zero continues to be rejected by the likelihood ratio tests (*p-value* < .01). Similarly to what happens to poorly educated consumers, the presence of environmental sustainability labels on food product does not seem to be relevant in influencing the behaviour of low-income consumers (except for Legambiente), while the same labels consistently make a positive contribution to the purchasing behaviour of high-income people. In particular, food labelling produces greater utility for high-income consumers, thereby affecting their likelihood of purchase, if the latter are informed about the value and meaning of such labels prior to purchase.

In both models (by education and by income), the Italian origin of the product retains its significant direct contribution in determining the purchase, regardless of the level of education or income of consumers and whether or not they have prior information. The negative signs of the price parameter confirm the decreasing utility of consumers as prices rise, regardless of the level of knowledge acquired. As expected, price negatively affects the likelihood of purchasing such a food product, as an increase in its price would result in a decrease in consumer utility. The adverse impact on the likelihood of purchase is, however, stronger for low-educated or low-income consumers, penalising them more than their better educated or high-income counterparts.

The negative coefficients of the opt-out alternative (no-buy) are, in absolute terms, greater for highly educated or high-income people, denoting a higher initial level of disutility for these consumer segments. In other words, all other things being equal, the preference for one of the two tomato purée alternatives (rather than having none) appears more pronounced for highly educated or high-income consumers than their less educated or low-income counterparts.[4]

Tables 9 and 10 show the estimated WTPs using CL models by education and income level, respectively, and separately for informed and uninformed respondents. The WTPs estimated on the whole sample are reported in the first columns of both tables. The WTPs suggest that highly educated or high-income consumers are willing to pay the highest premium for the Organic label if they are informed *a priori*. Otherwise, the WTPs are higher for the Rainforest label. However, WTPs are usually higher for better educated consumers, regardless of their level of knowledge about the meaning and content of environmental sustainability labels upstream of the study process.

Finally, well-educated or high-income consumers are willing to pay more for food of Italian origin than their less educated or low-income counterparts. Interestingly, WTPs are higher for uninformed consumers whether highly educated or high-income. The highest premiums for Italian origin for uninformed consumers were also established by the WTPs estimated on the entire sample (Table 6), confirming that food product origin is highly valued by consumers regardless of their familiarity with sustainability labels.

5. Discussion and conclusion

Food labelling schemes play an important role to guide consumers in their purchasing decisions by signalling the presence of specific product attributes that cannot be ascertained either at the time of choosing the product or after its use. Such attributes are defined credence as taken on faith by consumers when purchasing a food product. Both environmental sustainability features linked to the production of foods and their

[4] The Random Parameter Logit (RPL) and Random Parameter Logit-Error Component (RPL-CE) models were also estimated to test the hypotheses of preference heterogeneity across consumer choices and correlation across utilities and across taste parameters. We assumed that the price coefficients were invariant across respondents, while the coefficients and levels of the other attributes were assumed as random parameters with a normal distribution (Van Loo et al., 2011; Revelt and Train, 1998). However, the hypothesis of variation in the utility coefficients across individuals and the hypothesis of correlation across utilities and taste parameters were not verified on our data. All attributes kept their statistical significance (on average), but the derived standard deviation parameters did not statistically differ from zero for all sustainability labels, suggesting that respondents did not show significant preference heterogeneity in relation to different types of label attributes and that correlation is not an important issue in our sample, regardless of education and income level. That is, the RPL and RPL-CE models did not fit the data better than the CL model.

Table 8
CL model estimates (total, informed vs. uninformed consumers) by income.

Variables	Total		Informed		Uninformed	
	Low income	High income	Low income	High income	Low income	High income
	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)	Estimate (std. error)
No Buy	−0.5356***(.0834)	−1.1716***(.0925)	−0.5406***(.1123)	−0.9716***(.1334)	−0.5287***(.1246)	−1.3440***(.1292)
Label						
Rainforest	0.2016*(.1069)	0.4938***(.1097)	0.2513(.1618)	0.5707***(.1488)	0.1644(.1427)	0.4095**(.1635)
Organic	−0.0445(.1104)	0.5270**(.2187)	−0.0404(.1683)	0.7449***(.1810)	−0.0467(.1464)	−0.2878(.1796)
Legambiente	0.3515***(.1113)	0.1582***(.0584)	0.4442**(.1719)	0.1595**(.0720)	0.2833*(.1466)	−0.1462(.1719)
Origin (1 if *Italian*)	0.2676***(.0661)	0.3854***(.0690)	0.2864***(.1007)	0.4111***(.0944)	0.2539***(.0878)	0.3589***(.1017)
PRC	−0.4819***(.0396)	−0.2561***(.1069)	−0.4924***(.0544)	−0.3120***(.0540)	−0.4774***(.0585)	−0.2135***(.0466)
Sample size	98	94	44	52	54	42
N	1,764	1,692	792	936	972	756
Log likelihood	−1,051.59	−1,035.70	−469.62	−566.59	−578.74	−467.04

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 9
WTP estimates of the CL models (total, informed vs. uninformed consumers) by education.

Attribute	Total		Informed		Uninformed	
	Low education	High education	Low education	High education	Low education	High education
Rainforest	0.3714	1.8925***	0.7961*	1.6973***	−0.0087	2.0530***
Organic	0.0202	1.9259***	−0.2392	2.1404***	0.2426	1.5299**
Legambiente	0.5600*	1.0958**	0.8642*	0.9194*	−0.3072	1.2620*
Origin	0.6614***	1.3839***	0.7535***	1.1487***	0.5988**	1.6243***

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 10
WTP estimates of the CL models (total, informed vs. uninformed consumers) by income.

Attribute	Total		Informed		Uninformed	
	Low income	High income	Low income	High income	Low income	High income
Rainforest	0.4183*	1.9282***	0.5104	1.8292***	0.3444	1.9180**
Organic	−0.0923	2.0578**	−0.0820	2.3875***	−0.0978	−1.3480
Legambiente	0.7294***	0.6177***	0.9021**	0.5112**	0.5934*	−0.6848
Origin	0.5553***	1.5049***	0.5816***	1.3176***	0.5318***	1.6810***

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

origin fall in the category of credence attributes. Thus, specific labelling schemes adopted by producers and policy makers may become effective tools to inform consumers on these attributes. In particular, sustainability labels offer consumers the opportunity to consider some aspects of environmental sustainability in their food choices consistent with their preferences. The origin labels enable consumers to identify domestically produced foods that are more preferred than those that originate abroad (Apostolidis and McLeay, 2019; Kuchler et al., 2010; Loureiro and Umberger, 2007).

Based on these premises, the present research developed a choice experiment in the first step and estimated CL models in the analysis phase in order to investigate the effect of three environmental sustainability labels (Rainforest Alliance, EU Organic Farming, '*Per il Clima-Legambiente*') on consumer preferences and WTP for a processed food product, namely tomato purée, also controlling for the indication of domestic origin.

The overall results of this paper pointed out that the presence of environmental sustainability labels on the food product positively affects consumers' purchasing choices. Important differences were found when considering the role of information.

Consistent with our first expectations, the study confirmed that preferences for the environmental sustainability labelled product increase when consumers have proper knowledge about the meaning and content of the labels. By contrast, lack of awareness may lead consumers not to evaluate environmental sustainability labels in their purchasing decisions. However, the latter effect appears to be mitigated by the education level of consumers. In agreement with previous research focusing on the relationship between preferences for food-labelling schemes and socio-demographic characteristics, which highlighted the considerable role of education (Kumar and Kapoor, 2017; Rimpeekool et al., 2017), our study detected significant differences in consumer preferences *vis-à-vis* sustainability labels when respondents are ranked by education level. In particular, it should be noted that all three environmental sustainability labels are of little or no significance for poorly educated consumers, while their role becomes relevant to the food purchase decision process for consumers with at least upper education. The higher the education level, the greater the use of such labels by consumers since they are able to better process the environmental sustainability benefits that these labels certify (de Magistris et al., 2017; Grunert et al., 2014). Although all the environmental sustainability features certified by the selected labels influence the purchasing choices of well-educated consumers, the latter are willing to pay a higher premium price for the EU Organic Farming label than the Rainforest Alliance label when they are informed about the meaning of sustainability labels. In other words, more educated consumers' preferences are geared more towards aspects of environmental sustainability concerning the use of chemicals and fertilisers in crop production rather than aspects linked to biodiversity conservation. The positive effect of information about the presence of chemicals in food products on consumers' WTP for organically labelled foods was also found by other studies (Marette et al., 2012; Janssen and Hamm, 2012). Moreover, it is worth pointing out that well-educated consumers, albeit concerned with

environmental sustainability issues of food, still pay little attention to the relationship between the reduction in GHG emissions and food production, as shown by the limited use of the Legambiente label. A further result of this study, which confirmed the evidence of previous research (Van Loo et al., 2014; Scarpa et al., 2007), showed that WTPs are higher not only for the better educated but also for high-income consumers. Specifically, while well-educated consumers show higher WTPs, regardless of their level of knowledge of the meaning of environmental sustainability labels, high-income consumers only show higher WTP when properly informed.

In line with our second expectation, the information cue about the product's domestic origin is important for all consumers, regardless of their education, unlike environmental sustainability labels that are more appreciated by well-educated consumers. This result was consistent with previous research which pointed out a very strong impact of origin labels on consumer choices in terms of preference for domestically produced food (Apostolidis and McLeay, 2019; Kuchler et al., 2010). Furthermore, our result may be interpreted consistently with some studies suggesting that the origin labels can be used by consumers as proxies for quality and food safety (Jensen et al., 2019; Lee and Yun, 2015), and others linking consumer preferences for domestically produced foods because of the perception of affinity for their home (Loureiro and Umberger, 2007; Lusk et al., 2006). We cannot support the view proposed by others (de Magistris and Gracia, 2016; Aprile et al., 2016) that consumers perceive the cue of domestic origin as a sign of environmental friendliness. This potential association cannot be confirmed when the domestic origin label is combined with additional environmental sustainability-related information.

As regards our third expectation, consumer preferences appear to be oriented towards labels characterised by higher market penetration, regardless of certification by private or public organisations. The study revealed that consumers are willing to pay a higher premium for the food product with Rainforest Alliance and EU Organic Farming labels rather than with Legambiente. This result can be interpreted in light of the higher level of visibility and familiarity of the Rainforest and EU Organic labels that hold an established identity on the food market compared to the Legambiente label, present on only one product, namely tomato purée. These findings are corroborated by earlier research demonstrating that the visibility and familiarity of sustainability-labelled foods play an important role in leading consumers towards more sustainable food behaviours (Annunziata et al., 2019; Van Loo et al., 2015). In addition, we showed that the positive effect on consumer utility is more sizeable for Rainforest Alliance than EU Organic Farming, although the former is certified by a private association while the latter is certified by an important public institution, namely the European Community. This was contrary to our expectations formulated on the basis of previous studies showing that people are generally more inclined to trust public institutions than private organisations (de Magistris et al., 2017). However, as expected, well-educated and informed consumers are willing to pay a higher premium price for the EU Organic Farming label than the Rainforest Alliance label.

The evidence provided by this study indicates that a low level of consumer education may be a barrier to environmentally-friendly food behaviour. Although formal education does not necessarily instil environmental sustainability values, it may help increase consumer understanding and use of sustainability-related information in order to make sustainable food choices (Annunziata et al., 2019; Aprile and Mariani, 2015; Grunert et al., 2014). However, this may not lead to a greater propensity for sustainability or to purchasing behaviour in favour of environmentally sustainable food products.

Our findings provide suggestions for policy makers and food producers for the adoption of information campaigns aimed at increasing consumers' knowledge of the environmental sustainability dimensions of food production and consumption in the context of information on prices and nutritional values to which consumers are usually more attentive (Grunert et al., 2014). This could be an effective strategy to counter the effects of poor education. For instance, workshops and training courses on the relationship between environmental sustainability and food consumption could be held to make consumers more aware of lower energy consumption *vis-à-vis* food produced closer to the place of consumption (local production), and of the reduction in GHG emissions from organic methods of production. Moreover, reliable media sources may play a crucial role in providing accurate information on environmentally sustainable food production methods in order to instil environmental sustainability values in less educated consumers (Boccia and Punzo, 2021; Lawless et al., 2015). However, as shown by the literature (Annunziata et al., 2019; Mazzocchi et al., 2015), the above strategies may generate changes only in consumer attitudes and attention, but not in actual behaviour.

Therefore, more radical actions should be implemented to encourage consumers to buy sustainable food products. To this end, it would be appropriate to increase the market penetration of such products, for instance, by adding environmentally sustainable foods in large-scale catering outlets such as hospitals and schools, as well as company canteens. Other options may concern the placement of environmentally sustainable labelled foods in dedicated spaces in supermarkets to improve their visibility. The low visibility and familiarity of carbon footprint labelled foods (e.g. '*Per il Clima-Legambiente*'), due to their limited presence on the market, may be overcome by incorporating information on environmental impact into existing nutrition food labels to which consumers pay more attention.

While providing directions for future research on consumer behaviour *vis-à-vis* sustainability labels on food products, this work does not come without its limitations. The results yielded insights into a specific processed food product, namely tomato purée, without being generalised to other products and processes. Therefore, this paper calls for further empirical validation of other processed food products in other countries that would allow theoretical and practical advances while also controlling for country-specific factors. This paper also lays the groundwork for developing the role played by accurate information in raising consumer awareness on environmental sustainability in food production and consumption, in turn making it easier to define strategies to manage consumer expectations more effectively. Further efforts would be needed to investigate, along with environmental sustainability requirements, other product attributes (e.g. manufacturing and distribution brands) that affect consumers in their purchasing decisions.

CRediT authorship contribution statement

Maria Carmela Aprile: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Resources. **Gennaro Punzo:** Conceptualization, Methodology, Formal analysis, Software, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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