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High-Altitude, High Value? Consumer Preferences and Willingness to Pay for Mountain Wines

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Abstract

This study examines consumers' willingness to pay (WTP) for mountain wines and assesses the potential impact of extending the EU quality term "mountain product" to the wine sector. A discrete choice experiment was conducted with 256 wine consumers from the Veneto region, Italy. Participants were presented with various wine options featuring different attributes, including a mountain designation, organic certification, and price. The multinomial logit model was used to analyse consumer preferences and estimate WTP.
Consumers have a positive willingness to pay for mountain wines and for organic wines, with the two labels contributing independently to consumer utility.
Price, mountain designation, and organic certification were the most influential factors in the decision-making process. In addition, environmental awareness and the perception of mountain wines had a significant impact on consumer choice. These findings provide actionable insights for policymakers and producers, highlighting the potential of the "mountain product" label as a tool for sustainable rural development.

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Introduction

As several studies have shown, "mountain products" are perceived by consumers as high-quality, authentic, and healthy, as products that result from the sustainable use of local resources and promote the preservation of biodiversity, traditions, and the socio-economic fabric of mountain areas (Baritaux *et al*., 2011; Schjøll *et al*., 2010; Zuliani *et al*., 2018; Bonadonna *et al*., 2022; Staffolani *et al*., 2023; Zanchini *et al*., 2023). However, consumers often have difficulty recognising agricultural and food products from these areas on the market (Schjøll *et al*., 2010; Bentivoglio *et al*., 2019; Cei *et al*., 2023). To enhance and promote mountain areas, the European legislator has taken various measures, the best known of which is the optional quality designation "mountain product", introduced at European level by Regulation (EC) 1151/2012 and later supplemented by Delegated Act (EU) 665/2014. The adoption of an EU legal definition for "mountain products" reduces the risk of misleading consumers and disadvantaging genuine mountain producers (Santini, Guri and Gomez y Paloma, 2013), serves as a tool to enhance mountain areas themselves, and guarantees the authenticity of the products, thus supporting the economic system of these areas (Mazzocchi and Sali, 2022; Pagliacci *et al*., 2022; Finco *et al*., 2017; Sanjuán and Khliji, 2016). Since 2017, there have been 1,585 registered "mountain products" in Italy, with 42.5% concentrated in the Piedmont region (Masaf, 2024). The most represented supply chains are those of milk and dairy products, fruit, vegetables and cereals (both processed and unprocessed), and processed meat. However, wine products cannot benefit from this opportunity, despite increasing production in mountain areas due to climate change and evolving agricultural practices (Oliveira *et al*., 2021). The exclusion of the wine sector by the legislator within the framework of the regulation for mountain areas is controversial in the scientific community.

According to other authors (Linder *et al*. 2022; Schäufele-Elbers, Ricci and Sidali, 2024), extending the optional quality term "mountain product" to the wine sector would increase consumers' willingness to pay for these products, thereby supporting local investment in mountain agriculture, preventing depopulation trends, and strengthening rural communities.

The existing literature on mountain wine purchase and consumer evaluation is limited compared to other mountain food products. Some research indicates that consumers are increasingly interested in wines with geographical, organic, and sustainability credentials (Schäufele and Hamm, 2017; Capitello *et al*., 2021; Chandra, Moschini and Lande, 2025; Dominici *et al*., 2025), but there is little empirical evidence on consumer willingness to pay (WTP) for wines explicitly labelled as "mountain products". Furthermore, research on consumer valuation and perception of mountain

wines in the context of existing geographical indicators (GI) and quality certifications remains underdeveloped. Notably, earlier studies have found that consumer perception improves when GI food products indicate they are produced in a mountainous region (Mancini *et al.*, 2019; Endrizzi *et al.*, 2021).

Although previous studies have investigated consumer preferences for mountain food products and, more generally, for wines with sustainability or geographical characteristics, none has specifically examined consumers' willingness to pay for wines labelled as mountain products. The existing literature has primarily focused on the perception and evaluation of mountain products, such as dairy, meat, or other agri-food products (Baritaux *et al.*, 2011; Schjøll *et al.*, 2010; Cei *et al.*, 2023; Mazzocchi & Sali, 2022), and on consumer preferences for wine attributes such as origin, terroir, and organic certification (Schäufele & Hamm, 2017; Mauracher *et al.*, 2019; Capitello *et al.*, 2021). However, these studies have not been integrated to assess whether the quality term "mountain product", which currently cannot be applied to wine under EU Regulation 1151/2012, influences consumers' evaluation and willingness to pay in the wine sector. In other words, although the cited sources provide important conceptual and methodological foundations, they do not empirically quantify how consumers evaluate the potential extension of the "mountain product" designation to wine, nor do they examine how it interacts with other quality indicators such as organic certification or environmental attitudes.

The lack of research on whether consumers would value and pay a premium for mountain wine presents an opportunity to explore the potential economic and policy benefits of extending the EU mountain label to this sector.

Our study was designed to address this gap by conducting a discrete choice experiment that isolates the effect of the hypothetical mountain label on consumer preferences and willingness to pay.

This study investigates consumer willingness to pay for mountain wines and assesses the impact of a possible extension of the EU "mountain product" quality term to the wine sector. We also hypothesise that environmentally conscious consumers and those with positive perceptions of mountain wines will show higher willingness to pay for the "mountain product" label.

The study was conducted on a sample of Italian consumers, with a particular focus on residents of the Veneto region. Italy is one of the largest wine producers (OIV, 2024), with renowned wine-growing regions. As climate change shifts viticulture to higher altitudes, mountain wines are becoming an important category within the industry. The Veneto region was chosen due to its status as the leading wine-growing region in Italy and its position among the top regions for wine consumption (Istat, 2020). Veneto

was selected as a case study not only because it is Italy's leading wine-producing region, but also because of a paradox that characterises its wine market. Despite being among the Italian regions with the highest number of native grape varieties, the Veneto wine sector has traditionally favoured the production of conventional wines for highly competitive international markets, rather than promoting the specificity of its native varieties. This strategic focus has contributed to its economic success but has also increased exposure to global market volatility.

Furthermore, niche wine segments, such as mountain wines, can play a stabilising role during market crises. As observed during the COVID-19 pandemic, regions with stronger local or proximity markets (e.g., Friuli Venezia Giulia) were better able to cushion the effects of sudden demand shocks. Developing and promoting niche markets for mountain wines could therefore strengthen the resilience of the Veneto wine sector, while supporting the sustainability and distinctiveness of its mountain viticulture. Niche and mass-market strategies differ in focus and approach but can coexist and complement each other (Hammervoll *et al.*, 2014).

The research question focuses on whether such a designation would increase consumer preference and willingness to pay for mountain wines, thereby supporting the sustainability of mountain viticulture.

The study will quantify the relative importance of the mountain label compared to other well-established labels, such as organic certification. Participants were presented with different wine options featuring various attributes, including the presence or absence of a mountain designation, organic certification, and other key product characteristics. This approach enables an in-depth understanding of consumer trade-offs and the factors influencing their purchasing decisions.

Understanding consumer perception and valuation of these wines in Italy, a country with a strong wine culture (OIV, 2024), provides valuable insights into potential market acceptance and strategic positioning.

The results indicate that consumers exhibit a willingness to pay a premium for mountain wines, and for organic wines, with the two labels contributing independently to consumer utility. These findings contribute to the literature by providing empirical evidence on the market potential of mountain wine and the impact of labelling strategies on consumer choice (Anagnostou *et al.*, 2025). From a policy perspective, the study highlights the potential benefits of extending the EU "mountain product" label to the wine sector, supporting both mountain viticulture and rural economic development. From a business perspective, wineries in mountain regions could use this label to differentiate their products and attract environmentally conscious consumers.

This research contributes to the discourse on geographical labelling and sustainable marketing strategies for mountain agriculture, offering new insights into consumer behaviour and policy implications.

The remainder of the paper is structured as follows. The next section presents the data and methods, detailing the choice experiment and data collection approach. This is followed by an analysis of the findings, highlighting consumer preferences and willingness to pay for mountain wine. The discussion section connects these results to the existing literature and explores their implications for marketing, policy, and sustainability. Finally, the study concludes with recommendations for future research and potential policy considerations regarding the expansion of the EU mountain product label to include wine.

1. Materials and methods

1.1. *Data gathering*

To address the research questions, we conducted an online questionnaire with a convenience sample of Italian wine consumers. The online survey method facilitates easier data collection and processing. Additionally, online questionnaires provide a flexible range of options for question design.

Consumers were selected using screening questions before completing the questionnaire. The "conditio sine qua non" were: (1) legal drinking age in Italy (at least 18 years old), (2) consumption of wine at least once a month, and (3) residence in the Veneto region. If any of these conditions were not met, the respondent was excluded from the survey. Additionally, those who always answered "no purchase" in the selection experiment were excluded as invalid responses. The final number of consumers surveyed was 256.

While this number can be considered modest for large-scale segmentation analyses, it is adequate for discrete choice modelling aimed at estimating average preferences and marginal willingness to pay values. Similar sample sizes have been employed in previous discrete choice experiment studies on wine (Bazzani *et al.*, 2024).

The questionnaire was structured in three sections: (i) attitudinal questions capturing environmental values and perceptions of mountain agriculture, (ii) the discrete choice experiment (DCE), and (iii) sociodemographic information. The attitudinal section preceded the DCE to avoid contamination of self-reported attitudes by the experimental task, following established best practices in stated-preference research (De-Magistris & Gracia, 2016). Although this sequencing may increase attribute salience, it allows consistent estimation of interaction effects between attitudes and choice behaviour.

Consumer attitudes and perceptions were investigated through a series of questions using previously empirically tested and validated scales.

The final section collected socio-demographic data (age, gender, educational attainment, employment status, and income level), which was subsequently used in the analysis. Including this data allows for a full interpretation of the results and enables observation of how certain consumer characteristics are related to and influence the decision-making process.

The questionnaire was tested before distribution to identify any issues with question comprehension or the questionnaire's structure. After reviewing the various elements and making necessary corrections, the online distribution of the questionnaire began.

To assess consumer perception of mountain wines and the potential implementation of the "mountain product" quality term, the study was structured in several phases. The first phase identified the tool to pursue the defined objectives (discrete choice experiment). In the next phase, the product, its attributes, and the related attribute levels to be implemented and analysed in the study were defined. Based on these elements, the choice experiment was designed and then incorporated into the questionnaire. To set up the choice experiment mentioned above we implemented multiple tools: we used the Ngene software to design the choice experiment and QualtricsXM to create and distribute the questionnaire.

1.2. *The choice experiment*

The product examined in the study is a wine described by both constant (Table 1) and variable (Table 2) attributes. The choice of grape variety, and therefore of growing area and organoleptic characteristics, was based on selecting a product suitable for mountain viticulture and recognised as such by professionals and consumers (Fondazione Edmund Much, 2022). The identification of the variable attributes was based on current literature on consumer behaviour towards wine products. Various studies have shown the central importance of attributes such as price, place of origin, grape variety, production method and harvest year (Mauracher *et al*., 2019; Stanco *et al*., 2020). Although attributes such as brand, bottle design, the presence of sustainability certifications, and the presence or absence of additives or sulphites were also of interest, they were not considered in this study (Galati *et al*., 2019; Mauracher *et al*., 2019; Migliore *et al*., 2020; Stanco *et al*., 2020).

The product used in the selection procedure was defined based on these aspects. As previously mentioned, the wine simultaneously has attributes that may or may not differ in level between the alternatives. Specifically, elements such as grape variety, production area, presence of protected designation of origin, organoleptic characteristics, and alcohol content did not vary across

Table 1 - Constant attributes of the analyzed product

Attribute	Description
Wine type	White wine
Grape variety	Müller Thurgau
Cultivation area	Province of Bolzano
Protected designation of origin	Alto Adige DOC – Südtirol DOC
Organoleptic Characteristics	Dry, fresh, elegant minerality and with hints of sage, thyme and white peach
Net contents	0,75 L
Alcohol by volume	12% vol.

the different choice scenarios (Table 1). In contrast, the attributes that differed in level between the alternatives were the optional quality term "mountain product", production method, harvest year, and purchase price (Table 2). The first of these attributes used to describe the product is the optional quality term. However, according to Regulation (EC) No 1151/2012, this quality term cannot currently be applied to wine products, as also indicated in the questionnaire. This term was hypothetically applied to any wine in the study produced at an altitude of more than 500 m a.s.l. (in accordance with Regulation (EC) No 257/1999), while excluding wines produced in vineyards located in valley bottoms. The "mountain product" label used in this experiment was hypothetical, as there is currently no official EU label for wine. Therefore, the study may be subject to hypothetical bias, a common issue in stated preference methods, where respondents tend to overestimate their willingness to pay for socially desirable or sustainability-related attributes. This limitation has been acknowledged in the literature and is typical of wine consumption evaluation studies that use hypothetical statements to assess emerging labelling systems (Bazzani *et al*., 2024; Vecchio & Annunziata, 2021).

The second variable attribute used in the choice experiment concerns the production method. Specifically, a wine was defined as organic if it was produced from grapes sourced exclusively from certified organic farming and its vinification involved the use of certified organic wine products in accordance with Regulation (EC) 889/2008, as amended by Regulation (EC) 203/2012, along with limited use of sulphites. In contrast, wines without this label were produced from grapes grown using conventional viticulture and conventional oenological practices. The year of harvest is the third variable attribute analysed in the study. The attribute values correspond to the 2018

and 2019 harvests, which are the most recent options available on the market for this product. Finally, the price attribute ranges from €9.00 to €18.00 per bottle, reflecting the established market prices for the same product.

Table 2 - Variable attributes of the analyzed product and relative variation levels

Attribute	**Level**
"Mountain product" quality term	YES - NO
Organic production method	YES - NO
Vintage	2018 - 2019
Price (€/Bottle 0.75 L)	9.00 - 12.00 - 15.00 - 18.00

The choice cards were designed using Ngene software. The selected design consists of 12 different scenarios, each offering three choice alternatives. The first two correspond to the previously described product (Table 1); they differ in the characteristics of the previously identified variable features (Table 2). The third alternative is the "no choice" option, introduced to make the choice situation more realistic for the consumer. Based on the code used, this experimental design was programmed to be orthogonal (orth = OOD) and, more specifically, optimal orthogonal in the differences (OOD), following the principles defined by Street *et al.* (2005).

The design consists of 12 different choice scenarios (tasks) and has a D-optimality value greater than 90% (Figure 1).

Figure 1 - Example of choice scenario

As shown in Table 3, this type of design maximises the differences in attribute values between the alternatives and simultaneously maximises the information provided by respondents (Design, 2009).

Table 3 - Conversion of levels in Ngene

Attribute	**Level**	**Level in Ngene**
"Mountain product" quality term	YES - NO	1 - 0
Organic production method	YES - NO	1 - 0
Vintage	2018 - 2019	2018 - 2019
Price (€/Bottle 0.75 L)	9.00 - 12.00 - 15.00 - 18.00	9.00 - 12.00 - 15.00 - 18.00

Finally, Table 4 shows the design obtained by using Ngene for the different tasks of the choice experiment.

Table 4 - Design obtained using Ngene

	Alternative 1				**Alternative 2**			
Task	**Mountain**	**Organic**	**Vintage**	**Price**	**Mountain**	**Organic**	**Vintage**	**Price**
1	0	1	2018	12.00	1	0	2019	15.00
2	1	0	2018	9.00	0	1	2019	12.00
3	1	0	2018	12.00	0	1	2019	15.00
4	1	1	2019	9.00	0	0	2018	12.00
5	0	1	2019	9.00	1	0	2018	12.00
6	0	0	2019	12.00	1	1	2018	15.00
7	1	1	2018	18.00	0	0	2019	9.00
8	0	1	2018	15.00	1	0	2019	18.00
9	0	0	2018	15.00	1	1	2019	18.00
10	1	1	2019	18.00	0	0	2018	9.00
11	1	0	2019	15.00	0	1	2018	18.00
12	0	0	2019	18.00	1	1	2018	9.00

2. Results

2.1. *The sample*

To ensure response reliability, several data quality checks were conducted before analysis. Observations with unrealistically short completion times, which could indicate inattention, were removed. Participants who consistently selected the same alternative across all choice sets were also excluded. Additionally, a comprehension question following the DCE instructions ensured that participants understood the meaning of the "mountain product" label and the structure of the task. Only participants who passed this check were included in the final sample. These procedures align with recommended best practices for online discrete-choice experiments (Cummings & Taylor, 2019) and support the validity of our findings.

The sample obtained through the questionnaire, directed exclusively to people residing in the Veneto Region, is made up of 256 wine consumers (Table 5). Of these, 133 are female (52%) and 122 are male (48%). Only one respondent preferred not to provide any information in this regard. The mean age for the sample is 41 years, with a standard deviation of 13 years, while the median age is 42 years. Still referring to age, the sample was also divided into three age groups (18-34 years, 35-50 years and 51-68 years).

The average level of education is particularly high. In fact, just under 90% of respondents hold at least a high school diploma. More than 40% of the sample have a university degree or a higher qualification, such as a master's degree or a postgraduate degree.

On the other hand, if we look at the employment status of the respondents, we can see that around 80% are employed. The number of family members was on average 3.2 people, while the median value is 3 people. The analysis of the economic situation shows that 48% earn between €1000 and €2000. Around 20% of respondents stated that they had a monthly net income of at least €2000. 28% preferred not to provide any information on this.

Within the questionnaire, respondents were also asked to indicate the type of wine generally purchased based on colour, structure, alcohol content and effervescence (Table 6). In particular, the data collected demonstrate how consumer choice is equally redistributed between white wines (45%) and red wines (47%). Medium-bodied wines (47%) are preferred to both light-bodied wines (27%) and full-bodied wines (26%). From the point of view of alcohol content, wines with values included between 12% vol. and 13% vol. (65%) are the most appreciated by the consumer. Finally, still wines (63%) represent the most popular choice in terms of effervescence.

Table 5 - Sample characteristics

	Level	N	%
Gender	Female	133	51.9
	Male	122	47.7
	Not reported	1	0.4
Age	18-34	98	38.3
	35-50	74	28.9
	51-68	84	32.8
Educational level	None	0	0.0
	Primary school	1	0.4
	Middle school diploma	28	10.9
	High school diploma	113	44.2
	University degree	103	40.2
	PhD	6	2.3
	Other	5	2.0
Employment status	Employed	207	80.9
	Not employed	47	18.3
	Other	2	0.8
Number of family members	1	22	8.6
	2	59	23.0
	3	59	23.0
	4	86	33.6
	5	25	9.8
	6	5	2.0
Attitude towards spending	I have to pay close attention to what I spend and sometimes my income is not enough for necessary purchases	5	1.9
	With a bit of caution, I can afford even a few small luxuries from time to time	171	66.8
	I have no financial problems and when I want to buy something I do it	55	21.5
	I prefer not to answer	25	9.8
Net monthly income	Less than 1000 €	11	4.3
	Between 1000 € and 2000 €	122	47.7
	Between 2000 € and 3000 €	30	11.7
	Between 3000 € and 4000 €	16	6.2
	More than 4000 €	5	2.0
	I prefer not to answer	72	28.1

Table 6 - Consumer preferences related to certain wine characteristics

Attribute	Level	N	%
Colour	White	116	45.3
	Rosé	20	7.8
	Red	120	46.9
Structure	Light-bodied	68	26.5
	Medium-bodied	121	47.3
	Full-bodied	67	26.2
Alcohol by volume	Less than 12 %vol	40	15.6
	Between 12 %vol and 13 %vol	165	64.5
	Greater than 13% vol	51	19.9
Type of wine (effervescence)	Still	161	62.9
	Sparkling	70	27.3
	Fizzy	25	9.8

Consumer attitude was also analysed in relation to the concept of environmental sustainability. Specifically, this topic was assessed by including a tool known as the GREEN scale (Haws *et al.*, 2014) in the questionnaire. This scale consists of six distinct items, enabling the estimation of associated green consumption values (Table 7). In this study, respondents evaluated each item using a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The scale reflects the extent to which consumers consider the environmental consequences of their purchasing decisions and are willing to engage in environmentally responsible consumption, even when this involves personal inconvenience.

The analysis of the collected data shows that consumers in the sample tend to place particular importance on choosing products that are not harmful to the environment. This importance is reflected in their tendency to associate their decisions and actions with an assessment of potential environmental impact or with the possibility of consuming and wasting environmental resources. At the same time, purchasing habits are partially influenced by the potential impact on the environment.

Table 7 - GREEN scale (Haws et al., 2014)

Items	Min.	Max.	Mean	Std	Median
It is important to me that the products I use do not harm the environment	1	5	4.16	0.73	4
I consider the potential environmental impact of my actions when making many of my decisions	1	5	3.74	0.86	4
My purchase habits are affected by my concern for our environment	1	5	3.59	0.85	4
I am concerned about wasting the resources of our planet	1	5	3.90	0.86	4
I would describe myself as environmentally responsible	1	5	3.87	0.83	4
I am willing to take inconvenient actions that are more environmentally friendly	1	5	3.64	0.91	4

These observations show that consumers place particular importance on the role of agriculture in preserving and maintaining the mountain environment and its resources. These consumers associate the term "mountain wine" with a product made from local grape varieties and produced with few additives. Moreover, consumers appear almost indifferent to factors such as the location and altitude of cultivation when considering mountain wines. It is also notable that greater finesse in aromas and flavours, as well as the use of more manual labour in vineyard cultivation and harvesting, do not significantly influence the value consumers attribute to these wines. Based on these observations, consumers are also especially interested in extending the optional quality term "mountain product" to wines produced in these areas.

Table 8 - Perception of mountain wines

Items	Min.	Max.	Mean	Std	Median
Wines from mountain areas must be more delicate in terms of aromas and flavours	1	5	3.20	0.79	3
Grapes for mountain wines must be grown on small farms	2	5	3.49	0.76	3
Mountain vineyards must be terraced	1	5	3.27	0.72	3
Mountain vineyards should be high altitude	1	5	3.21	0.84	3
Mountain vineyards should be at least in highland	1	5	3.42	0.78	3
Agriculture should preserve the mountain environment	1	5	4.26	0.67	4
Wine producers in mountain areas should use fewer additives	1	5	3.83	0.80	4
viticulture in mountain areas should use local varieties	1	5	4.07	0.69	4
Mountain wine should be made using more manual labour	1	5	3.40	0.8	3
The total volume of wine production should be limited in mountain areas	1	5	3.30	1.0	3
The optional “mountain product” quality term should also be extended to wines	1	5	3.88	0.76	4

2.2. *Elicitation of consumer preference structure*

According to Lancaster theory (Lancaster, 1966), discrete choice models assume that the total utility consumers derive from a product can be decomposed into the marginal utilities associated with the product’s attributes. Accordingly, in our model, the utility function (U) that individual n derives from choosing option j in choice situation t can be specified as follows:

$$U_{njt} = \beta_p Price_{njt} + \beta_1 Mountain_{nj}t + \beta_2 Organic_{njt}t + \beta_3 Vintage_{njt} + \varepsilon_{njt.}$$

$Price_{njt}$ represents the purchase price of the wine,

$Mountain_{njt}$ is a dummy variable equal to 1 when the optional "mountain product" quality term is present and 0 otherwise,

$Organic_{njt}$ is a dummy variable indicating organic certification, and

$Vintage_{njt}$ identifies the harvest year (2018 = 1; 2019 = 0). The term ε_{njt} is an independently and identically distributed error term following a Type I extreme value distribution.

The opt-out alternative ("no purchase") is explicitly included in the choice set and is modeled through an alternative-specific constant:

$$U_{n0t} = ASC_{optout} + \varepsilon_{n0t}$$

The alternative-specific constant ASCoptout captures the average utility difference between choosing one of the wine alternatives and opting out of the choice task. A negative value of this parameter indicates a higher propensity to select one of the purchase alternatives rather than the no-buy option.

The model is estimated as a Multinomial Logit (MNL), which provides a parsimonious and robust framework for estimating average preferences and marginal willingness-to-pay (WTP) values in discrete choice experiments with moderate sample sizes (Tait *et al.*, 2016). Although the MNL assumes homogeneous preferences across individuals, it is well suited to the exploratory objective of this study, which focuses on identifying aggregate preference structures rather than individual-level heterogeneity.

In this specification, utility is defined relative to a normalized reference alternative, and all estimated coefficients should therefore be interpreted as relative effects on choice probabilities rather than absolute levels of utility. The inclusion of the opt-out alternative ensures that the model explicitly captures the buy versus no-buy decision, thereby improving the behavioral realism of the choice task.

The model was estimated using the mlogit package in R (Croissant, 2020). The estimated coefficients represent average marginal utilities at the population level (Jaeger & Rose, 2008). Willingness-to-pay measures were derived as the negative ratio between the attribute-specific coefficients and the price coefficient, consistent with standard practice in discrete choice modeling.

The MNL model estimates the effects of various attributes on respondents' choice decisions in a discrete choice experiment (Table 9).

Table 9 - Results from MNL

Attribute	Coefficients	Std. Error	*z* values
Intercept	0.002	0.041	0.063
Price	–0.112***	0.008	–12.680
Mountain	0.320***	0.022	14.269
Organic	0.290***	0.022	12.977
Year 2018	0.034	0.020	1.628
Optout	–2.668***	0.130	–20.474
Log-Likelihood: –2816.8			
McFadden R^2: 0.072601			
Likelihood ratio test: $\chi^2 = 441.02$ ($p < 0.001$)			

The alternative-specific constant associated with the opt-out option is negative and statistically significant, indicating that respondents derive higher utility from choosing one of the wine alternatives rather than opting out of the choice task. This suggests that the attributes included in the model capture key factors influencing decisions

The positive and significant coefficient for the "Mountain" attribute suggests that respondents strongly prefer mountain-related options. The large z-value indicates a robust effect. In addition, the positive and significant coefficient for "Organic" suggests that respondents prefer organic products to non-organic alternatives. This indicates a potential willingness to pay more for organic options.

The coefficient for the 2018-year variable is positive but not statistically significant. This indicates that there is no strong evidence that choices differed significantly in 2018 compared to other years in the dataset.

The estimated coefficient for the price attribute is negative and significant. This means that as the price increases, the likelihood of choosing a given alternative decrease. The consumer is therefore more likely to choose the alternative with a lower price. This is expected, as higher prices generally lead to lower demand.

The model achieved a McFadden pseudo-R^2 of 0.0726, which is within the range commonly reported for discrete choice experiments (0.02–0.10; McFadden, 1974; Hensher *et al.*, 2015). Although pseudo-R^2 values are not directly comparable to those from linear regression models, this level of fit indicates that the estimated model provides a satisfactory representation of respondents' choice behaviour.

In addition to explaining the random utility model, these coefficients can also be used to estimate the consumer's willingness to pay by associating this aspect with specific attribute levels. In this case, willingness to pay can be determined as the negative ratio between the coefficients of the attribute *r* and the price coefficient β_{price} (1).

$$WTP = -\frac{(\beta_l - \beta_{ref})}{\beta_{price}} \quad (1)$$

Where β_l represents the estimated coefficient for the attribute level *l*, while β_{ref} corresponds to the coefficient for the reference level, the value of which is zero in the case of *dummy coding*. Finally, β_{price} identifies the estimated coefficient relating to the price attribute.

Given that the model was specified as a Multinomial Logit (MNL) with fixed coefficients, the estimated WTP values represent average marginal valuations across respondents. The standard errors and 95% confidence intervals were calculated using the Delta Method (Hole, 2007), based on the model's variance-covariance matrix.

Therefore, applying the equation reveals that the marginal willingness to pay for the presence of the optional "Mountain product" quality term is €5.70 per bottle (Table 10). Similarly, the estimated marginal willingness to pay for wines produced using an organic method is €5.18 per bottle.

Table 10 - Estimated Willingness to Pay

Attribute	Level	WTP (€/bottle)	Std. Error
Mountain	Yes	5.70***	0.85
Production method	Organic	5.18***	0.82

The estimation of a second MNL model also made it possible to verify whether the attribute levels related to the presence of the optional quality term and the organic production method add value to the product independently or, on the contrary, overlap in the quantification of the willingness to pay.

In parallel, additional models were implemented to assess the relationship and impact of socio-demographic variables on consumers' decisions and their willingness to pay. The results from these models show that the various socio-demographic variables do not significantly influence the value consumers associate with the term "mountain product". However, the data

indicate that female consumers and those without economic concerns are more willing to pay a higher price for organically produced wines.

The study also examined how consumers' attitudes towards environmental sustainability influence the previously estimated willingness-to-pay values. In this context, the observations collected using the green scale described above were used. This variable, after being centred and standardised, was added to the data set and then analysed with mlogit (Croissant, 2020).

The results of the model (Table 11) show that the attitude towards environmental sustainability contributes significantly to explaining and quantifying the willingness to pay in relation to the term "mountain product" and the organic production method.

Tab. 11 - Mlogit output: GREEN scale

Attribute	**Coefficients**	**Std. Error**	***z* values**
Intercept	0.012	0.043	0.294
Price	–0.117***	0.009	–12.895
Mountain	0.336***	0.023	14.608
Organic	0.307***	0.023	13.345
Year 2018	0.034	0.021	1.607
Mountain:Green	0.133***	0.022	6.133
Organic:Green	0.165***	0.022	7.607
Optout	–2.707***	0.132	–20.424
Log-Likelihood: –2772.1			
McFadden R^2: 0.087314			
Likelihood ratio test: $\chi^2 = 530.4$ ($p = < 0.001$)			

The estimated coefficients indicate that consumer attitudes toward environmental sustainability systematically moderate the utility derived from product attributes. In particular, the positive and statistically significant interaction terms show that consumers with stronger pro-environmental values assign higher utility to both the mountain product label and organic certification. This implies that environmental awareness amplifies the marginal effect of these credence attributes on choice probabilities. Importantly, the results suggest that the mountain product label and organic certification appeal to a similar consumer segment in terms of environmental orientation. Rather than attracting distinct groups of consumers, both attributes are valued more strongly by individuals with higher pro-

environmental consumption values, indicating a convergence in the profile of consumers who respond positively to sustainability-related labels. In parallel, the role of perceptions of mountain wines was analyzed using a comparable modeling approach. The perception index, constructed from multiple items and subsequently mean-centered and standardized, was interacted with the labeling attributes to assess whether product-related beliefs further shape willingness to pay. The results confirm that more favorable perceptions of mountain wines increase the marginal utility associated with both the mountain product label and organic certification, reinforcing the role of cognitive evaluations alongside value-based attitudes in shaping consumer choice.

Tab. 12 - Mlogit output: Perception of mountain wine

Attribute	**Coefficients**	**Std. Error**	***z* values**
Intercept	0.011	0.042	0.249
Price	–0.116***	0.009	–12.851
Mountain	0.334***	0.023	14.581
Organic	0.305***	0.023	13.315
Year 2018	0.034	0.021	1.610
Mountain:Wine	0.140***	0.022	6.377
Organic:Wine	0.135***	0.022	6.188
Optout	–2.698***	0.132	–20.435
Log-Likelihood: –2780.6			
McFadden R^2: 0.084515			
Likelihood ratio test: $\chi^2 = 513.4$ (p = < 0.001)			

The results of the model analysis (Table 12) show that the perception of mountain wines significantly influences willingness to pay, as was also found in the environmental sustainability model. In particular, the utility factor attributed by the consumer to the choice option can increase or decrease depending on their expressed perception of mountain wines. This may alter the consumer's choice compared to other alternatives, as it affects the decision-making process.

In addition to the baseline model, we estimated a set of parsimonious interaction specifications aimed at testing theoretically grounded hypotheses regarding the role of consumer attitudes and multiple quality labels.

First, environmental attitudes (measured through the GREEN scale) and perceptions of mountain wines were interacted separately with the mountain product and organic labels, in order to assess whether these attitudinal dimensions systematically moderate preferences for credence attributes. These interactions capture heterogeneity in preferences driven by value orientation and product-related beliefs, without introducing higher-order or compounded attitudinal constructs.

Second, given the increasing policy relevance of multi-label strategies, we explicitly tested whether the joint presence of the "mountain product" quality term and organic certification generate complementarities, redundancies, or neutral effects in consumer utility. To this end, an interaction term between the mountain label and organic certification was included in the model. This approach builds directly on the literature on multiple quality labels (Stiletto and Trestini, 2022) and allows us to assess whether the informational content conveyed by the two labels is perceived by consumers as reinforcing or overlapping in the wine sector.

At the same time, the first-order interactions between labeling attributes and consumer attitudes remain statistically significant. Both environmental attitudes and positive perceptions of mountain wines increase the marginal utility associated with the mountain product and organic labels, confirming that attitudinal orientation acts as a meaningful moderator of preferences without requiring higher-order interaction terms.

3. Discussion

The findings of this study contribute to the growing body of research on consumer preferences for geographical and sustainability-based wine labelling, showing a significant positive effect of the mountain product label on consumer choice. This result is consistent with research by Linder *et al.* (2022), who found that including a mountain designation in wine labelling can enhance consumer interest and willingness to pay for such products. Similar findings have already been reported in studies focusing on other products, such as milk, dairy products, and meat (Cei *et al*., 2023; Mazzocchi and Sali, 2022; Staffolani *et al*., 2023; Zanchini *et al*., 2023). In particular, there is clear consumer interest in the mountain product label, even when it is not associated with other quality attributes or production method indicators.

The analysis of the collected data and the coefficients estimated using the mlogit function (Croissant, 2020) enabled a deeper exploration of consumer interest in mountain wines. In particular, these analyses showed that consumers associate agriculture with the care and preservation of the mountain environment. They also believe that mountain wines should be

made from indigenous grape varieties, thereby linking the wine to the territory and reinforcing its status as a local product. Furthermore, consumers place great importance on the reduced use of additives in the production process, prioritising this factor over elements such as vineyard altitude or aromatic composition. This finding highlights a proactive consumer attitude towards environmental sustainability, as also reflected in the Green Scale values from the questionnaire (Haws *et al*., 2014).

Consumers exhibit a willingness to pay a premium for mountain wines and for organic wines, with the two labels contributing independently to consumer utility. These findings are consistent with previous studies that have highlighted consumers' positive perceptions of mountain products (Schjøll *et al*., 2010; Zuliani *et al*., 2018) and their willingness to pay more for products associated with sustainability and local origin (Schäufele & Hamm, 2017; Cei *et al*., 2023). Overall, mountains evoke a broadly positive collective imagination among consumers. Mountain territories are perceived as carriers of positive values, and mountain products are regarded as inherently valuable (Mazzocchi and Sali, 2020).

The significant willingness to pay for mountain wine also aligns with research on the value of geographical indications (GIs) in consumer decision-making (Costanigro *et al*., 2014; Mauracher *et al*., 2019). Like protected designation of origin (PDO) labels, the mountain label serves as a quality cue for consumers, reinforcing the perception that wines produced in high-altitude regions have unique and desirable characteristics. However, unlike PDOs, which primarily emphasize terroir, the mountain product label signals broader sustainability and regional authenticity aspects, which are increasingly valued by contemporary consumers. The effect of multiple quality labels (such as PDO, organic, and mountain product) on consumer behaviour must be analysed across different products and regions. Stiletto and Trestini (2022) argue that providing extensive information is not always the most effective strategy for firms.

An important contribution of this study lies in the explicit assessment of how multiple quality labels jointly affect consumer choices in the wine sector. Contrary to expectations of strong complementarities, the interaction between the mountain product label and organic certification is not statistically significant, suggesting a neutral effect. This finding aligns with evidence from other agri-food contexts, such as cheese products (Stiletto and Trestini, 2022), and indicates that the informational content conveyed by the two labels is perceived as distinct rather than overlapping.

From a policy and managerial perspective, this result implies that extending the "mountain product" quality term to wine would add value independently of existing organic certification schemes. Rather than crowding out or duplicating the informational role of organic labels, the mountain

designation appears to function as a separate quality cue, reinforcing the case for its inclusion within the EU quality policy framework. At the same time, the positive moderating role of environmental attitudes and mountain wine perceptions highlights the importance of targeted communication strategies aimed at environmentally conscious consumers.

Another noteworthy finding is the interaction between environmental consciousness and the mountain product label (Laca *et al.*, 2020). Consumers with stronger pro-environmental attitudes were more likely to express willingness to pay a premium for mountain wines. This supports previous research indicating that environmentally conscious consumers prefer products with sustainability credentials (Haws *et al.*, 2014; Migliore *et al.*, 2020). In particular, young consumers tend to choose products with the mountain product label more frequently (Bonadonna *et al.*, 2022), likely due to associations with recreational activities and a generally greener lifestyle (Mazzocchi and Sali, 2024).

Additionally, the study shows that the perception of mountain wines influences willingness to pay (WTP), suggesting that consumer education and marketing strategies highlighting the environmental and social benefits of mountain viticulture could further increase demand. To quantify the value consumers place on the "mountain product" label, the marginal willingness to pay for its presence was estimated at €5.70 per bottle. This indicates that, all else being equal, the term generates a positive consumer valuation. This value is partly explained, as already noted, by consumers' positive attitudes towards environmental sustainability. However, despite consumer support for extending the "mountain product" label to wines, regulatory challenges persist. At present, wine is excluded from the list of products eligible for this designation under Regulation (EC) No 1151/2012 and Delegated Act (EU) No 665/2014. As a result, consumer recognition of the term in the market remains difficult to achieve, reinforcing the need for policy intervention.

From a policy perspective, these findings provide strong empirical support for extending the EU "mountain product" label to include wine. Previous research has identified a regulatory gap in labelling policies for mountain wines (Finco *et al.*, 2017), and our study contributes to this discussion by demonstrating the potential market benefits of such an extension. By formally recognising mountain wines, policymakers could help sustain viticulture in high-altitude regions, prevent rural depopulation, and support economic resilience in mountain communities. In conclusion, this study contributes to the literature by providing empirical evidence on the market potential of mountain wines and the role of labelling strategies in consumer decision-making.

Conclusions

Beyond confirming a positive willingness to pay for mountain wines, this study offers several implications for policy design, producer strategies, and market communication. The finding that the "mountain product" label contributes independently to consumer utility suggests that its informational content is not redundant with existing quality schemes, such as organic certification or geographical indications. This reinforces the potential role of the mountain designation as a complementary policy instrument, capable of enhancing consumer information without increasing label complexity or causing informational overload.

From a regulatory perspective, extending the optional "mountain product" quality term to the wine sector could support clearer and more transparent communication of production conditions specific to mountain viticulture. Such an extension would recognize the structural constraints and environmental characteristics of high-altitude wine production, contributing to the preservation of mountain landscapes, traditional practices, and regional identity. At the same time, the voluntary nature of the quality term may limit its enforceability under existing consumer protection and competition rules. Policymakers should therefore carefully consider the trade-off between accessibility for producers and the strength of regulatory oversight, particularly in comparison with more stringent certification-based schemes.

For wine producers, the results suggest that adopting a mountain designation can serve as an effective differentiation strategy in increasingly competitive markets. By signaling environmental stewardship, territorial specificity, and production in challenging conditions, the mountain label may help justify price premiums and attract consumer segments that value authenticity and sustainability. Producers operating in high-altitude areas could benefit from emphasizing the distinctive characteristics associated with mountain wines, including their perceived links to biodiversity, traditional viticultural practices, and environmentally responsible production methods.

From a marketing and communication standpoint, the findings highlight the importance of conveying the meaning and value of mountain wines in a clear and credible manner. Promotional strategies should focus on authenticity, territorial identity, and sustainability-related attributes, aligning with broader trends in consumer demand for environmentally responsible and place-based food products. In this context, collaborations with tourism initiatives, local institutions, and regional branding strategies may further enhance the visibility and perceived value of mountain wines by embedding them within a broader cultural and environmental experience.

Overall, this study contributes to the literature on quality labeling and credence attributes by providing evidence on the role of the mountain product

designation in the wine sector. While the analysis focuses on a specific regional context, the results offer insights that may be relevant for other mountain areas and agri-food products facing similar challenges. Future research could extend this work by examining consumer responses across different countries, wine types, or regulatory frameworks, as well as by exploring the long-term market effects of introducing mountain-specific quality labels.

Limitation and future research

Despite the results, several limitations of this study should be acknowledged. First, the sampling strategy relied on a convenience sample collected online, which resulted in an uneven distribution of respondents. As is common in online surveys, younger and more educated individuals are likely overrepresented, a group that may exhibit higher awareness of environmental and sustainability-related issues. Consequently, the findings should be interpreted as reflecting the preferences of a digitally active segment of Italian wine consumers rather than being fully generalizable to the entire population.

Relatedly, the geographic scope of the study is limited to the Veneto region. While this area represents a relevant and economically important wine-producing context, extending the analysis to other regions would help assess the robustness of the results and evaluate the broader market potential of mountain wine labeling across different territorial and cultural settings. Future research employing probabilistic or stratified sampling frameworks and cross-regional designs would be particularly valuable in this respect. A further limitation concerns the sample size, which restricts the possibility of conducting detailed subgroup analyses. Nevertheless, the sample provides sufficient variation to estimate aggregate-level preferences and willingness-to-pay measures with acceptable precision. Consistent with previous discrete choice experiment studies on wine consumer preferences (e.g., Bazzani *et al.*, 2024), the results should therefore be interpreted as representative of broad preference structures rather than specific consumer segments. Larger and more diverse samples could allow future studies to explore preference heterogeneity in greater depth. While more flexible modeling approaches such as the Mixed Logit model allow for a richer representation of unobserved taste heterogeneity, the primary objective of this study was to identify average preference patterns and assess the relative importance of key product attributes.

A further limitation of this study relates to the interpretation of willingness-to-pay (WTP) estimates derived from the econometric model.

While the analysis allows the estimation of marginal WTP for specific product attributes, it does not model overall market participation or simulate total demand. Therefore, although consumers may express a higher willingness to pay for certain attributes (such as mountain wine labelling), this does not necessarily translate into increased overall sales, as some consumers may switch to alternative products at higher price levels. Future research could address this limitation by combining attribute-based WTP estimation with market simulation approaches to better capture potential changes in total demand and market outcomes.

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