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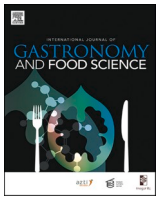

Main factors influencing consumer willingness to pay for sustainable wine

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ABSTRACT

This paper examines the factors influencing consumers' willingness to pay a premium for sustainable wine. Using survey data from 528 Sicilian consumers and a logistic regression model, we assess determinants of low versus high Willingness To Pay. Results show that attention to labels and environmental considerations positively influence Willingness To Pay, while higher prices negatively affect it. Other variables, though not statistically significant, suggest trends in consumer behavior. The paper concludes with implications for producers and marketers, offering recommendations to promote sustainable wine consumption in Sicily and beyond.

1. Introduction

In recent years, there has been a significant increase in emphasis on sustainability within the agri-food sector, influencing both consumer preferences and business strategies (Cecchini et al., 2018). This trend reflects a growing awareness of the environmental, social, and economic impacts associated with agricultural activities. Post-modern consumers, who are increasingly informed and concerned about environmental issues, now seek products that not only meet quality standards but are also produced sustainably (Modica et al., 2023). Consequently, agribusinesses are adapting their practices to integrate sustainability as a fundamental component of their business strategies.

In particular, according to ISMEA,[1] the Italian wine sector is a cornerstone of the national economy, generating a total turnover of €13.8 billion, which represents 10% of the agri-food sector's turnover. According to the Confragricoltura100,[2] more than half of the enterprises in this sector have achieved a high level (either high or medium-high) of sustainability, with their number steadily increasing over the past three years: from 48.8% in 2020 to 52.6% in 2022. Delving deeper into the regional context, Sicily ranks as the second largest region in terms of vineyard area and stands out as the second highest producer of quality wines. Renowned for its rich wine-making tradition, Sicily has seen a growing number of agri-food companies adopt sustainable practices to cater to evolving market segments (Ingrassia et al., 2023). This Mediterranean Island, blessed with a favorable climate and fertile soil, has long been a center for high-quality wine production (Nesto and Di Savino, 2013).

In the Sicilian context, a significant initiative is the "SOStain[3] Sicilia Foundation," which promotes sustainability in the local wine sector through its certification program. This program includes Organization Certification, assessing overall business operations, and Product Certification, evaluating the entire wine lifecycle.

Sustainability is crucial for Sicilian wine production, preserving the island's environment and natural resources, enhancing the

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[1] ISMEA, the Institute of Services for the Agricultural Food Market, is an Italian public economic entity operating under the supervision of the Ministry of Agricultural, Food and Forestry Policies (MIPAAF). ISMEA performs several crucial functions for the agricultural and agro-food sector, including Market Analysis and Information, by collecting, processing, and disseminating economic and statistical information on the agricultural and food market. https://www.ismeamercati.it/analisi-e-studio-filiere-agroalimentari.

[2] Agricoltura100 is a study promoted by Confagricoltura and Reale Mutua Assicurazioni that recognizes agricultural enterprises that have adopted innovative solutions or promoted initiatives aimed at improving the environmental, social, and economic sustainability of their activities, also benefiting the communities in which they operate. https://www.confagricoltura.it/media/4673/AGRIcoltura100-RAPPORTO-2022-Reale-Mutua-Confagricoltura_DEF.pdf.

[3] SOStain Sicilia is a sustainability program for Sicilian viticulture, promoted by the Consorzio di Tutela Vini Doc Sicilia and Assovini Sicilia, aimed at certifying the sustainability of the regional wine sector. https://www.fondazionesostainsicilia.it/.

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socioeconomic conditions of local communities, and safeguarding the quality of the final product. This integrated approach enables producers to minimize their ecological footprint while empowering consumers to support responsible practices, contributing to a sustainable future for the entire wine sector. The certification serves as a model demonstrating how companies can operate sustainably to benefit both the environment and society (Macchion et al., 2023). The research hypothesis on Consumers' willingness to pay (WTP) for sustainable wine is influenced by factors such as sustainable certifications, brand reputation, and perceived environmental benefits, while high prices tend to have a negative impact. Additionally, socio-demographic characteristics can play a significant role in determining WTP. This study aims to evaluate consumers' WTP for sustainable wine by focusing on socio-demographic factors and key determinants such as price, brand reputation, sustainability certifications, label attention, and environmental benefits.

Research Questions.

1. Which socio-demographic characteristics most affect the willingness to pay for sustainable wine?
2. How does price, brand reputation, sustainability certifications, label attention, and environmental aspects influence WTP?

The paper is organized into the following sections: a literature review on sustainable wine consumption habits, an explanation of the data and methods used, a presentation of the findings, and finally, the conclusions.

2. Literature review on sustainable wine consumption habits

1. Growing Market Trends for Sustainable Wine

Economic and marketing literature shows a positive trend towards the purchase of environmentally friendly products, with sustainable wine emerging as a growing market segment (Fiore et al., 2017; Mariani and Vastola, 2015; Santini et al., 2013). Many authors have investigated consumer preferences for sustainable wine (Valenzuela et al., 2022; Li and Kallas, 2021; Schäufele and Hamm, 2017), highlighting the increasing demand driven by both socio-demographic characteristics and specific product features. For instance, Stockl et al. (2024) examined consumer knowledge and preferences for organic and sustainably certified wines in the DACH region (Germany, Austria, and Switzerland). Their findings underscore the importance of consumer awareness and education, revealing that higher levels of sustainability knowledge correlate with stronger preferences for certified wines. Additionally, the study highlighted regional variations, with consumers in Germany showing greater sensitivity to organic labels compared to those in Austria and Switzerland.

Similarly, Ugaglia et al. (2021) explored consumer preferences for certified wines in France, focusing on the comparative influence of different sustainability labels. Their research demonstrated that consumers place varying degrees of trust in certifications, with some labels perceived as more credible and influential in purchasing decisions than others. The study emphasized the role of label clarity and transparency in shaping consumer behavior, particularly in markets where multiple sustainability certifications coexist.

2. Socio-Demographic Factors Influencing Consumer Preferences

Consumer preferences for sustainable wine are shaped by various socio-demographic factors. For instance, women are more likely to choose sustainable wines, as they tend to place high value on sustainability attributes and are willing to pay a premium for them (Wolf and Higgins, 2017). In contrast, men may be more influenced by factors such as the quality and prestige of the wine rather than its sustainability (Bonn et al., 2020).

Age also plays a significant role. Younger consumers, particularly Millennials, exhibit a strong preference for sustainable wines as they are more likely to support sustainable practices and choose environmentally friendly products (Kelley et al., 2022). This generation is generally more informed and sensitive to environmental issues (Pomarici and Vecchio, 2014). The 35–54 age group shows interest in sustainable wine as well, though their purchasing decisions are often influenced by economic factors and perceived product quality (Chaerudin and Syafarudin, 2021). Conversely, individuals aged 55 and older are less inclined to prioritize sustainability, focusing more on tradition and brand loyalty (Halwani, 2021).

In terms of education, consumers with higher education levels are more aware of sustainability issues, prefer sustainable wine options, and appreciate the value of sustainability certifications (Stanco et al., 2020). Regarding income, consumers with higher disposable incomes are more likely to afford and choose premium sustainable wines (Mauracher et al., 2019), while middle-income consumers often base their purchases on a balance between price and sustainability (Polzin et al., 2023).

3. Family and Geographic Influences

Family size and place of residence also influence sustainable wine consumption. Large families are generally inclined towards cheaper wines (Aqueveque, 2023), but growing environmental awareness can shift their preferences towards sustainable options, especially when perceived as beneficial for health and the environment (Sáenz-Navajas et al., 2024). Additionally, urban residents show a stronger interest in sustainability issues due to greater exposure to targeted marketing campaigns. In contrast, people in peripheral areas may focus more on the qualitative aspects of wine, with less emphasis on sustainability (Palumbo et al., 2020).

4. Price Sensitivity and Willingness to Pay (WTP)

Price remains a critical factor in purchasing decisions (Safitri, 2018). Specifically, the willingness to pay (WTP) for sustainable wine is becoming an important indicator of shifting consumer preferences towards products that reflect environmental and social values (Inderst and Thomas, 2021). Consumers are increasingly informed about the environmental and social impacts of wine production and are willing to pay a premium for sustainable wine if they perceive significant added value related to quality, taste, or environmental benefits (Sogari et al., 2016).

Numerous studies highlight consumers' willingness to pay a premium for sustainable wine compared to conventional options. For example, Delmas and Lessem (2017) found that American consumers are willing to pay a 20% premium for organically certified wine. Similarly, Caputo et al. (2013) observed higher WTP for organic wine in Spain and Italy. Demographic factors such as age, income, and education level significantly influence WTP. Forbes et al. (2009) showed that younger consumers and those with higher education levels tend to have a higher WTP for sustainable wine. Additionally, Marangon et al. (2012) reported that consumers in northern Italy are more willing to pay for sustainable wine compared to those in the south.

5. The Role of Brand Reputation and Certifications

Brand reputation and its association with sustainable practices also play an important role. Businesses with a strong sustainable identity can positively influence consumer preferences (Kuokkanen and Sun, 2020). Pivato et al. (2008) demonstrated that consumers appreciate companies that adopt sustainable practices and contribute positively to local communities through social projects and economic development initiatives.

Furthermore, voluntary certifications such as BIO and Fair Trade enhance consumer trust and increase purchase intentions (Tong and Su, 2018). The transparency and traceability provided by these certifications assure consumers of the authenticity of sustainable practices.

6. Reducing the Ecological Footprint and Consumer Education

A fundamental aspect of sustainability in the wine industry is reducing the ecological footprint. This can be achieved through renewable energy use in wineries, waste recycling, minimizing plastic use, and implementing low-impact production practices (Merli et al., 2018). Karwacka et al. (2020) highlighted that consumers value ecological practices, prompting many sustainable wine producers to invest in technologies that improve energy efficiency and reduce greenhouse gas emissions.

Educational campaigns and consumer awareness initiatives also play a pivotal role. D'Alessandro and Pecotich (2013) demonstrated that well-structured informational campaigns significantly increase consumers' WTP for sustainable wine. Such campaigns leverage social media, educational events, and collaborations with influencers to disseminate information. Annunziata et al. (2016) further emphasized the importance of consumer education, showing that well-informed consumers are more willing to pay for sustainable wine, particularly when they understand the environmental, social, and economic benefits of sustainable viticulture.

2.1. Data and methods

In this study, we build upon our previous work (Sgroi et al., 2023) by conducting a more rigorous empirical analysis of consumer behavior towards sustainable wine consumption. Whereas our earlier research primarily focused on descriptive exploration of survey variables, this current investigation employs a logistic regression model to empirically analyze the determinants of consumers' willingness to pay (WTP) for sustainable wine. Logistic regression is a widely accepted method for examining binary outcomes, particularly in studies related to consumer preferences and behavioral intentions (Hosmer et al., 2013).

The methodology involves categorizing WTP into binary outcomes—high or low—based on survey responses, with explanatory variables including demographic factors, consumer perceptions, and attitudes towards sustainability in the wine sector.

The theoretical model underlying the analysis of willingness to pay (WTP) for sustainable wine can be described using a linear regression model. In this model, the dependent variable is the willingness to pay for sustainable wine, while the independent variables include socio-demographic characteristics and other key determinants.

The general form of the model is:

$$\begin{aligned} WTP = {} & \beta 0 + \beta 1 Gender + \beta 2 Age + \beta 3 Party\_Size + \beta 4 Educational\_Level \\ & + \beta 5 Residence\_City + \beta 6 Income + \beta 7 Wine\_Consume \\ & + \beta 8 Attention\_tolabel + \beta 9 Environment\_Sacrifices \\ & + \beta 10 Sustainable\_Wine\_Purchase + \beta 11 Knowledge\_SOSTAIN \\ & + \beta 12 Price + \beta 13 Brand + \beta 14 Environmental\_Aspects \\ & + \beta 15 Sustainable\_Certification + \beta 16 Socioeconomic\_Impact + \epsilon \end{aligned}$$

This approach allows us to identify significant predictors that influence consumers' decisions to pay a premium for sustainable wine, providing deeper insights into the factors driving consumer behavior in this context. By adopting this empirical framework, we aim to offer a more robust understanding of how sustainability considerations interact with consumer preferences and behaviors within the wine industry.

3. Results

The results from the logistic regression model and the average marginal effects provide insight into the factors influencing the willingness to pay (WTP) for sustainable wine (Table 1, Table 2). Here, the coefficients, marginal effects, and their statistical significance are discussed together to offer a comprehensive understanding.

In examining the factors influencing willingness to pay (WTP) for sustainable wine, several variables were considered and their effects evaluated: Gender was analyzed, revealing that being female increased the log-odds of WTP by 0.272, although this effect was not statistically significant ($p = 0.163$). The corresponding marginal effect suggested a 5.9 percentage point increase in the probability of WTP, also not statistically significant ($p = 0.160$). Age showed a decrease in the log-odds of WTP by 0.101 with increasing age, which was not statistically significant ($p = 0.198$). This translated to a 2.2 percentage point decrease in the probability of WTP, similarly not statistically significant ($p = 0.195$).

Family size indicated that larger families increased the log-odds of WTP by 0.103, though this effect was not statistically significant ($p = 0.189$). The marginal effect reflected a 2.2 percentage point increase in the probability of WTP, also not statistically significant ($p = 0.186$). Higher education levels were associated with a decrease in the log-odds of WTP by 0.384, which was marginally significant ($p = 0.082$). This represented an 8.4 percentage point decrease in the probability of WTP, marginally significant ($p = 0.079$). Living in larger cities decreased the log-odds of WTP by 0.133, a non-significant finding ($p = 0.310$). The corresponding marginal effect showed a 2.9 percentage point decrease in the probability of WTP, similarly not statistically significant ($p = 0.309$). Higher income increased the log-odds of WTP by 0.215, with

Table 1
Logistic regression results.

Variable	Coefficient	St.E.	Z	P > z	[95% Conf. Interval]
Gender	0.2723347	0.1951666	1.4	0.163	−0.1101849 0.6548543
Age	−0.1006254	0.0781371	−1.29	0.198	−0.2537713 0.0525205
Party_Size	0.102757	0.0781493	1.31	0.189	−0.0504129 0.2559268
Educational_level	−0.3837513	0.2209386	−1.74	0.082	−0.816783 0.0492803
Residence_City	−0.1332777	0.1313409	−1.01	0.31	−0.3907011 0.1241457
Income	0.2147888	0.1161465	1.85	0.064	−0.0128541 0.4424318
Wine_Consume	−0.1026626	0.0881862	−1.16	0.244	−0.2755044 0.0701793
Attention_tolabel	0.6413082	0.2442487	2.63	0.009	0.1625896 1.120027
Environment_Sacrifices	−0.57863	0.4946148	−1.17	0.242	−1.548057 0.3907971
sustainabile_wine_purchase	0.4108773	0.3730994	1.1	0.271	−0.3203841 1.142139
Knowledge_SOSTAIN	0.1382791	0.2300146	0.6	0.548	−0.3125412 0.5890994
Price	−0.1832523	0.0935137	−1.96	0.05	−0.3665358 0.0000312
Brand	−0.019433	0.0926898	−0.21	0.834	−0.2011016 0.1622356
Environmental_aspects	0.3452762	0.1624856	2.12	0.034	0.0268103 0.6637421
Sustainable_Certification	−0.0490771	0.165144	−0.3	0.766	−0.3727534 0.2745992
Socioeconomic_impact	−0.0305033	0.155068	−0.2	0.844	−0.3344309 0.2734243
_cons	−1.252075	0.6874254	−1.82	0.069	−2.599404 0.0952542

Source: own elaboration

Table 2
Marginal effects from logistic regression.

Variable	dy/dx	St.E.	Z	P > z	[95% Conf. Interval]
Gender	0.0592817	0.0422018	1.4	0.16	−0.0234324 0.1419957
Age	−0.0219041	0.0169147	−1.29	0.195	−0.0550562 0.0112481
Party_Size	0.0223681	0.0169057	1.32	0.186	−0.0107665 0.0555026
Educational_level	−0.0835348	0.0475849	−1.76	0.079	−0.1767995 0.00973
Residence_City	−0.0290118	0.0284906	−1.02	0.309	−0.0848525 0.0268288
Income	0.0467551	0.0249833	1.87	0.061	−0.0022112 0.0957214
Wine_Consume	−0.0223475	0.0191056	−1.17	0.242	−0.0597938 0.0150987
Attention_tolabel	0.1395996	0.0519302	2.69	0.007	0.0378184 0.2413808
Environment_Sacrifices	−0.1259558	0.1071962	−1.18	0.24	−0.3360566 0.0841449
sustainabile_wine_purchase	0.0894395	0.0809278	1.11	0.269	−0.069176 0.248055
Knowledge_SOSTAIN	0.0301005	0.0500101	0.6	0.547	−0.0679176 0.1281186
Price	−0.0398903	0.0200938	−1.99	0.047	−0.0792733–0.0005072
Brand	−0.0042302	0.0201727	−0.21	0.834	−0.0437679 0.0353075
Environmental_aspects	0.0751595	0.0348261	2.16	0.031	0.0069017 0.1434174
Sustainable_Certification	−0.0106831	0.0359384	−0.3	0.766	−0.081121 0.0597548
Socioeconomic_impact	−0.0066399	0.0337508	−0.2	0.844	−0.0727902 0.0595104

Source: own elaboration

marginal significance (p = 0.064), translating to a 4.7 percentage point increase in the probability of WTP, also marginally significant (p = 0.061). Analysis of higher wine consumption revealed a decrease in the log-odds of WTP by 0.103, which was not statistically significant (p = 0.244). This equated to a 2.2 percentage point decrease in the probability of WTP, similarly not statistically significant (p = 0.242). Paying attention to labels increased the log-odds of WTP significantly by 0.641 (p = 0.009), corresponding to a 14 percentage point increase in the probability of WTP, also statistically significant (p = 0.007). Making environmental sacrifices decreased the log-odds of WTP by 0.579, which was not statistically significant (p = 0.242), resulting in a 12.6 percentage point decrease in the probability of WTP, similarly not statistically significant (p = 0.240).

Purchasing sustainable wine increased the log-odds of WTP by 0.411, though this effect was not statistically significant (p = 0.271). The marginal effect indicated an 8.9 percentage point increase in the probability of WTP, not statistically significant (p = 0.269). Knowledge of the SOSTAIN program increased the log-odds of WTP by 0.138, which was not statistically significant (p = 0.548). This corresponded to a 3 percentage point increase in the probability of WTP, also not statistically significant (p = 0.547). Higher prices decreased the log-odds of WTP by 0.183, with marginal significance (p = 0.050), resulting in a 4 percentage point decrease in the probability of WTP, marginally significant (p = 0.047). The brand had a negligible effect on the log-odds of WTP (−0.019), which was not statistically significant (p = 0.834), translating to a 0.4 percentage point decrease in the probability of WTP, similarly not statistically significant (p = 0.834). Considering environmental aspects increased the log-odds of WTP by 0.345, a statistically significant finding (p = 0.034). This indicated a 7.5 percentage point increase in the probability of WTP, also statistically significant (p = 0.031). Sustainable certification decreased the log-odds of WTP by 0.049, which was not statistically significant (p = 0.766), resulting in a 1.1 percentage point decrease in the probability of WTP, similarly not statistically significant (p = 0.766). Lastly, socioeconomic impact had a minimal effect on the log-odds of WTP (−0.031), which was not statistically significant (p = 0.844), translating to a 0.7 percentage point decrease in the probability of WTP, also not statistically significant (p = 0.844). These analyses provide insights into the various factors influencing consumers' willingness to pay for sustainable wine, highlighting significant and non-significant effects across different variables. Variables such as attention to labels, environmental aspects, and price show statistically significant effects on WTP. Specifically, paying attention to labels and considering environmental aspects positively influence WTP, while higher prices negatively affect WTP. Other variables, although not statistically significant, provide insights into potential trends and relationships affecting consumers' willingness to pay. These findings are in accordance with the available literature, which shows that attention to labels and environmental considerations positively influences the willingness to pay (WTP), while higher prices have a negative effect, in fact, numerous studies highlight that consumers are willing to spend more for products certified as sustainable, as such labels increase transparency and trust in the product (Moscovici et al., 2021; Gow et al., 2022). However, when prices are excessively high, even the most sustainability-conscious consumers may be discouraged from purchasing (Gallo et al., 2023; Mahadeva et al., 2024). This balance between the importance of certifications and price sensitivity clearly represents the dynamics described in the existing literature.

The logistic regression analysis highlights key factors influencing consumers' willingness to pay (WTP) for sustainable wine. Notably, attention to labels (p = 0.007) and environmental aspects (p = 0.031) show statistically significant positive effects on WTP. Consumers who pay closer attention to sustainability labels and value environmental considerations are more inclined to pay a premium for sustainable wine, with marginal effects indicating increases of 14% and 7.5%, respectively. Conversely, price has a marginally significant negative effect (p = 0.047), suggesting that while sustainability matters, higher costs can limit consumer willingness to pay, even among environmentally conscious buyers. Additionally, income (p = 0.061) and educational level (p = 0.079) exhibit marginal significance; higher income correlates with greater WTP, while surprisingly, higher education shows a slight negative trend, potentially reflecting more critical attitudes toward sustainability claims. Although variables such as gender, age, and sustainable wine purchase history were not statistically significant, they still indicate trends consistent with the literature—such as younger consumers and females generally showing higher WTP. These results underscore the critical role of clear sustainability communication and environmentally focused marketing strategies, balanced with pricing considerations, to effectively promote sustainable wine consumption across diverse consumer segments.

4. Conclusions

The findings of this study underscore the significant impact of sustainability certifications on consumer preferences for wine. Our results indicate that these certifications play a crucial role in influencing purchasing decisions, highlighting a growing consumer emphasis on environmental and ethical considerations in their consumption choices. Specifically, post-modern consumers increasingly demonstrate interest in sustainable products, presenting new opportunities for the wine sector to adapt marketing strategies to align with sustainability-focused market demands. This shift reflects not only a trend but also a fundamental change in consumer behavior, where environmental

consciousness and ethical considerations have become integral components of purchasing decisions.

Our analysis also reveals that sustainability certifications are not merely symbolic endorsements but serve as powerful tools to bridge the gap between producers and consumers. They provide verifiable assurances about environmentally friendly production practices, ethical sourcing, and social responsibility. These factors resonate strongly with contemporary consumers, who seek authenticity and transparency in the products they choose. As such, sustainability certifications can significantly enhance brand reputation, build consumer trust, and foster brand loyalty, ultimately influencing repeat purchases and long-term customer relationships.

Another critical finding is the role of sustainability in shaping not just individual purchasing decisions but also broader market trends. The increasing demand for sustainable wine reflects a global shift towards more responsible consumption patterns, influenced by heightened awareness of environmental issues such as climate change, resource depletion, and biodiversity loss. This trend suggests that sustainability is evolving from a niche market feature to a mainstream expectation, compelling wine producers to integrate sustainable practices into their core business strategies to remain competitive.

5. Discussion

The results of our study align with and expand upon existing literature on the role of sustainability certifications in the agri-food sector, offering several innovative insights specific to the wine industry. First, while previous research has acknowledged the importance of sustainability certifications, our study highlights the multidimensional influence of these certifications on consumer behavior. It shows that beyond acting as indicators of environmental responsibility, they also serve as markers of product quality, ethical production, and brand authenticity.

One of the key innovative contributions of this research is the identification of a delicate balance in pricing strategies for sustainable wines. Our findings suggest that while higher prices are often perceived as indicative of superior quality and environmentally friendly production methods, excessively high prices can limit accessibility to a broader consumer base, potentially hindering the widespread adoption of sustainable practices. Conversely, prices that are too low may raise doubts about the authenticity of sustainability claims, affecting consumer trust and purchase intentions.

Moreover, the study provides new insights into the role of sustainability certifications in enhancing supply chain resilience. By promoting environmentally friendly farming practices, resource efficiency, and ethical labor conditions, these certifications help mitigate risks associated with climate variability, resource scarcity, and regulatory changes. This resilience is particularly critical in the wine industry, which is highly sensitive to environmental fluctuations.

Another significant contribution is the emphasis on stakeholder engagement. The influence of sustainability certifications extends beyond consumer behavior to affect relationships with suppliers, distributors, and retailers. Companies that demonstrate strong sustainability commitments are more likely to form strategic partnerships within the value chain, fostering a more integrated and cohesive approach to sustainability.

Furthermore, our findings indicate that sustainability is not just an added value but is becoming a market prerequisite. This shift reflects a cultural transformation where consumers increasingly value products that align with their environmental and social values. Producers who can effectively communicate their sustainability efforts and integrate them into their brand identity are more likely to achieve competitive advantages and long-term success.

While this study focuses specifically on Sicilian consumers, the findings offer insights that may be relevant to broader contexts, particularly within regions sharing similar cultural, economic, and environmental characteristics. Sicily, as a major wine-producing region with a strong emphasis on sustainability, provides a valuable case study for understanding consumer behavior in markets where traditional agricultural practices intersect with modern sustainability trends.

However, it is important to acknowledge certain limitations regarding the external validity of the results. Consumer preferences for sustainable wine can be influenced by regional factors such as cultural attitudes toward environmental issues, local economic conditions, and the prominence of sustainability certifications in the marketplace. Therefore, while the observed trends—such as the positive impact of label attention and environmental considerations on willingness to pay (WTP), and the negative influence of higher prices—are likely to hold in other Mediterranean wine-producing regions, caution should be exercised when applying these findings to contexts with different socio-economic dynamics, such as Northern European or non-European wine markets.

Future research could enhance the generalizability of these findings by conducting comparative studies across different regions and countries. Such studies would help determine the extent to which factors influencing WTP for sustainable wine are consistent across diverse consumer populations. Additionally, exploring how regional marketing strategies and sustainability policies affect consumer perceptions would provide a more comprehensive understanding of the global sustainable wine market.

In conclusion, this study contributes to the growing body of literature on sustainability in the agri-food sector by providing a deeper understanding of the complex interplay between sustainability certifications, consumer behavior, market dynamics, and strategic business practices in the wine industry. Continued research is essential to explore these dynamics further and to develop innovative strategies that support sustainable development in the global wine market.

5.1. Limitations of the study

While this study provides valuable insights into the factors influencing consumers' willingness to pay (WTP) for sustainable wine, it is important to acknowledge several limitations that may affect the interpretation and generalizability of the results.

Firstly, the study is based on data collected exclusively from Sicilian consumers. Although Sicily represents a significant wine-producing region with unique cultural and economic characteristics, the findings may not be fully generalizable to other regions within Italy or to international contexts where consumer preferences and sustainability perceptions may differ. Future research could address this limitation by including a more diverse, geographically representative sample.

Secondly, the reliance on self-reported survey data introduces the potential for response biases. Social desirability bias may have influenced participants to overstate their environmental concerns or willingness to pay for sustainable products. Additionally, the cross-sectional design of the survey captures consumer attitudes at a single point in time, limiting the ability to assess changes in behavior over time or in response to external factors such as market trends or policy shifts.

Thirdly, while the logistic regression model used in this study effectively identifies relationships between variables, it may not capture the full complexity of consumer decision-making processes. Some variables hypothesized to influence WTP did not reach statistical significance, which could be due to model limitations, measurement errors, or unobserved confounding factors. Moreover, the alignment of the hypothesis with the results, despite many non-significant findings, highlights the need for cautious interpretation. This suggests that while certain factors like attention to labels and environmental considerations are influential, other dynamics affecting consumer behavior may not have been fully captured.

Finally, the sample size, though sufficient for the statistical analyses conducted, may limit the detection of subtle effects, particularly in subgroup analyses. Increasing the sample size in future studies could enhance statistical power and provide more robust insights into the

determinants of WTP for sustainable wine.

Acknowledging these limitations helps frame the study's findings within an appropriate context and underscores the need for further research to explore the complex interplay of factors influencing sustainable consumption behaviors.

6. Implications for gastronomy

The study on Sicilian consumers' willingness to pay (WTP) for sustainable wine highlights the growing demand for environmentally and ethically produced goods. Firstly, sustainable wine can be incorporated into menus to signal a commitment to responsible consumption practices. Transparency in sourcing and pricing should be enhanced to build consumer trust. Secondly, differentiation through sustainability can differentiate establishments in a competitive market, catering to post-modern values. So, integrating sustainable wine into broader sustainability initiatives can elevate brand identity and attract environmentally conscious consumers. Finally, strategic marketing of sustainable gastronomy can also be achieved by focusing on storytelling and incorporating themes of environmental stewardship and social responsibility. The findings from this study on Sicilian consumers' willingness to pay (WTP) for sustainable wine can help gastronomy industry.

CRediT authorship contribution statement

Federico Modica: Writing – review & editing, Writing – original draft, Project administration, Investigation, Formal analysis, Data curation, Conceptualization, Validation, Visualization. **Filippo Sgroi:** Validation, Supervision. **Amparo Baviera-Puig:** Validation, Supervision. **Caterina Sciortino:** Visualization, Validation, Software, Project administration, Methodology, Investigation.

Declaration of competing interest

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

Data availability

The data that has been used is confidential.

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