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The effect of PGI and Organic labelling on consumers' Willingness To Pay: Evidence from an experimental auction

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Abstract

As numerous studies have attempted to explain the variables influencing food-related purchasing decisions, in this article, we explored Italian consumers' preferences and willingness to pay for two different sustainability labels, the EU Organic Farming and the Protected Geographical Indication (PGI), in southern Italy, while highlighting the food values that can guide consumers' choices and affect their willingness to pay. The current study extends the application of an established methodological framework, combining different food values with food labelling, aiming to explore and measure the WTP of consumers for the Pachino cherry tomato. Data collection was conducted using a non-hypothetical experimental auction technique following a two-treatment design. The results showed that different food values influence consumers' purchasing decisions in general, and, more specifically, the factor groupings of origin and naturalness affect their willingness to pay. Consumers in our case study offered almost the same first price for PGI tomatoes and organic tomatoes, which is higher than the price offered for conventional tomatoes. This shows that the willingness to pay is affected by choice criteria based on food values and is considered important by Italian consumers.

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Introduction

In recent decades, there has been a steady increase in the demand for high-quality meals due to many factors, such as health and environmental concerns, as well as the expectations of more aware and discerning consumers (Mancuso *et al.*, 2024). Besides, consumers are increasingly concerned about the transparency and safety of the food they eat, since they are unable to properly understand the intricate dynamics of today's food supply chains (Meyerding *et al.*, 2019). In this regard, the European Union (2021) has created several trademarks, also called EU quality labels. These labels aim to protect, inform, and assist customers in making food choices. They also act as a food control instrument (Dias and Mendes, 2018). Furthermore, they help farmers and producers better sell their products effectively, providing customers with assurances about the provenance of food products, their production methods, and traditional knowledge (De Canio and Martinelli, 2021). Above all, certified goods are made in accordance with a specific code of practice. This attests to the product's 'traditional' status and details its unique features, the borders of its production region, and its manufacturing process (Török *et al.*, 2022).

In particular, the Protected Designations of Origin (PDO) and Protected Geographical Indications (PGI), which are based on a product's association with a specific territory, have been introduced as part of the legal framework for local products (European Community Regulations No. 510/2006), and recognized as key labels of product quality and as tools for protection (Garavaglia and Mariani, 2017; Bellia *et al.*, 2015a). The 'organic' label was also created when the European Parliament and Council introduced quality certifications for organic agri-food products (Regulation (EU) No 2018/848). This legislation states that organic products were created in response to a market in which consumers requested goods produced in a way that promotes animal welfare, environmental preservation, and rural development, while preserving Europe's biodiversity (Sampalean *et al.*, 2021).

However, consumer spending on organic food items in Italy totalled 2.5 billion euros in 2018, accounting for 3% of the total value of the country's agri-food industry (ISMEA, 2019). Based on this evidence, it is not surprising that researchers are looking more closely at factors and drivers that influence food purchasing and choice. However, it is challenging to fully explain the numerous factors that are involved in food-related decisions. Many studies have attempted to overcome this obstacle by identifying the most pertinent purchasing drivers (Baldi *et al.*, 2021; Aprile *et al.*, 2012; Meyerding *et al.*, 2019; Gracia and de-Magistris, 2016; Garavaglia and Mariani, 2017; Sampalean *et al.*, 2021). Indeed, given the current shift in consumer

behaviour and purchasing patterns towards environmentally friendly products, the importance of credible quality cues has grown (Moser, 2016; Prakash *et al.*, 2019). The purchase of a particular product or feature is often seen as a means of achieving a desired end state, which may help to explain why consumers choose one option over another (Lusk, 2011; Lusk and Briggeman, 2009). Notably, values have the ability to influence consumer behaviour in a variety of contexts, including the decision to buy (Gutman, 1982). Previous research has suggested using food values, such as safety or product origin, to reveal solid patterns of consumer desire (Pappalardo and Lusk, 2016).

Within this context, the study aims to provide new insight into the factors that influence consumers' purchasing intentions with regard to two product categories that are widely acknowledged as genuine in the food literature: PGI labelling and organic food items.

Yet, the desire for local and organic products has been rising recently because of their ethical credentials (Aprile *et al.*, 2012). Based on this assumption, it was suitable and interesting to create an explanatory study about a specific food product, to investigate consumer knowledge of and preferences for particular attributes, and to analyse the main factors that influence consumer purchasing motivations, using a non-hypothetical experimental auction technique.

The concrete consumers' buying intentions and willingness to pay (WTP) for local and organic food labels were compared to identify commonalities and variations in the factors influencing customers' purchasing decisions. The current study applies the methodological framework established by Pappalardo and Lusk (2016) to the case of Pachino cherry tomato. Specifically, it combines food values, which provide insight into drivers of food consumption, and food labelling, which guides consumers towards more informed choices, to assess consumers' WTP for this product. This may be advantageous for the scientific literature as well as researchers in the sector.

The main objective of this work is to understand consumer purchasing intentions, as indicated by their WTP for a specific high-quality product identified by a particular brand. As well as to determine if there is a difference in consumers' WTP for tomatoes carrying different labels, taking into consideration the economic barrier other than the environmental one. We addressed two main specific research questions: (RQ1) How do certifications differentially influence WTP for tomatoes? (RQ2) To what extent do food values influence WTP?

1. Literature Review

1.1. *General background: informed purchasing decisions based on food labelling*

Consumers today are more conscious, selective, and sensitive about the authenticity, quality, and safety of food. They are also extremely interested in understanding how the meals they purchase affect the environment (Ran *et al*., 2022). However, around 30% of greenhouse gas emissions are caused by the food system, which raises environmental expenses (Poore and Nemecek, 2018). As a result, it is critical that consumers can collect information about environmentally conscious and healthful diets at the point of sale and use it to inform their choice of products (Jürkenbeck, 2023). According to the literature, labelling is a crucial component of different communication techniques and signals (Garavaglia and Mariani, 2017), and consumer knowledge and understanding of label information are critical, as they are the main source of information (Savelli *et al*., 2021). Indeed, the purpose of sustainability labelling is to assist consumers in finding products that satisfy their demands when they are searching for sustainable substitutes for traditional food items (Weinrich and Spiller, 2016; Ingrassia *et al*., 2022).

According to the European Commission (2018), the European quality schemes are critical in preserving the legacy of European agriculture by protecting traditional production techniques and preventing imitation or adulteration of regional products. Thus, the EU helps ensure the survival of regional culinary traditions and the knowledge and skills that accompany them by promoting these products. Moreover, European quality schemes serve to increase consumer awareness and trust in the genuineness and quality of food products (Selvaggi *et al*., 2023).

Research indicates that consumers are impacted by front-of-pack (FOP) labelling while making food purchases (Shangguan *et al*., 2019). They can now trust and recognise high-quality products thanks to EU quality recognition, which also helps companies avoid free riding and trade on added-value marketplaces (Sampalean *et al*., 2021). Furthermore, more focus is being placed on identifying the information and certifications related to production sites and specific production methods that consumers use to judge the quality of food products and how those characteristics may affect their decision to buy. Nowadays, a sustainable diet is linked to a number of different labels on the market (Biasini *et al*., 2021). Nutrition claims on food products, for example, may assist consumers in focusing their choices on the health component.

Yet, the consumption of organic food has increased in recent decades due to consumers' perceptions of food safety and quality. (Hurtado-Barroso *et*

al., 2019). Thus, the use of organic certification labels is an important factor influencing consumers' attitudes towards organic food (Malissiova *et al*., 2022). In this regard, buyers can use the organic label to demonstrate their commitment to environmental issues to consumers (Jürkenbeck, 2023).

Evidence of organic farming labels shows that consumers see these labels favourably and that organic products are more expensive than conventional ones (Aprile and Punzo, 2022). Also, organic certification is communicated to consumers by product labelling, which might include extra organic certification logos or just a generic label with the prefix "organic". Indeed, research revealed that consumers also associate the organic label with several characteristics, such as the perception that the items are healthier than meals made conventionally (Richetin *et al*., 2022).

1.2. *Findings from the literature on methods of measuring the WTP for different food labels*

Using choice experiments, Janssen and Hamm (2012) examined consumers' WTP for various organic labels across six European nations. They revealed significant variations in these WTPs. They also suggested that consumers were willing to pay considerably higher prices for well-known labels. Regardless of their own national level of specialisation in food quality, EU consumers appeared to recognise the organic farming designation more universally (European Commission, 2018).

Furthermore, if a consumer is influenced by ethical concerns when purchasing food items, he or she might favour goods that benefit rural development (PGIs, for example). In this regard, origin labelling schemes are seen as an important instrument that allows consumers to connect a product's origin to its overall quality. In the past ten years, consumers' preference for local food has received significant international attention (Bavorova *et al*., 2016). However, certified Geographical Indications (GIs) are created in accordance with a code of practice that details the goods' unique characteristics, the manufacturing process, and the boundaries of the production region (Török *et al*., 2022). Therefore, these labels could significantly contribute to sustainable rural development (Aprile *et al*., 2012; Bellia *et al*., 2015c) by offering clear details about the origin and production processes of goods. This empowers customers to make informed decisions and builds confidence in the European food market (Glogoveţan *et al*., 2023).

However, accounting for the domestic origin of the product provides additional information on the factors that influence customers' purchasing decisions, as consumers may view country-of-origin labelling as an indication of increased product safety and a stronger sense of connection to their

homeland (Aprile and Punzo, 2022). Several studies have opted to measure individual WTP for tomato attributes by estimating the commonly used discrete choice experiments (Baldi *et al.*, 2021; Aprile and Punzo, 2022; Meyerding *et al.*, 2019), examining the impact of retrieved attitude factors on WTP. These studies require a high cognitive effort on the participant's side, as they are mainly based on a hypothetical food product. However, in hypothetical decision situations, participants experience no consequences for their choices (Jürkenbeck, 2023). As a result, when expressing personal opinions, they might reflect biased, subjective, and overestimated attitudes (De Houwer *et al.*, 2013). Other studies in the literature have opted to measure the WTP for food products, focusing on a single attribute using choice experiments (e.g., Menapace *et al.*, 2011; Janssen and Hamm, 2012; Török *et al.*, 2022; Malissiova *et al.*, 2022).

Nevertheless, compared to other methods of studying consumer preferences, such as the previously mentioned choice experiment, contingent valuation, and conjoint analysis, the use of real goods and money in experimental auctions allows a real market environment to be simulated and incentive-compatible conditions to be met. They produce data that closely matches customer preferences (Chen and Chai, 2010). Overall, it is important to note that consumers are willing to pay more for food products bearing sustainability labels than for similar unlabelled products. (Aprile and Punzo, 2021). By assisting in the development of focused labelling strategies and laws, food producers and policymakers can better understand the potential synergies of consumer demand for environmental sustainability labels.

2. Materials and methods

2.1. *Data collection*

The survey was conducted in Sicily, Italy, between May and October 2022. A specific experimental design involving two treatments was developed using a between-subjects approach, with participants being randomly assigned to one of the two treatments. Data were collected through an experimental auction procedure, with participants recruited with the support of various local trade associations. A random sample of 117 consumers was recruited and invited to attend an experimental laboratory on agreed dates and times for the experimental phase. The experimental procedure comprised three sections: first, participants completed a Best-Worst (BW) questionnaire to rate their food preferences; next, the experimental auction was conducted to determine their WTP for tomatoes; finally, participants completed a socio-demographic questionnaire.

2.2. *Best-worst questions*

In the first section, participants were asked to complete a sequence of ten BW questions relating to food values in general, not just tomatoes. In this study, BW was used to assess the importance of specific attributes when purchasing food products in general. The list of adopted food values is referred to as Pappalardo and Lusk (2016). Table 1 shows all the food values considered in the experimental design and the descriptions provided to participants for each.

Table 1 - Food values and descriptions

Value	**Description**
Taste	The extent to which the consumption of the food is appealing to the senses
Price	The price you pay for the food
Safety	Eating the food will not make you sick
Appearance	Food looks appealing and appetizing
Origin	Where the agricultural commodities were grown (local, national, or abroad)
Environmental impact	Effects of food production on the environment
Healthiness	When a product is good for health
Labelled information	Information reported by labels regarding the product's characteristics
Naturalness	The extent to which food was made without modern food technologies (genetic engineering, hormone treatment, and food irradiation)
Convenience	Ease with which food is cooked and/or consumed

The values were randomly aggregated so that each attribute was repeated the same number of times. The 10 food values were divided into sets of 5 attributes, for a total of 10 BW question sets. In each set, the question remained the same: "When buying food, which of the following is the most important and which is the least important?" For each question, only one food value had to be indicated as "Best" and one as "Worst". The scores for each attribute were summed across all participants to produce a total score for each attribute: higher positive scores indicate greater importance, and higher negative scores indicate less importance.

2.3. *Auction procedure*

After completion of the BW questionnaire, participants took part in a non-hypothetical second-price auction aimed at eliciting their WTP for 500g packs of tomatoes. As the experimental auction mechanism, we chose the Vickrey second-price auction for its proven ability to elicit participants' actual WTP, thanks to its incentive-compatible nature (Vickrey, 1961; Lusk and Briggeman, 2009). This method was commonly adopted in the literature on consumer food preferences because it yields a reliable and quantifiable estimate of individuals' WTP (Pappalardo and Lusk, 2016; Reitano *et al*., 2024; McCallum *et al*., 2025). Each participant submitted a bid for each type of tomato, and the highest bidder won the product but paid the second-highest bid. Otherwise, they did not obtain the product and incurred no cost. It is important to note that the winner of a product is required to pay the auction price in real money. All bidders had an equal chance of winning, regardless of their valuations.

Before the start of the auction, the moderator explained the procedure to all participants. Each participant was presented with a 500g pack of tomatoes and was given a chance to examine the product and read its information. During this inspection phase, the moderator read the label aloud. In this study, the participants were asked to bid on three kinds of tomatoes successively in three rounds of the auction. Auction targets were conventional Pachino tomato, Pachino PGI Tomato, and organic Pachino tomato in the three rounds, and participants took part in each round. To account for potential order effects related to the presentation of information across products, a between-subjects treatment design was implemented. Depending on the treatment condition assigned, the sequence in which product information was provided varied. Thus, in Treatment 1, one participant received information in the following sequence: in the first round, generic information on the conventional tomato being auctioned, indicating only the area of origin. In the second round, detailed information on the PGI label of the Pachino tomato, and in the third round, information on the organic Pachino tomato. In Treatment 2, the sequences were inverted in the second and third rounds. Participants were randomly assigned to one of two treatments.

After three rounds of the auction, one round was randomly selected to determine the binding round and product. The moderator notified the winners (the highest bidders) for each group, who then paid the second-highest bid and received the binding product. The other participants were not required to pay anything. At the end of the experimental procedure, each participant received a €10 gadget box as a token of appreciation for their participation in the study.

2.4. *Data processing*

All statistical analyses were conducted using IBM SPSS Statistics software version 29.0.2.0 (20).

In order to proceed with the elaboration and analysis of the gathered data, we opted for Principal Component Analysis (PCA). Before performing PCA, the perceived importance of each food value was assessed based on participants' responses to the BW scaling. For each attribute, an individual importance score was calculated using the following formula:

$$Average\ score = Count_{best} - Count_{worst}$$

where "Countbest" indicates the number of times an attribute was selected as the most important ("best"), and "Countworst" represents the number of times it was selected as the least important ("worst"). To compute these scores, each time an attribute was chosen as "best," it was assigned a value of +1, while each time it was identified as "worst," it was assigned a value of −1. Since each attribute appeared five times throughout the questionnaire, the possible range of resulting scores for each attribute varied from a minimum of −5 to a maximum of +5.

These individual scores were subsequently used as input for the PCA, which is a helpful statistical method for lowering the number of original variables to a smaller set. The PCA creates new variables, or principal components, by identifying the linear correlations between the original variables in order to explain the potential variability of the original data. The sequence of these principal components is such that the largest amount of variability is explained by the first component, followed by the next largest amount by the second, and so on. In summary, PCA is a helpful statistical method for simplifying a data set's interpretation by lowering the number of variables. In addition to producing a smaller set of new variables, referred to as principal components, which represent the same variability in the original data (Moreno-Escobar *et al*., 2023). Additionally, the PCA approach subjectively increases the weight of some parameters while decreasing the weight of others that have less bearing on output results (Jaouachi, 2012).

PCA nevertheless remains a potent method for extracting structure from input datasets that may have many dimensions. It is easily accomplished by resolving an eigenvalue problem. It entails projecting the incoming data into two primary components, or axes. The majority of the structure in the input data may frequently be summarised by a small number of principal components (Gazzah *et al*., 2015). However, according to Kagraoka (2016) and Meloun *et al.* (2017), the number of shared elements needs to be determined using a set of standards. In our study, we applied the criterion of explained variance (the chosen factors should explain as large a proportion

of the overall variability as possible) and the principle of eigenvalues (factors with eigenvalues greater than one are considered significant).

We can calculate the factor loadings once the number of factors has been established. One variable may correlate with multiple factors throughout these calculations, which could lead to uncertainty in the results. The rotation is used to optimise the differences between factors. The rotations enable factor loadings, or correlations between variables and factors, to take on a form that makes explanations clearer and more precise (Bucko *et al.*, 2018). In our analysis, Varimax rotation was used to find the best possible explanation of the factors.

Finally, the average WTP was calculated for each kind of tomato using the following formula:

$$Average\ WTP = \frac{\Sigma(WTP)}{n}$$

Where: "Average WTP" is the overall average WTP, "WTP" is the value of an individual's WTP, and "n" is the number of participants.

To further investigate the factors influencing changes in WTP, two multiple linear regression analyses were conducted. The first model was estimated using the principal components extracted from the value-related attributes through principal component analysis (PCA). These components captured the underlying dimensions of consumers' food-related values, and their inclusion allowed for a more structured assessment of how latent preferences influence WTP. In addition, a second regression model incorporated independent variables representing both socio-demographics and behavioural characteristics. To ensure the final model was interpretable, variables showing significant associations with WTP in the exploratory models were retained, while still capturing the key factors that had been highlighted. Both models aimed to quantify the impact of these variables on WTP, assessing which specific factors had a statistically significant effect on consumers' WTP across the different tomato types.

3. Results

3.1. *Sample characteristics*

Table 2 presents summary data of the sample's demographic attributes. The sample included 117 respondents. The sample's gender balance was equal, with approximately 53% female. respondents. The ages of the participants ranged from 18 to 63 years old, and the most represented age

group was 18-24 (55.6%). As regards educational level, most participants reported having a college degree (37.6%) and a high school diploma (54.7%).

The composition of the participants' households was heterogeneous. However, more than half of the participants (64.1%) came from households consisting of more than three individuals. Nevertheless, triad households consisting of three family members accounted for 21.4% of participants, while nuclear families made up of one more member than the participant accounted for 8.5%.

Table 2 - Sample characteristics

Quota description		**n.**	**%**
Age	18-24 y.o.	65	55.6
	25-49 y.o.	42	35.9
	50-63 y.o.	9	7.7
	Over 63 y.o.	1	0.9
Gender	Male	54	46.2
	Female	62	53.0
	Prefer not to say	1	0.9
Marital Status	Married/cohabiting	21	17.9
	Never been married	50	42.7
	Separated/Divorced/Widowed	46	39.3
Education	Middle school	2	1.7
	High school	64	54.7
	College degree	44	37.6
	Post-graduate (PhD, Master's)	7	6.0
Net household income, per year	Under €20.000	41	35.0
	From €20.000 to €39.999	31	26.5
	From €40.000 to €59.999	24	20.5
	From €60.000 to €79.999	12	10.3
	From €80.000 to €99.999	6	5.1
	Over €100.000	3	2.6
Household size	1	7	6.0
	2	10	8.5
	3	25	21.4
	More than 3	75	64.1

Quota description		n.	%
Residential area	Rural	59	50.4
	Urban	58	49.6
Most frequently purchased Tomato packaging	Packaged	56	47.9
	Unpacked	61	52.1
Frequency of tomato purchase	Never	2	1.7
	Rarely	6	5.1
	Sometimes	26	22.2
	Often	59	50.4
	Always	24	20.5
The most common place to buy tomatoes	Supermarket	62	53.0
	Regional market, farmer's market, or other forms	27	23.1
	Specialty shop (fruit and vegetables)	22	18.8
	Mini-market	1	0.9
	Street vendors	5	4.3

Overall, half of the surveyed people (50.4%) indicated that they frequently purchase tomatoes, of which a basically balanced percentage is purchased in bulk (52.1%) and in packaged form (47.9%).

3.2. *Best-worst findings*

Table 3 reports the descriptive statistics of the importance scores attributed to each food value, as derived from the BW scaling. Among the most positively evaluated attributes, "Safety" (average = 0.95), "Origin" (average = 0.57), and "Healthiness" (average = 0.47) emerged as the top priorities for respondents. Notably, Safety also registered the most extreme minimum value (min = −2.00). Naturalness, although associated with the second-highest minimum importance score (min = −3.00), exhibited the lowest average value among the positively evaluated attributes (0.42). This suggests that while some consumers consistently prioritize natural characteristics, others attach less importance to this dimension, resulting in a more variable overall perception. These results reinforce the idea that certain intrinsic food values drive consumer decision-making in the food context.

Conversely, attributes such as "Convenience", "Appearance", and "Environmental impact" received the lowest scores. The low importance assigned to those values suggests that these aspects are perceived as secondary when compared to attributes directly related to personal well-being and intrinsic product characteristics. This interpretation is further supported by the observation that both "Convenience" (max = 4.00) and "Appearance" (max = 3.00) also reported the lowest maximum scores.

Intermediate attributes such as Naturalness (average = 0.42) and Labelled Information (average = 0.44) reported moderately positive mean scores, while Taste (average = −0.05) and Price (average = −0.03) were characterized by values very close to zero, suggesting a relatively neutral evaluation by participants.

Table 3 - Results of BW scaling

	Average	**Std. Dev.**	**Min**	**Max**
Labelled information	0.44	2.01	–5.00	5.00
Healthiness	0.47	2.00	–4.00	5.00
Environmental impact	–0.54	1.75	–5.00	5.00
Taste	–0.05	1.43	–4.00	5.00
Naturalness	0.42	1.49	–3.00	5.00
Convenience	–1.66	2.01	–5.00	4.00
Price	–0.03	2.14	–5.00	5.00
Safety	0.95	1.74	–2.00	5.00
Appearance	–0.55	1.67	–5.00	3.00
Origin	0.57	1.94	–5.00	5.00

3.3. *Elements influencing consumer purchasing behaviour*

To calculate the number of factors, we employed PCA, eigenvalues, and explained variance. The PCA enabled us to group the purchasing components into four factors, which explain 65.66% of the total variance (Table 4). This result, obtained through the BW questions, has enabled us to identify the various elements that influence the purchasing behaviour of the respondents based on food values.

Based on eigenvalues greater than 1.0, four factors were selected as the outcome of the initial analysis. However, as the factor loadings were unclear, we rotated the factors using the Varimax method to make the results easier to understand and interpret. The results are shown in Table 5 below.

Table 4 - Total variance explained by the PCA

Explained total variance									
Components	**Initial eigenvalues**			**Load Sums of Extraction Squares**			**Load sums of rotation squares**		
	Total	**% of variance**	**% cumulative**	**Total**	**% of variance**	**% cumulative**	**Total**	**% of variance**	**% cumulative**
1	2.477	24.767	24.767	2.477	24.767	24.767	1.838	18.383	18.383
2	1.745	17.451	42.218	1.745	17.451	42.218	1.766	17.657	36.041
3	1.313	13.129	55.347	1.313	13.129	55.347	1.504	15.037	51.077
4	1.032	10.318	65.665	1.032	10.318	65.665	1.459	14.587	65.665
5	0.984	9.837	75.502						
6	0.744	7.437	82.938						
7	0.666	6.657	89.596						
8	0.577	5.772	95.367						
9	0.463	4.628	99.995						
10	0.000	0.005	100.000						
Extraction method: Principal component analysis									

The first factor reflects consumers' tendency to pay attention to the "labelled information" (0.150) on the tomatoes they buy, as well as "healthiness" (0.835) and "safety" (0.683). This suggests that consumers who value health-related attributes may also critically evaluate label content. This factor contributed the most to explaining the total variance with 24.77%. The second factor essentially includes taste, convenience, price, and appearance. This factor explains around 17.45% of the total variance and shows strong positive associations with "taste" (0.743) and moderate loadings for "convenience" (0.294), "price" (0.168), and "appearance" (0.132). This component addresses people's desire to check that the product they intend to purchase is good. Factor 3 is defined by strong loadings on "naturalness" (0.810) and "origin" (0.397). This factor explains 13.13% of the total variance explained and reflects a preference for products perceived as authentic, minimally processed, and locally sourced. In the fourth factor, the most important purchase criteria presented is the "environmental impact" (0.919), suggesting the emergence of a distinct segment of environmentally conscious consumers for whom sustainability is a decisive criterion in food choices. This factor explains 10.32% of the total variance. Based on these outcomes, we can conclude that the growing attention paid to product labelling, health, and safety confirms that consumers today prioritise these aspects when making purchases.

Table 5 - Component matrix after rotation

	Components			
	1	**2**	**3**	**4**
Labelled information	0.150	–0.774	–0.154	–0.177
Healthiness	0.835	0.110	–0.073	0.074
Environmental impact	–0.070	0.041	0.017	0.919
Taste	0.007	0.743	0.001	–0.256
Naturalness	0.045	0.217	0.810	0.254
Convenience	–0.437	0.294	–0.660	0.135
Price	–0.443	0.168	–0.155	–0.522
Safety	0.683	–0.021	0.335	0.007
Appearance	–0.365	0.132	–0.298	–0.393
Origin	–0.352	–0.650	0.397	0.045
Rotation method: Varimax with Kaiser normalisation				

Overall, the PCA results reveal four meaningful dimensions that shape consumers' purchasing behaviour: attention to health and label information, preference for sensory and practical features, concern for naturalness and product origin, and environmental awareness. These findings underline the complexity of consumer decision-making and the coexistence of utilitarian, hedonic, and ethical motivations.

3.4. *Consumers' WTP for tomatoes*

The consumers' WTP for the three types of labelled tomatoes, presented in Table 6, shows that the consumers' mean bid values for the conventional, PGI, and Organic types were €1.55, €2.00, and €2.01, respectively. To assess statistically significant differences across labelling schemes, we conducted paired sample t-tests on WTP differences (ΔWTP) between treatments.

Table 6 - Consumers' bid for a differently labelled tomato

	Average WTP (€)	**Standard error**	**95% Confidence Interval**
Conventional	1.55	0.084	1.39-1.72
PGI	2.00	0.110	1.79-2.22
Organic	2.01	0.109	1.79-2.23

Table 7 - Pairwise WTP differences (ΔWTP) based on paired t-tests

Comparison	ΔWTP (€)	p-value
PGI-Conventional	0.45	< 0.001***
Organic-Conventional	0.46	< 0.001***
Organic-PGI	0.01	0.9202

Note: The null hypothesis is mean difference = 0, and the probability is (|T|>|t|).
The symbol *** denotes significance at the 1 per cent level.

Results show that consumers are willing to pay a statistically significant premium for both certified products compared to the conventional product. In particular, the average WTP premium is €0.45 for PGI relative to the conventional product ($p < 0.001$) and €0.46 for organic tomatoes relative to the conventional product ($p < 0.001$). These results indicate that certification schemes significantly increase consumers' WTP compared to the baseline product. In contrast, no statistically significant difference was found between PGI and organic tomatoes (Δ = €0.01, $p = 0.92$), which suggests that consumers do not differentiate between these two types of certifications in monetary terms in the context of this study.

To investigate the factors influencing consumers' WTP for conventional, PGI, and organic tomatoes, multiple linear regressions were estimated.

The specification of the regression model is as follows:

$$WTP_i = \beta_0 + \beta_1 \times PC1_i + \beta_2 \times PC2_i + \beta_3 \times PC3_i \times \beta_4 \times PC4_i + \beta_5 \times Gender_i + \beta_6 \times Agei + \beta_7 \times Marital\ Statusi + \beta_8 \times Rural\ Residency_i + \beta_9 \times Tomato\ packaging_i + \varepsilon_i$$

Where WTP_i, the dependent variable, represents the WTP of individual i for a specific tomato type (conventional, PGI, or organic); β_0 denotes the intercept; β_n are the coefficients associated with the four principal components extracted from the food value dimensions and socio-demographic and behavioural characteristics; ε_i is the error term.

Table 8 summarizes the estimated coefficients and significance levels for each variable.

Table 8 - Regression analysis of factors influencing WTP

Variable	Conventional	PGI	Organic
PC1	–0.112	0.004	0.052
PC2	–0.217**	–0.182*	–0.150
PC3	0.024	0.150	0.302**
PC4	0.038	0.056	0.089
Gender	–0.120	–0.276	–0.179
Age	–0.018**	–0.009	0.001
Marital Status	–0.435***	–0.364*	–0.316*
Rural residence	0.158	0.154	0.322
Tomato packaging	0.299*	0.355*	0.187

Notes: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.
Model statistics:

- Conventional: R-squared: 0.178; Adjusted R-squared: 0.108
- PGI: R-squared: 0.137; Adjusted R-squared: 0.064
- Organic: R-squared: 0.214; Adjusted R-squared: 0.148

The results indicate that among the components, PC2 exhibits a statistically significant negative effect on WTP for conventional tomatoes ($p < 0.05$) and a weaker (marginally significant) effect for PGI products. This suggests that consumers who place greater emphasis on attributes such as taste, convenience, price, and appearance tend to exhibit lower willingness to pay for labelled products, potentially reflecting a stronger orientation toward immediate product attributes rather than credence characteristics. Conversely, PC3 shows a positive and statistically significant effect on WTP for organic tomatoes ($p < 0.05$), indicating that consumers who value naturalness and origin are more likely to pay a premium for organic products. No significant effects emerge for PC1 and PC4 across the three product categories.

Turning to socio-demographic variables, marital status consistently shows a negative and statistically significant association with WTP across all models, with stronger significance levels for conventional and PGI products. This indicates that individuals in certain household structures may exhibit more price-sensitive behaviour. There is a negative effect of age on WTP for conventional tomatoes ($p < 0.05$), suggesting that older consumers are less willing to pay a premium for standard products. No significant effect is observed for labelled alternatives. The variable capturing purchasing habits (i.e., tomato packaging) shows a positive and marginally significant effect for both conventional and PGI tomatoes. This suggests that consumers'

purchasing routines are associated with a higher stated willingness to pay in these categories. No statistically significant effects are observed for gender and rural residency, although the latter displays a positive (but non-significant) coefficient in all specifications.

The regression model explains approximately 17.7% of the variance for conventional tomatoes, 13.7% for PGI, and 21.4% for organic products. These relatively low R-squared values highlight the inherent complexity of consumer preferences and indicate that additional unobserved factors may play a critical role in shaping WTP. Ozili (2023) points out that, in the social sciences, a low R-squared is acceptable if the explanatory variables are statistically significant. Although our results show limited explanatory power, they meet this condition.

4. Discussion and conclusions

Food labelling schemes play an essential role in guiding consumers' purchasing decisions by indicating certain product features that cannot be determined at the time of selection or after consumption. Specifically, sustainability labels enable consumers to consider certain environmental factors when choosing food that suits their tastes.

Furthermore, organic foods and PGI items differ since they use distinct production techniques, yet they both have the same "image" as genuine, ethical, and high-quality goods. This is something that has become increasingly acknowledged by the market, not only by academic research. For example, food retailers are identifying the food macro categories under investigation as premium brands, especially when it comes to their private labelling regulations. Customers do, in fact, increasingly view them as genuine, high-quality food products, but they are also more likely to "feel" that they can support sustainable production and consumption practices (Aprile *et al.*, 2012).

Based on these assumptions, the present research first developed a BW questionnaire and then used experimental auctions to investigate the effect of labels such as 'organic' and 'PGI' on consumer preferences and WTP for a specific fresh food product: the Pachino cherry tomato (Bellia *et al.*, 2015b). However, as they are becoming more interested in regional and locally produced goods, as well as organic produce, it was important to examine their purchasing motivations further and establish whether there are any similarities or differences.

It is undeniable that tomatoes are cherished products in Italy, representing its food culture and way of life; nonetheless, Italy is a major exporter of tomatoes worldwide (FAOSTAT, 2017). Given this, it was important to

understand the purchasing habits of this food item, which, as shown in the results, is a basic product in all households (50% of respondents said they OFTEN buy tomatoes, while 20% said they ALWAYS buy them). Especially when this product is no longer conventional and is certified, it is more appreciated by consumers.

Indeed, Italians are generally willing to pay the highest premium for the quality of origin from Southern Europe. Conversely, they are not satisfied with tomatoes that are imported from outside of Europe (Baldi *et al.*, 2021). They believe that a tomato from Southern Europe is more socially sustainable, even if it is grown with high water use in a region that may experience water scarcity and is likely to fall into the local food trap (Born and Purcell, 2006; Baldi *et al.*, 2019).

Our study showed that consumers significantly preferred PGI- and organic-certified tomatoes, despite the similar price, suggesting that they attach the same level of importance to them as they do to tomatoes from conventional farming. Therefore, to determine whether this assumed similarity is justified, a reading of the factors influencing consumer purchasing behaviour for these food products in light of sustainable development is necessary. As part of our investigation, we tried to compare consumers' intentions to purchase organic and PGI-labelled Pachino cherry tomato, and examine the influence of certain food values on attitude-intention.

As the results of the PCA demonstrate, consumers generally prioritise the factor that encompasses these three elements (labelling, healthiness, and safety) when choosing food. So, when it comes to a particular product, especially tomatoes, they tend to base their choices mainly on these values. The overall findings of this study show that consumers are more likely to buy food products when sustainability labels are present. Consistent with our objectives, the study confirmed that the presence of informed labels increases consumers' WTP. More specifically, the components of the third factor, 'Naturalness and origin', are considered to affect not only consumers' choice of food, but also their willingness to pay. This confirms that consumers in Italy are willing to pay more for fresh tomatoes locally grown and therefore rich in symbolic origin features.

Unlike other studies, which have found that consumers may value PGI or local certification more than organic certification (Meyerding *et al.*, 2019; Gracia and de-Magistris, 2016; Garavaglia and Mariani, 2017; Sampalean *et al.*, 2021) or vice versa (McLeod *et al.*, 2023; Menapace *et al.*, 2011; Panico *et al.*, 2014), our study found that consumers assigned the same weight to both labels and offered almost the same premium price for both organic and PGI-certified tomatoes compared to the conventional ones. This is to say that consumers' WTP was positively impacted by awareness of food safety and certification. WTP was higher for the labelled Pachino tomato than the

conventional one for consumers who were highly concerned about food safety or knowledgeable about certification.

Consumers in this study indicated that safety, labelled information, and healthiness were the most important food qualities, with taste in second place. These results are consistent with earlier studies on food values, which found that taste and safety are among the most crucial factors for buyers (Bazzani *et al*., 2018; Cerroni *et al*., 2021). The correlation between food values and food labels among consumers confirmed the idea that additional information is helpful, as evidenced by the rise in label preference share following the addition of the label's definition.

However, the importance of buying packaged tomatoes appears to affect consumers' WTP, as the participants in our study revealed that they consider certain characteristics to be important when purchasing food, specifically the healthiness and safety of products as guaranteed by food labels.

These findings pave the way for new methods of analysing food consumption patterns, which could be useful for creating sustainable marketplaces that adhere to green regulations. These outcomes are possible if marketers and policymakers have a thorough understanding of how various consumer categories will respond to certain policy situations. This is particularly true when measures are to be taken in the food industry.

It is noted that there are three main limitations of our study. Firstly, a limited geographical area, as our study was held at a regional scale, covering only a part of southern Italy. Another limitation concerns the demographic composition of our sample, which was heavily weighted towards younger consumers (55.6% of participants aged 18–24). This age imbalance, combined with the geographical limitations of the sample, restricts our ability to generalise the results to the national level and to all Italian consumers. Furthermore, we only compared consumers' WTP for two kinds of labels, which are PGI and Organic. In fact, there are many EU and national labels in the Italian market. WTP for tomatoes carrying other labels needs to be researched further.

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