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Enhancing wineries' sustainability through territorial certifications: a case study in Emilia-Romagna, Italy

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Abstract

Purpose – As sustainability concerns become increasingly influential in shaping wineries' strategies at the production and processing stages, this study aims to investigate the anticipated benefits, incentives and constraints associated with a territorial sustainability certification in the wine industry.

Design/methodology/approach – Focusing on wine producers from the Romagna Consortium (Italy), the research explores the influence of firm characteristics on sustainability attitudes and explores the Consortium potential role in facilitating the ecological transition. Data are collected through an online survey and analyzed by means of factor and cluster analysis.

Findings – Findings reveal the Consortium capacity to expand its scope, incorporating elements of sustainability, resilience and territorial development. In addition, it emerges that the perception of sustainability among local producers extends beyond environmental concerns, encompassing the economic and social domains.

Practical implications – Acting as a cluster constituent, the Consortium can stimulate collaborative behavior and promote knowledge dissemination contributing to a mature collaborative environment. A territorial sustainability certification is thus viewed as multifunctional tool, enhancing economic performance and collective reputation, while addressing the numerous environmental challenges faced by the sector.

Originality/value – The study's originality lies in its direct engagement with a considerable number of producers in a geographic area boasting a mature wine industry but with limited research focusing on coordinated efforts for improved sustainability performance.

Keywords Italy, Surveys, Wines, Labelling, Survey research

Paper type Research paper

1. Introduction

The European Union (EU) has been at the forefront of implementing specific policies addressing environmental concerns, as evidenced by the early formulation of the Common Agricultural Policy (CAP). The CAP has undergone significant changes, with the 2013

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reform marking a pivotal shift toward incentivizing sustainable farming practices through direct support to producers. This evolution prompted a public discourse in 2017, resulting in the identification of nine EU-level objectives, emphasizing environmental protection, climate change mitigation, rural development and farmers' position in the value chain (Recanati *et al.*, 2019).

The CAP 2023–2027, aligned with Agenda 2030, aims to transition toward more sustainable food systems. The European Green Deal, a flagship initiative for carbon neutrality by 2050, complements this effort. Within the Green Deal, the Farm to Fork strategy focuses on developing a fair, healthy and environmentally friendly food systems through the promotion of sustainable value chains, production methods and combating food fraud. Organic farming gains renewed focus under this strategy, with the target of stimulating the conversion of EU agricultural land under organic cultivation by 2030, while eco-schemes within the CAP provide incentives for environmental and climate performance improvements (European Commission, 2021; European Parliament, 2022).

Pomarici and Sardone (2020) argue that this comprehensive EU policy framework presents a unique opportunity to harmonize and enhance environmental performance across the wine sector. The wine industry, given its considerable magnitude and ongoing expansion, plays a crucial role in sustainability discussions (Rugani and Lamastra, 2023), as reflected by the central role of sustainability in the realm of wine economics and business research (Ruggeri, Corsi and Mazzocchi, 2023). Several strategies for enhancing the sustainability of the wine industry have been indeed suggested, especially with regard to the adoption of environmental practices across different supply chain phases (Silva Barbosa *et al.*, 2018; Bandinelli *et al.*, 2020). The integration of these measures reflects a collective effort toward the long-term viability of wine production and consumption, aligning with the broader goals of Agenda 2030 and the Sustainable Development Goals.

It is claimed that the Italian agricultural sector is making significant advances in embracing sustainability, fueled by an increasing commitment to the implementation of sustainable practices among national producers (Wine News, 2019). Despite this, there exists a notable gap in empirical evidence regarding the diffusion of sustainable practices among Italian wineries. De Steur *et al.* (2020) shed light on the relatively low level of adherence to sustainable practices among Italian wine growers. Bandinelli *et al.* (2020) further emphasize disparities in the adoption rates of sustainable measures across different phases of viticulture, highlighting the key role played by the cost-benefit ratio specific to each practice. Focusing on the producer side in the context of the Emilia-Romagna region (Italy), this study contributes to the ongoing debate concerning the ecological transition of the wine industry by exploring the anticipated advantages, motivations and challenges associated with obtaining a territorial sustainability certification from the perspective of wine companies. In addition, specific traits of the companies under investigation − such as their size, methods of vineyard management, export orientation and sales structure − are subsequently included in the analysis to verify if, within the same territory, different groups of wineries sharing similar structural characteristics and sustainability orientations can be identified. Specifically, this work addresses the following research question:

RQ. Regarding the implementation of a territorial sustainability certification in the context of Emilia-Romagna, how is the sustainable transition perceived by the wine companies of "Consorzio Vini di Romagna" (Consortium for the Protection of Wines of Romagna)?

The results are finally discussed with regard to the association between sustainability perception and wineries' structural characteristics (i.e. market and production orientation) and the expected facilitating role of the local producers' association (Consortium).

2. Literature review

2.1 Sustainability in wine production and consumption

The wine industry has witnessed a growing significance placed on sustainability concerns, resulting in a notable transformation in the perspectives and behaviors of managers and owners. The adoption of sustainability measures within the sector is subject to a range of circumstances, encompassing both internal and external drives as well as strategic considerations. It is argued that internal factors can play a more influential role than external motivations, as reflected by the importance given to internal drivers such as ethical choices, environmental concerns and behavioral factors (De Steur *et al.*, 2020; Chauvin *et al.*, 2023). Similarly, altruistic reasons and personal conviction have been found to be key determinants in the conversion toward organic wine production (Hauck *et al.*, 2021). Conversely, the absence of knowledge and effective leadership might act as barriers in the process of adopting sustainable practices, specifically within the context of small and medium-sized enterprises (Dodds *et al.*, 2013).

The wine industry's sustainability efforts are nevertheless influenced by external drivers, such as the need to comply with regulations, core requirements for export and pressure from large retailers (Pomarici *et al.*, 2015). On the other hand, the lack of sustainability orientations among other actors of the supply chain (Signori *et al.*, 2017), obstacles associated with bureaucratic procedures in the certification process (Siepmann and Nicholas, 2018) and unsuitable weather conditions (Hauck, Szolnoki and Pabst, 2021) can also discourage conventional wineries from taking part in the transition process. In addition, strategic factors− such as competitive advantage, differentiation, product quality, marketing benefits, brand reputation, public image and cost savings − have been found to have a positive influence on the environmental sustainability of the sector (Dodds *et al.*, 2013). Some conflicting evidence concerning these aspects is nevertheless present. For instance, the transition toward biodynamic production or the adoption of sustainable technological innovations (e.g. lighter bottles, screw-top closures) may prejudice the perceived quality of the wine (Signori *et al.*, 2017). Economic reasons also need further examination, as the higher costs associated with organic production suggest that market incentives might not appear among the decisive factors motivating the transition, and the lack of active promotion of organic labels by producers denotes little confidence in using certification as a means of promotion (Hauck *et al.*, 2021). As regards strategic factors and communication, wineries can also be distinguished in terms of degree of both implementation of sustainable practices in the firm (orientation), and dissemination (exposure). Casini *et al.* (2010) identify four different profiles, namely, devoted (strong implementation and high communication), unexploiters ("stuck in the middle," not capitalizing on the adoption of green practices), opportunists (heavy communication of few sustainable practices) and laggards (no interest or communication).

With regard to the effect of company attributes, the relationship between investments in sustainable practices and firm characteristics and ownership has been the object of numerous studies (Balasubramanian *et al.*, 2021). Concerning firm size in the wine sector, larger wineries are believed to be more likely to implement environmentally sustainable practices for competitive positioning reasons, even if they do not necessarily have more positive attitudes toward environmental sustainability (Spielmann, 2017). However, the literature on this topic does not present a consistent set of arguments (Sinha and Akoorie, 2010), as other

studies (Muscio *et al.*, 2013) present opposing evidence that firm size is not a discriminant factor for eco-innovation. Even the interpretation of the sustainability concept is supposed to vary among firms of different dimensions, with small wineries prioritizing environmental concerns and cooperatives and larger companies also taking economic and social concerns into account (Szolnoki, 2013).

The demand for sustainable products among consumers has witnessed a notable surge, as individuals increasingly prioritize the consideration of environmental and social consequences while making purchase choices (Nuttavuthisit and Thøgersen, 2017). A similar trend can be identified also in the wine market (D'amico *et al.*, 2016; Sellers-Rubio and Nicolau-Gonzalbez, 2016), where firms face significant financial opportunities to capture market shares with eco-certified wines (Moscovici *et al.*, 2021). Despite this, empirical evidence still indicates a general confusion regarding sustainability among purchasers (Szolnoki, 2013), for instance not being aware of the diversity of sustainable practices or differentiating among organic, biodynamic and natural wines (Mastroberardino *et al.*, 2020). Even the existing body of literature pertaining to eco-friendly wines and consumer perceptions of their quality remains inconclusive (Atkin *et al.*, 2012; Abraben *et al.*, 2017). Consumers are thus confronted with an assortment of sustainable wine certifications, contributing to a scenario of informational overload. The wide array of certification programs, each with its own set of requirements and standards, has led to confusion among consumers regarding the meaning and authenticity of eco-labels (Capitello and Sirieix, 2019). Understanding consumers' perception is crucial in comprehending the broader landscape of sustainable practices in the Italian wine industry. Mastroberardino *et al.* (2020) identify a significant lack of precision in consumers' comprehension of sustainability-related terms, such as "natural," "biodynamic" and "organic," often used interchangeably. This uncertainty among consumers underscores the need for clear communication and standardized definitions within the industry. Nevertheless, it is expected that a substantial proportion of Italian consumers is willing to allocate additional financial resources for sustainable wines, especially among young generations (Galati *et al.*, 2019).

2.2 Sustainability in the wine industry: innovation initiatives

The focus on the environmental sustainability of viticulture operations has been steadily growing. The use of methodologies like Life Cycle Assessment allows to identify the environmental consequences of specific stages of the supply chain, such as production, bottle manufacturing and distribution (Point *et al.*, 2012; Mariani and Vastola, 2015), while the rapid development of greenhouse gases (GHGs) inventories specific to food systems (Crippa *et al.*, 2021) is reflected by the increasing attention to the carbon intensity of wine production, from grape harvesting to final consumption (Baiano, 2021). However, from a triple bottom line perspective (Elkington, 1998), these efforts to improve the environmental performance of the wine sector should be coupled by renewed attention to the economic and social dimensions of sustainability. The former, normally measured through profitability, liquidity, stability and productivity indexes, can be associated with economic viability, meaning that the farming system should be capable of adapting to changing economic conditions and provide prosperity to the farming community (Van Cauwenbergh *et al.*, 2007). The latter dimension can be assessed at both the farm and societal level. On the one hand, the social sustainability of viticulture production is reflected by those aspects related to education, working conditions and quality of life, while on the other multifunctional and socially acceptable agricultural practices generating high quality products contribute to value creation for society at large (Lebacq *et al.*, 2013). The emergence of Social Life Cycle

Assessment studies in the literature indeed denotes the interest for the social implications of viticulture operations throughout the product life cycle (Martucci *et al.*, 2019).

Regarding environmental aspects, there has been a growing attention toward those processes where the wine industry should be more sustainable, like waste production and energy use (Mariani and Vastola, 2015; Maicas and Mateo, 2020). Eco-innovation − considered as the creation and use of innovative products, processes, services, leading to a decreased environmental risk and impacts throughout the life cycle (Kemp and Pearson, 2007) − can indeed support some environmental practices typical of the wine industry, namely, the reduction of pesticide and herbicide use, conservation of soil and water resources, wildlife habitat improvement and waste management (Pullman *et al.*, 2010; Silva Barbosa *et al.*, 2018). Technological innovations have the potential to support the uptake of sustainable practices among wine producers. For instance, precision viticulture enhances resource allocation efficiency by considering geographical variability within a vineyard (Arnó *et al.*, 2009). Technological interventions in the cellar, including on-site wastewater treatment and the use of treated wastewater, can also contribute to increased environmental sustainability (Lofrano and Meric, 2016). Furthermore, the potential reuse in various industries of wine by-products in a circular economy perspective (Maicas and Mateo, 2020), the installation of solar panels in the farm (Silva Barbosa *et al.*, 2018), the efficient construction of structures and the use of vertical gardens to isolate the cellar (Bandinelli *et al.*, 2020) are all technological opportunities for improved environmental sustainability of the wine industry.

The focus on sustainable viticulture is underscored by the growth of organic and biodynamic practices in Italy. Recent data reflect a steady increase in the number of certified organic vineyards since 2005, exhibiting an average annual growth rate of 9% (OIV, 2021) and a largely-export oriented sector, with organic wine accounting for 19% of the total global export of Italian organic agribusiness (Nomisma, 2023). Italy is also experiencing a notable increase in the production of biodynamic wines (Castellini *et al.*, 2017; Vecchio *et al.*, 2023), reaching 1,948 hectares of Demeter-certified grape area (Simpfendörfer and Fischer, 2022), hence highlighting a broader industry shift toward environmentally conscious practices. An important indication of a commitment to sustainability within the Italian wine sector is the extensive array of sustainability initiatives launched in recent years by private enterprises and public entities (Corbo *et al.*, 2014). Among others, two notable examples include the VIVA certification, launched by the Ministry of the Environment in 2011, and Equalitas, promoted by the National Federation of the Consortia for the protection of designation of origin in the wine industry in 2015 (Casolani *et al.*, 2023). Besides regional and national programs, there exist several sustainability initiatives representing an important opportunity for the long-term growth of the sector, such the Wine Observatory on Sustainability (Gilardoni, 2020), the SOStain program (Schimmenti *et al.*, 2016) and producers' associations promoting natural wine (Alonso González and Parga-Dans, 2020). Nevertheless, this considerable number of sustainability initiatives and programs may lead company's management to misunderstand the specific benefits of each program (Corbo *et al.*, 2014) and to disorientate both producers and consumers, as exemplified by the legal case regarding the "Vino Libero" label in 2014 (Cristiani, 2018). Creating a common reference for sustainable wine production, shared by a large number of producers, would be crucial for the entire sector (Merli *et al.*, 2018). In addition, a single sustainability framework could further enhance the competitiveness of Italian wine on foreign markets (Corbo *et al.*, 2014).

2.3 Certification and competitive advantage

Voluntary sustainability certifications encompass the adoption, verification and communication of sustainable practices through product labeling. Certification, especially if administered by third parties, attests to a product or organization meeting specific standards, instilling confidence in stakeholders (Delmas and Gergaud, 2021). Third-party certification enhances credibility and minimizes conflicts of interest, ensuring the stringent adherence to sustainable practices (Castka and Corbett, 2016). While most certifications are voluntary, regulatory bodies, buyer demands or societal pressures may mandate adherence, with associated costs acting as barriers for smaller enterprises (Forbes *et al.*, 2013). Beyond conventional certified environmental management, sustainability certifications are believed to enhance the perception of a more integrated understanding of environmental sustainability, allowing the firm to testify its contribution to the achievement of Sustainable Development Goals (Mosgaard and Kristensen, 2023).

From a resource-based perspective (Hart, 1995), the achievement of a sustained competitive advantage can be supported by the adoption of sustainability practices at the firm level, implying that investments in social and environmental performance can generate virtuous circles in productivity and competitiveness (Porter and Van Der Linde, 1995). In the wine industry, environmental proactivity in the form of environmental management systems (Atkin *et al.*, 2012; Galati *et al.*, 2017), involvement in agro-ecological partnerships (Warner, 2007) and other eco-labeling practices (Fanasch, 2019) is deemed as a differentiation strategy to increase wineries' competitiveness.

Certifications within the supply chain yield market benefits and enhance coordination, potentially leveraging dynamic capabilities for a sustained competitive advantage (Stranieri *et al.*, 2022). Communication through labeling serves as both a policy and marketing tool, encouraging sustainable choices and addressing information asymmetry between consumers and producers (Neumayr and Moosauer, 2021). Eco-labels can be understood as a remarkable example of product-level information policy. Indeed, a primary objective of eco-labels is to mitigate the information asymmetry between producers and consumers, stemming from the absence of the latter during the production phase, which impedes their ability to evaluate environmental attributes (Delmas and Lessem, 2017). Plus, analyzing the labels' potential to contain competition reflects the increasing importance attributed non-price competition tools in explaining the economic interactions occurring along the supply chain, as opposed to traditional standard market power models focusing solely on price and quantity setting (Simeone *et al.*, 2017).

However, challenges like credibility and label proliferation exist, requiring transparency and reliable assessment procedures (Darnall *et al.*, 2018). The multitude of certification labels can lead to consumer confusion, necessitating improved communication strategies (Brécard, 2014; Hauck *et al.*, 2021). Economic regulation and specific controls are also needed to avoid the so-called free riding phenomenon, with opportunistic producers taking advantage of collective certifications enhancing the reputation of the whole production area, which may subsequently suffer from a decrease in demand in the long run (Malorgio *et al.*, 2008). Once these requirements are met, eco-labels provide a stimulus to demand by encouraging investments in product differentiation, advertising, sales promotion and visualization-related innovations, thereby appealing to psychological motivations for consumer purchasing decisions as an effective marketing tool to boost the product demand through enhanced positive image (Eldesouky *et al.*, 2020; Potter *et al.*, 2021; Shi *et al.*, 2022).

In the wine industry, diverse labels and certifications exist, ranging from sector-specific to broader designations (Stranieri *et al.*, 2022). The first example of a sustainable winegrowing program can be traced back to the Californian Lodi Winegrape Commission in 1992. Since then,

there has been an increasing spread of certification initiatives: normally voluntary, these programs tend to cover both the cellar and vineyard stages and to use a comprehensive set of indicators to assess sustainability performance (Merli *et al.*, 2018; Moscovici and Reed, 2018). The emergence of regional, state and national programs has been characterized by the involvement of different stakeholders in the program implementation, ranging from state agencies to nonprofit organization and local associations (Szolnoki, 2013; Flores, 2018; Moscovici and Reed, 2018). Being the wine market increasingly characterized by a fragmented demand, producers may take advantage of these certification initiatives to drive consumers' loyalty on their wine as they represent a valuable product attributes communication tool, possibly more relevant than the brand name of the company itself (Chrysochou *et al.*, 2012). Although in the past decades the number of certifications has been increasing all over the world (Moscovici and Reed, 2018), most of the research on wine business strategy and sustainability has been taking place in the New World Countries, namely, Chile, New Zealand, Australia, Argentina and the USA (Santini *et al.*, 2013). In particular, notable examples that received special attention include the Sustainable Winegrowing New Zealand (Montalvo-Falcón *et al.*, 2023), a successful program contributing to enhance the competitive advantage of the local wine industry (Moscovici and Reed, 2018), the Certified California Sustainable Winegrowing in the USA, whose positive effect on business profitability has been recognized by the wineries participating in the program (Pomarici *et al.*, 2015) and Wines of Chile, the Chilean national sustainability certification which received widespread interest in its Code possibly due to both its institutional influence and the perceived need to prove Chilean wine to importers (Marola *et al.*, 2020).

In summary, sustainability within the wine industry is a multifaceted and evolving landscape influenced by a number of factors. The adoption of sustainable practices is contingent upon managerial attitudes, internal culture, external pressures and strategic considerations, while challenges such as greenwashing (Sgroi *et al.*, 2023), limited consumer awareness (Pomarici *et al.*, 2016) and a proliferation of hardly comparable sustainability initiatives (Borsellino *et al.*, 2016), underscore the complexities of navigating the sustainability terrain in the wine market. This research focuses on a specific case study represented by the expected benefits, incentives and constraints related to the implementation of a territorial sustainability certification among the companies belonging to the "Consorzio Vini di Romagna". A territorial approach to sustainability, considering site-specific environmental and socio-economic structures, is required for regional and rural development strategies (Péti, 2012). In the case of agricultural production, territorial sustainability is achieved when specific gastronomic products become a driving force for local sustainable development and the resilience of agricultural landscapes through territorial branding (Sgroi and Modica, 2022). The present work should be considered as an exploratory analysis, since no specific details on the type of certification involved were provided to the respondents. Considering that other Italian producer associations are embracing already-established certification schemes, future analysis might focus on wineries' perception of the sustainability requirements embedded in these labels [1]. In Chapter 3, the data and methodology used for the analysis are described. Results are first presented in Chapter 4, while Chapter 5 provides a discussion of the findings and the main conclusions of the paper.

3. Data and methods

The data collection for this research was performed with an online survey, subdivided in five distinct sections and developed using Qualtrics. The first section is related to main firm's characteristics and supply chain structure. In detail, companies were asked to provide information regarding vineyard area managed, grape and wine production amounts,

existence of organic production (percentage over the total), degree of vertical integration (grape supply origin), degree of market diversification (share of foreign sales) and degree of distribution channel diversification (sales composition). In this section, the principal aim was to understand and define the main features of the company from a descriptive perspective. The other four sections were structured to explore respondents' opinions about implications and outcomes of a sustainability path. Respondents were asked to indicate, on a five-point Likert scale, the extent to which they agreed with a set of items. The item generation and selection process began with a thorough review of the literature presented in Section 2 to develop a theoretical understanding of the construct. This understanding was then used to guide the creation of an initial pool of items that were believed to capture the domain of interest, hence adopting a recommended inductive approach when doing exploratory research (Hinkin, 1998). In particular, the elaboration of the questionnaire built on the survey by De Steur *et al.* (2020) focusing on wine producers' perception of sustainability, namely, drivers and barriers to the adoption of sustainability practices. Relevant items from this established instrument were carefully adapted to fit the specific research context. This approach allowed the study to benefit from previously validated measures while tailoring them to its unique focus.

We contextualize the analysis by considering common aspects in previous studies assessing the territorial sustainability of agricultural production systems, such as product quality, employment creation and ethics (Baccar *et al.*, 2019), as well as participatory planning and preservation of cultural identity (Borrelli, 2016). A total of 42 items were formulated and organized as follows:

- Section 2 (attitude) focused on the general perception toward a territorial sustainability certification;
- Section 3 (benefits) regarded the expected benefits from undertaking a sustainability path;
- Section 4 (constraints) investigated which constraints may act as barriers in a sustainability path; and
- Section 5 (drivers) concerned the factors that can ease the uptake of a sustainability path.

Each section, consisting of Likert scales, was described separately, showing how answers were structured. To accomplish this, answers to each item must be counted by category (Strongly disagree – Disagree – Neither agree nor disagree – Agree – Strongly agree).

The survey was distributed via e-mail to all 116 companies belonging to Consortium Vini di Romagna. The survey opened in late January 2023 and closed in late February 2023. During this stage, all companies were informed via phone call about the ongoing investigation and were invited to participate. The survey was answered by winery managers or employees with decision-making responsibilities, who were assured that the results would be disseminated in aggregate form and with all necessary precautions to avoid the identifiability of the participants. The final number of completed responses was 45.

The analysis started with a preliminary exploration through descriptive statistics, aimed at delineating the sample characteristics. This phase set the groundwork for a subsequent exploratory factorial analysis (EFA), which served as a statistical validation technique. The EFA was conducted to assess the number and the validity of the underlying constructs and to determine which items, characterized by the highest factor loadings, encapsulate core themes in each of the sections of the questionnaire. This approach ensured that the core themes in each section of the questionnaire were captured with the most statistically relevant items

(Gorsuch, 1997). The final stage entailed using the items with the highest factor loadings for each identified factor to conduct a cluster analysis (specifically, k-means clustering). This analytical technique was pivotal in categorizing and elucidating the distinctive attributes of the resultant groups. All the analysis were performed in IBM SPSS v.22.

4. Results

4.1 Sample demographics

The participating firms represent a diverse cross-section of the wine-growing industry in Romagna (Table 1) [2]. The vineyard area among these enterprises averages 17.6 hectares, with a range extending from 3 to 41 hectares, indicative of predominantly small to medium-scale operations. In terms of sustainable farming practices, the average area under integrated pest management is reported at 6.56 hectares, while the commitment to organic farming ranges from none to as much as 50 hectares, with an average of 11.1 hectares per enterprise. Concerning the relationship between firm size and organic farming (Table 2), the proportion of fully organic wineries over the total is highest in the second and third quartile of acreage distribution, subsequently it drops to 36% among large-scale producers above 23 hectares. Production capacities further underscore the diversity of the sample (Table 3), as the average grape production is 1,554 tons, with a considerable range from 120 to 4,500 tons. Similarly, wine production varies significantly among participants, with an average of 1,052 hectoliters. Notably, the proportion of organic wine production averages 56.6%.

In the evaluation of distribution channels among the 45 wine-producing companies in the Romagna region (Table 4), the study uncovers diverse strategies encompassing exports, large-scale distribution, hotels, restaurants, cafes (HORECA), direct sales and online sales.

Table 1. Structural characteristics of sampled wineries ($N = 45$)

Descriptive statistics	Vineyards (HA)	Integrated pest management (HA)	Organic farming (HA)
Mean	17.6	6.56	11.1
Median	16	0	9
Standard deviation	9.8	11.1	12.3
Minimum	3	0	0
Maximum	41	44	50

Source: Authors' own work

Table 2. Sustainable practices of sampled wineries based on acreage distribution ($N = 45$)

	Totally integrated		Partially organic		Fully organic		Total	
Size category (HA)	No. of companies	Average size (ha)	No. of companies	Average size (ha)	No. of companies	Average size (ha)	No. of companies	Average size (ha)
<= 10.0	6	7	0	0	7	7.2	13	7.10
> 10.0–16.0	3	14.3	1	13	8	14.6	12	14.4
> 16.0–23.0	2	18	0	0	7	20.5	9	19.9
> 23.0	6	31.7	1	24	4	33.5	11	31.6
Total	17	18.3	2	18.5	26	17.1	45	17.6

Source: Authors' own work

Table 3. Production capacity of sampled wineries ($N = 45$)

Descriptive statistics	Grape production (T)	Wine produced (HL)	Organic wine produced (%)	Bottled wine (%)	Bottled organic wine (%)
Mean	1554	1052	56.6	66.7	38.1
Median	1350	800	85	80	0
SD	1028	766	47.9	34.9	45.6
Minimum	120	10	0	0	0
Maximum	4500	3000	100	100	100

Source: Authors' own work

Table 4. Distribution channels of sampled wineries ($N = 45$)

Descriptive statistics	Export (%)	Large-scale distribution (%)	Catering (%)	Direct selling (%)	Online sales (%)
Mean	16.6	10.7	54.4	31.7	3.22
Median	10	5	60	25	0
SD	19.4	13.3	25	24.3	4.15
Minimum	0	0	10	0	0
Maximum	70	60	95	90	15

Source: Authors' own work

The analysis reveals that the average percentage of wine exports is 16.6%, with a standard deviation of 19.4%, indicating that while some companies have a strong focus on international markets, the majority are less engaged in exporting their products. Sales through large-scale retail channels averages 10.7%, with a standard deviation of 13.3% and a median of 5%, suggesting that a significant proportion of the companies have minimal involvement in this channel. In contrast, the HORECA channel emerges as a predominant avenue for sales, with an average value of 54.4%, which reflects its importance for the majority of the companies surveyed. Direct sales to consumers represent a major component of the distribution strategy for many companies, accounting for an average of 31.7% of total sales. Conversely, despite the growing trend of digital commerce, online sales remain a relatively underutilized channel for the majority of the wineries under analysis.

4.2 Factor analysis

EFA allows the identification of the main factors influencing the following themes: attitude toward sustainability certification, expected benefits from sustainability and factors facilitating the ecological transition. Regarding the theme related to the constraints associated with a sustainability path, no components emerge from the EFA. The extraction method adopted is principal component analysis; the emerged components are rotated using varimax rotation (Tables 5–8):

(1) *Attitude toward sustainability certification:* The emerged factors show that companies evaluate the sustainability certification both in terms of adaptation to ecological and market challenges, and in terms of alignment with consumer needs (Table 5).

Table 5. Rotated component matrix: attitude

A territorial sustainability certification would …	Component 1	2
1.1 – be important to meet the challenges of the ecological transition	0.931	0.169
1.3 – allow my firm to increase sales	0.793	0.276
1.2 – allow to adapt to market regulatory requirements	0.783	0.034
1.7 – improve relations within the supply chain	0.670	0.483
1.4 – be more complying with sustainability requirements compared to organic certification	0.185	0.900
1.5 – address consumers' preferences regarding the reduction of pesticides	0.125	0.895
1.6 – allow to adapt to global competition	0.156	0.669
1.8 – allow to adapt to the changing European regulations regarding wine production	0.546	0.603

Source: Authors' own work

Table 6. Rotated component matrix: expected benefits

Embracing a sustainability path and the ecological transition allows to …	Component 1	2
2.3 – reduce carbon footprint	0.860	0.305
2.4 – enhance the wine cultural features and the territorial heritage related to viticulture	0.859	0.062
2.12 – preserve vineyard landscape	0.797	0.219
2.10 – improve relationships among local actors	0.788	0.248
2.1 – tackle the causes of climate change	0.768	0.407
2.9 – improve profitability	0.676	0.481
2.11 – improve market transparency	0.655	0.500
2.6 – promote exports	0.607	0.426
2.7 – being complementary to organic or integrated management certifications	0.059	0.913
2.5 – adapt to the evolution of consumers' taste and habits	0.486	0.638
2.8 – expand the range of products	0.226	0.638
2.2 – increase the value and/or reputation of the Designation of Origin	0.566	0.599

Source: Authors' own work

- *Factor 1*: focuses on the importance of the sustainability certification to face ecological challenges, increase sales and adapt to regulations and market evolutions;
- *Factor 2*: emphasizes alignment with market needs and consumer expectations, suggesting a market-oriented approach in the perception of sustainability certifications.

(2) *Expected benefits from sustainability:* Here, the factors indicate expectations of both environmental and business benefits (Table 6).

- *Factor 1*: reveals expectations of primarily environmental (reduction of carbon footprint, landscape preservation) and cultural benefits (cultural strengthening, relationships between operators);
- *Factor 2*: highlights the expectation of benefits related to the complementarity with other certifications, evolution of consumer tastes and expansion of products offering, indicating a comprehensive view of the value of sustainability.

Table 7. Rotated component matrix: facilitating factors

Embracing a sustainability path and the ecological transition is eased if …	Component 1	2
4.4 – distribution channels raise sustainability standards requirements	0.853	0.255
4.8 – strategic collaboration takes place among local companies	0.826	0.412
4.5 – the exchange of information between winegrowers and society is improved	0.809	0.295
4.7 – sustainability certification processes are simplified	0.796	0.326
4.9 – the distinctiveness of the production area in the market is enhanced	0.765	0.166
4.3 – financial schemes to compensate producers' efforts are improved (support for agri-environmental practices)	0.665	0.530
4.2 – the awareness of the need to modernize production methods prevails among winegrowers	0.653	0.514
4.6 – environmental regulations are strengthened	0.641	0.399
4.10 – Consortium members have access to financial incentives to compensate their sustainability efforts	0.376	0.854
4.11 – the Consortium takes the lead carrying out the administrative procedures	0.424	0.837
4.1 – there is support by adequate technical and management tools	0.122	0.797
4.12 – the territorial commitment to sustainability is regularly publicized through public events	0.558	0.728

Source: Authors' own work

Table 8. EFA: explained variance

Component	Total	Squared loadings Proportion of variance	Cumulative proportion
1 – Attitude	2.931	36.634	36.634
2 – Attitude	2.762	34.528	71.161
1 – Expected benefits	5.19	43.252	43.252
2 – Expected benefits	3.041	25.339	68.59
1 – Facilitating factors	5.211	43.428	43.428
2 – Facilitating factors	3.755	31.292	74.721

Source: Authors' own work

(3) *Factors facilitating the ecological transition:* The results highlight the importance of collaboration, communication and regulatory and technical support as key elements to facilitate the transition to more sustainable practices (Table 7).

- *Factor 1*: underlines the importance of strategic collaboration, effective communication and simplification of operational practices as key elements for the ecological transition;
- *Factor 2*: shows a strong focus on the role of the Consortium and regulatory/technical support, highlighting the need for a structured support framework for the ecological transition.

4.3 Cluster analysis

Cluster analysis is conducted using sample demographics as well as the items with the highest factor loadings for each identified factor[3], to delineate and categorize the

distinctive attributes of the emerged clusters (Table 9). The criteria adopted for determining the optimal number of clusters is based on the Elbow method.

4.3.1 Cluster 1: small and medium-sized sensitive innovators. Companies included in Cluster 1 are already embracing sustainable practices. The proportion of both vineyard acreage converted to organic and organic wine production are significant, indicating commitment to sustainable agriculture, with organic methods being preferred to integrated management. These companies display lower export rates and the prevalence of HORECA channels, suggesting a lower diversification in sales strategies compared to Cluster 2. Regarding attitudes toward sustainability, the values indicate a broad understanding of both the environmental benefits that may derive from the certification (Question 1.1, Question 2.3) and the importance of addressing market incentives such as distribution requirements (Question 4.4) and financial support (Question 4.10). The clearer orientation toward organic viticulture with respect to Cluster 2 wineries is reflected in Questions 1.4 and 2.7, indicating a holistic understanding of sustainability, as the territorial certification is not seen as a substitute for organic production methods.

4.3.2 Cluster 2: large-sized versatile and pragmatist wineries. Cluster 2 is characterized by wineries with higher firm size and production volumes. In general, they present a larger vineyard area and a higher percentage of hectares dedicated to integrated pest management. The proportion of organic production is lower compared to Cluster 1, both in terms of bottled wine and grape volumes. The greater focus on bottled wine over total production (77.50% vs 63.60%) is reflected by the role of export and large-scale distribution, which are more relevant for Cluster 2 wineries. These companies are characterized by a more equal repartition among distribution channels, as the main four options (export, HORECA, large-

Table 9. Main characteristics of the two groups emerged through k-means cluster analysis

Mean values	Cluster 1	Cluster 2
Vineyards (ha)	13.59	31.70
Integrated pest management (ha)	3.66	16.70
Organic farming (ha)	10.67	12.70
Wine produced (hl)	1094.09	3165.00
Grape production (t)	713.00	2239.90
Organic wine produced (%)	61.97	38.00
Bottled wine (%)	63.60	77.50
Bottled organic wine (%)	40.43	30.00
Export %	14.86	22.50
Large-scale distribution %	8.86	17.00
HORECA %	57.43	44.00
Direct selling %	30.57	35.50
Online sales %	3.14	3.50
1.1 – Importance of ecological transition	4.11	3.80
1.4 – Higher compliance with sustainability requirements compared to organic certification	3.29	3.70
2.3 – Carbon footprint reduction	3.74	3.50
2.7 – Complementarity to organic or integrated management certifications	3.63	3.40
4.4 – Requirements for sustainability standards in distribution channels	4.00	3.50
4.10 – Access to financial incentives for sustainability efforts within the Consortium	4.26	3.40

Source: Authors' own work

scale retail, direct selling) all lie between 17% and 44% of the total. The values placed on sustainability items indicate awareness of the benefits of adopting of a territorial sustainability certification, which tends to be deemed as a more effective strategy to improve the sustainable performance of the Romagna wine industry compared to organic certification (Question 1.4). Although Question 1.4 did not identify a specific dimension of sustainability (environmental, social, economic), this result could imply that a greater focus on the preservation and promotion of the local wine heritage is perceived as a more effective strategy to promote the sustainability efforts of these companies among the different distribution channels they are involved in. Alternatively, it might suggest that larger companies do not see organic certification requirements as environmentally responsible.

5. Discussion and conclusions

5.1 Evolving perception of sustainability

There is no unambiguous definition of sustainable wine, especially considering that the proliferation of sustainability claims is influenced by geographical differences, with most countries (including Italy) still making the association "sustainable=organic" (Szolnoki, 2013). Although in general it can be said that sustainability initiatives in the wine industry have historically favored the environmental component (Baiano, 2021), the literature suggests that it is precisely in the producing countries of the so-called Old World that the perception of producers may be more limited, delimiting sustainability to organic production and to environmental issues (Mariani and Vastola, 2015). In the case of the companies that are part of the Consortium, the results suggest that the perception of sustainability by Romagna producers seems to be sufficiently broad, involving the three spheres of the sustainability. These results also show that the analyzed companies see territorial certification as a multifunctional means (Winkler *et al.*, 2017; Arru *et al.*, 2019), capable of increasing the economic performance of the enterprise and at the same time contributing to the ecological transition by intervening positively both at the societal (e.g. cultural heritage preservation) and environmental level (e.g. carbon footprint reduction) (Component 1 − expected benefits). The frequent confusion between the terms "sustainable," "organic" and "biodynamic" wine (Santini *et al.*, 2013), therefore, does not appear to be present in the study sample. With reference to the environmental dimension, the multifaceted understanding of sustainability may also encompass energy sustainability targets in the certification process. Viticulture, as any other economic activity, will have indeed to face the challenge of clean energy use, especially in the light of the Renewable Energy Directive adopted by the European Commission in 2023, which raises the EU 2030 renewable energy target to a minimum of 42.5% (European Union, 2023a).

Furthermore, the results indicate that there does not appear to be a conflict between organic production and sustainable viticulture for the Romagna wineries. Unlike what has emerged in other studies that have highlighted how − often for reasons of personal and ideological conviction − producers prefer to renounce an organic certification, in favor of a greater focus on the territory and tradition (Siepmann and Nicholas, 2018; Hauck *et al.*, 2021), in the case of Romagna territorial sustainability and organic production are seen as complementary (Component 2 − expected benefits), with the first being able to supplement the gaps in sustainability of the second (Component 2 − attitude). Based on the mean values attributed by the respondents to the different items of the questionnaire (Table S1), we recommend that future efforts to implement a common sustainability scheme in the area should clarify the contribution of the certification to meet the challenges of the ecological transition (Question 1.1), minimize the increase in bureaucratic burden for the operators (Question 3.3), be aligned with CAP guidelines for eligibility for agro-climatic-environmental payments (Question 4.3)

and include an active role by the Consortium in terms of economic and procedural support (Question 4.10, Question 4.11). In addition, we suggest that the sustainability scheme would benefit from the inclusion of specific indicators measuring the social impact of the certification, given the farm to fork objective of transitioning to a Farm Sustainability Data Network and the current limited availability of measures to assess the social sustainability dimension of the Italian wine industry (e.g. local employment, gender equality and social capital) (Sardone *et al.*, 2023).

Although the cluster analysis denotes the presence of two groups (Table S2), distinguished mainly by structural characteristics (e.g. production volumes, marketing channels), the attitude toward territorial certification as a means to cope with the ecological transition is high in both Clusters 1 and 2. This contrasts with those cases where, despite the identification of two groups of producers with distinct motivations does not prejudice the positive attitude toward the ecological transition (newcomers *vs* successors, idealists *vs* pragmatists), the adoption of a certification is evaluated positively only by one of the two (Csizmady *et al.*, 2021; Svanidze and Costa-Font, 2023). Indeed, using the analysis of variance (ANOVA) to test for differences between the two groups, it emerges that the most significant elements that define separate clusters are related to the structural characteristics of sampled wineries, rather than the territorial certification items (Table S3). Nevertheless, the possible divergence among entrepreneurs' motivational drivers should not be underestimated as potential source of conflict. It can be argued that even more pragmatist wineries should be, at least to some extent, concerned about the environmental impacts of their activity and willing to adopt a new company culture in order for the certification to succeed. In this sense, monetary benefits from the initiative might not live up to the expectations in the early implementation stages, possibly deterring those companies driven solely by market incentives.

A potentially enabling function of the Consortium emerges at this stage, since it has been seen that eco-innovation and the adoption of sustainable practices in socio-environmental domains are positively influenced by factors outside the company, such as the collaboration with other actors in the chain and research institutions (Annunziata *et al.*, 2018; Frigon *et al.*, 2020; Depetris-Chauvin *et al.*, 2023), with which the Consortium could play an active role of intermediary. At the operational level, the Consortium could also provide support in terms of sharing resources and tools for common marketing strategies, which prove to be one of the most important drivers for promoting the sustainable transition in the wine industry (García-Cortijo *et al.*, 2021) and thus respond to the needs of producers (Component 2 − facilitating factors). Indeed, certification schemes are more likely to have local roots and be initiated by wine industry operators, rather than being the product of a command and control systems (Moscovici and Reed, 2018), which suggests the importance of considering also the role of the local producers' association in this exploratory study.

5.2 Active involvement of the Consortium

While the Consortium was originally focused on protecting and promoting the local DOC (Controlled Designation of Origin) wines, our analysis reveals that it has the potential to expand its scope beyond its usual activities by incorporating aspects of sustainability and territorial enhancement, taking the lead in the implementation of a territorial sustainability certification (Question 4.11, Table S1). The presence of a Consortium is one of the fundamental elements in defining a productive cluster within a wine region (Montaigne and Coelho, 2012). As a constituent element of clusters, Consortia have the potential to promote the creation of common relationships and mechanisms (e.g. marketing), thus stimulating knowledge networks oriented toward the dissemination of innovations (Maghssudipour *et al.*, 2020). The results of our study

highlight a certain level of maturity of the companies in the study region, as the strategic collaboration between companies is considered as an important facilitator for the adoption of the territorial certification of sustainability (Component 1 − facilitating factors).

Especially in the early stages of the supply chain, the literature has emphasized that Consortia play an important role of knowledge intermediatory or knowledge broker, being the first point of reference for many companies in the stage of management of the vineyard. This promotes a fair dissemination of knowledge among the companies that are part of the cluster, thus stimulating cooperative behavior (Sedita *et al.*, 2021). It has even been argued that it is precisely the cooperative behavior, which allows a cohesive group of producers to resolve the asymmetries present in the value chain, to be more decisive in the market success of a particular *terroir*, even more important than the quality of the wine itself (Carter, 2018). The wine company's role as an agent of local development can therefore be understood through the concept of shared value, meaning that the involvement of producers' associations and other local certification organisms to enable the growth of local clusters is deemed as a key strategy for joint private and societal value creation (Porter and Kramer, 2011).

With regard to the marketing phase, it is claimed that the acquisition of a geographical identity is a positive element within the international markets, thus proving to be an important element of strategic differentiation (Agostino and Trivieri, 2014). In this sense, a coordinated system of communication at the territorial level is necessary to be competitive in foreign markets (Rocchi and Gabbai, 2013) and it is here that the Consortium Vini di Romagna can intervene, especially through the promotion of the local cultural heritage to appeal to a wider range of consumers and enhancing the distinctiveness of the production area in the market (Question 4.9, Table S1). The EFAhas indeed highlighted the importance attributed by producers to the need to adapt to the increasing sensitivity of consumers with regard to sustainability (Component 2 − attitude), a phenomenon for the most evidenced in other contexts (Schäufele and Hamm, 2017), although it is still desirable to conduct a preliminary study to identify the characteristics of the consumer groups targeted by the Consortium producers (Sogari *et al.*, 2016). With respect to consumers' reaction, the Consortium reputation is expected to offset the increasing mistrust toward environmental, social and governance claims. In the past decade, the Italian public opinion has been overburdened by numerous food fraud scandals, possibly leading to a suspicious perception toward corporate sustainability efforts.

It is also highlighted that Consortia should have a more active role, not only as knowledge intermediatory, but as a leader in the promotion of the territory (Chiodo *et al.*, 2020). In doing so, Consortia will have to take into account the drivers of the so-called regionality of wine, i.e. specialization in a particular wine style, the involvement of opinion formers and the search for a unique and recognizable taste (Easingwood *et al.*, 2011). In this sense, acting in an area − the Romagna provinces − with a high tourist vocation and characterized by the presence of certain grapes strongly associated with this territory (e.g. Albana), the Consortium can for example play an active role in the implementation of wine tourism initiatives, a phenomenon with great potential in the Italian context (Colombini, 2015; Gastaldello *et al.*, 2022; Marco-Lajara *et al.*, 2023), especially where supported by instruments of innovation in the digital field. Interesting in this regard is the study by Festa *et al.* (2020), which highlights how Italian wine consortia are considered an important stakeholder for the purpose of tourism promotion especially in large municipalities and less in those with a population of less than 5,000 inhabitants. It would therefore be necessary to develop a strategy of tourism promotion that meets the specific needs of the areas involved, since the territory covered by the Consortium is extremely varied. In addition, the

publicization of sustainability efforts represents an important condition. Finally, as recent legislative developments at the European Union level tend to encourage an increasingly active role for producers' associations (including in the field of sustainability reporting [4]), the Romagna Consortium is recommended to valorize and coordinate the growing sustainability efforts implemented by the companies included in the study. Another activity where the Consortium could intervene involves the publicization of sustainability efforts by local wineries through the organization of public events (Question 4.12, Table S1).

5.3 Study limitations and conclusions

It is important to acknowledge the potential presence of confounding variables in our factor analysis and their impact on the interpretation of the results. Some factors have relatively high loadings on both components (e.g. Question 2.2, Question 4.3), suggesting that they may be influenced by both external market forces and internal Consortium decisions. This makes it challenging to interpret their specific effects on the embracing of a sustainability path and ecological transition. The presence of confounding variables may influence the associations we have observed, and it is crucial to consider their potential impact when interpreting the results. Future research could investigate the effects of confounding variables by using various methodological approaches, such as partial correlation analysis, regression analysis with control variables or collecting additional data on potential confounding factors.

In summary, the study's conclusions advocate for a thorough comprehension of sustainability in the wine industry, going beyond environmental certification to a comprehensive approach involving the socio-economic development of the area where the wineries operate. The focus on a specific area of investigation is based on the premise that wineries' approach toward sustainability is highly dependent on the geographic conditions of the area where winegrowing activities take place (García Cortijo *et al.*, 2023). By promoting territorial sustainability certifications, the research highlights the role of local producers' associations in contributing to the ecological transition, with potential benefits not only for the wine industry but for broader societal well-being, especially as Italian wine consumers pay increasing attention to both environmental concerns and social issues, like fair labor conditions (Piracci *et al.*, 2022). Taking into account the potential for quality certification to strengthen the territorial identity of wine producing areas through the promotion of its cultural heritage (Ruiz Pulpón and Cañizares Ruiz, 2022), the integration of environmental and social sustainability in a territorial label can lead to improved quality of life in regions with a long and established history of winemaking, such as Emilia-Romagna. Broadening the implications to the relationship between local private actors and policymakers, such certifications could be leveraged as tools for regional development, aligning them with broader European Union initiatives like the eco-schemes under the CAP to increase the likelihood of adoption by farmers and reduce the administrative costs related to management and oversight (Poppe and Koutstaal, 2020).

Highlighting the crucial role of the Consortium, and recognizing the presence of different producers' perspectives on sustainability while encouraging cooperative behavior in the field of eco-innovation, this study sheds light on a promising trajectory for the Romagna wine sector's sustainable evolution. At the same time, we suggest that the effectiveness and added value of the certification are expected to depend on consumers' awareness and recognition of sustainability benefits, thus implying the importance of adequate communication of sustainability efforts to the end consumer (Ingrassia *et al.*, 2022). Consistency in the regulatory framework for a clear sustainability message, together with the diffusion of reliable and verifiable results in producers' commitments, will be key elements for successful implementation of the certification.

Notes

1. In 2022, Consorzio del Vino Nobile di Montepulciano (Siena, Tuscany) became the first Consortium to obtain the Equalitas territorial sustainability certification for the Denominations of Origin "Vino Nobile di Montepulciano" and "Rosso di Montepulciano" in Tuscany.
2. Not having information on the wineries that declined the invitation to take part to the survey, we are not able to evaluate the problem of self-selection (Heckman, 2010) in sample formulation. Nevertheless, the sample can be considered representative of the regional wine industry in terms of firm size, as public data from the Italian Farm Accountancy Data Network report a 2022 average value of 17.74 hectares.
3. From a theoretical perspective, items with the highest factor loadings are considered to be the best representatives of the underlying construct or factor (Tinsley and Tinsley, 1987). By focusing on these items, we can capture the core essence of each construct while minimizing the inclusion of less relevant or redundant items. This is consistent with the principle of simple structure, which suggests that scales should be composed of a minimum number of items that adequately cover the domain of interest (Cudeck and MacCallum, 2007). However, we acknowledge the potential limitations of this method, due to the tradeoff between parsimony and content validity, possibly resulting in limited representation of the domain of each construct (Churchill, 1979; Cortina, 1993).
4. "A producer group, or a recognised producer group where such a group exists, may prepare and regularly update a sustainability report based on verifiable information, comprising a description of existing sustainable practices implemented in the production of the product, a description of how the method of obtaining the product impacts on sustainability, in terms of social, environmental, economic or animal welfare commitments, and information necessary to understand how sustainability affects the development, performance and position of the product. The Commission shall make the sustainability report public" (European Union, 2023b).

References

Abraben, L.A., Grogan, K.A. and Gao, Z. (2017), "Organic price premium or penalty? A comparative market analysis of organic wines from Tuscany", *Food Policy*, Vol. 69, pp. 154-165, doi: 10.1016/j.foodpol.2017.04.005.

Agostino, M. and Trivieri, F. (2014), "Geographical indication and wine exports. An empirical investigation considering the major European producers", *Food Policy*, Vol. 46, pp. 22-36, doi: 10.1016/j.foodpol.2014.02.002.

Alonso González, P. and Parga-Dans, E. (2020), "Natural wine: do consumers know what it is, and how natural it really is?", *Journal of Cleaner Production*, Vol. 251, p. 119635, doi: 10.1016/j.jclepro.2019.119635.

Annunziata, E., Pucci, T., Frey, M. and Zanni, L. (2018), "The role of organizational capabilities in attaining corporate sustainability practices and economic performance: Evidence from italian wine industry", Journal of Cleaner Production, Vol. 171, pp. 1300-1311, doi: 10.1016/j.jclepro.2017.10.035.

Arnó, J., Martínez-Casasnovas, J.A., Ribes-Dasi, M. and Rosell, J.R. (2009), "Review. Precision viticulture. Research topics, challenges and opportunities in site-specific vineyard management", *Spanish Journal of Agricultural Research*, Vol. 7 No. 4, pp. 779-790, available at: www.inia.es/sjar (accessed 8 December 2023).

Arru, B., Furesi, R., Madau, F.A. and Pulina, P. (2019), "'Value portfolio', value creation and multifunctionality: the case study of an Italian wine agritourism farm", *Aestimum*, Vol. 75, pp. 163-181, doi: 10.13128/aestim-8149.

Atkin, T., Gilinsky, A. and Newton, S.K. (2012), "Environmental strategy: does it lead to competitive advantage in the US wine industry?", *International Journal of Wine Business Research*, Vol. 24 No. 2, pp. 115-133, doi: 10.1108/17511061211238911.

Baccar, M., Bouaziz, A., Dugué, P., Gafsi, M., Le Gal, P. (2019), "The determining factors of farm sustainability in a context of growing agricultural intensification", Agroecology and Sustainable Food Systems, Vol. 43 No. 4, pp. 386-408.doi, doi: 10.1080/21683565.2018.1489934.doi

Baiano, A. (2021), "An overview on sustainability in the wine production Chain", *Beverages*, Vol. 7 No. 1, p. 15, doi: 10.3390/BEVERAGES7010015.

Balasubramanian, S., Shukla, V., Mangla, S. and Chanchaichujit, J. (2021), "Do firm characteristics affect environmental sustainability? A literature review-based assessment", *Business Strategy and the Environment*, Vol. 30 No. 2, pp. 1389-1416, doi: 10.1002/bse.2692.

Bandinelli, R., Acuti, D., Fani, V., Bindi, B. and Aiello, G. (2020), "Environmental practices in the wine industry: An overview of the italian market", British Food Journal, Vol. 122 No. 5, pp. 1625-1646, doi: 10.1108/BFJ-08-2019-0653.

Borrelli, I.P. (2016), "Territorial sustainability and multifunctional agriculture: a case study", *Agriculture and Agricultural Science Procedia*, Vol. 8, pp. 467-474, doi: 10.1016/j.aaspro.2016.02.046.

Borsellino, V., Migliore, G., D'Acquisto, M., Di Franco, C.P., Asciuto, A. and Schimmenti, E. (2016), "Peer-review under responsibility of Fondazione Simone Cesaretti 'green' wine through a responsible and efficient production: a case study of a sustainable Sicilian wine producer", *Agriculture and Agricultural Science Procedia*, Vol. 8, pp. 186-192, doi: 10.1016/j.aaspro.2016.02.092.

Brécard, D. (2014), "Consumer confusion over the profusion of eco-labels: lessons from a double differentiation model", *Resource and Energy Economics*, Vol. 37, pp. 64-84, doi: 10.1016/j.reseneeco.2013.10.002.

Capitello, R. and Sirieix, L. (2019), "Consumers' perceptions of sustainable wine: an exploratory study in France and Italy", *Economies*, Vol. 7 No. 2, pp. 1-20, doi: 10.3390/economies7020033.

Carter, E. (2018), "For what it's worth: the political construction of quality in French and Italian wine markets", *Socio-Economic Review*, Vol. 16 No. 3, pp. 479-498, doi: 10.1093/ser/mwx060.

Casini, L., Cavicchi, A., Corsi, A. and Santini, C. (2010), "Hopelessly devoted to sustainability: marketing challenges to face in the wine business", 119th EAAE Seminar 'Sustainability in the Food Sector: rethinking the Relationship between the Agro-Food System and the Natural, Social, Economic and Institutional Environments.

Casolani, N., Chiodo, E. and Liberatore, L. (2023), "Continuous improvement of VIVA-Certified wines: analysis and perspective of greenhouse gas emissions", *Sustainability (Switzerland)*, Vol. 15 No. 3, p. 2349, doi: 10.3390/su15032349.

Castellini, A., Mauracher, C. and Troiano, S. (2017), "An overview of the biodynamic wine sector", *International Journal of Wine Research*, Vol. 9, pp. 9-10, doi: 10.2147/IJWR.S69126.

Castka, P. and Corbett, C.J. (2016), "Governance of eco-labels: expert opinion and media coverage", *Journal of Business Ethics*, Vol. 135 No. 2, pp. 309-326, doi: 10.1007/s10551-014-2474-3.

Chauvin, N.D., Marta, F.O., Hu, W. and Malorgio, G. (2023), "A behavioural perspective of organic wine production decisions: an application to the Spanish wine industry", *British Food Journal*, Vol. 125 No. 12, pp. 4396-4414.

Chiodo, E., Giordano, L., Tubi, J. and Salvatore, R. (2020), "Wine routes and sustainable social organization within local tourist supply: case studies of two Italian regions", *Sustainability*, Vol. 12 No. 22, p. 9388, doi: 10.3390/su12229388.

Chrysochou, P., Krystallis, A. and Giraud, G. (2012), "Quality assurance labels as drivers of customer loyalty in the case of traditional food products", *Food Quality and Preference*, Vol. 25 No. 2, pp. 156-162, doi: 10.1016/j.foodqual.2012.02.013.

Churchill, G.A. (1979), "A paradigm for developing better measures of marketing constructs", *Journal of Marketing Research*, Vol. 16 No. 1, pp. 64-73.

Colombini, D.C. (2015), "Wine tourism in Italy", *International Journal of Wine Research*, Vol. 7 No. 1, pp. 29-35, doi: 10.2147/IJWR.S82688.

Corbo, C., Lamastra, L. and Capri, E. (2014), "From environmental to sustainability programs: a review of sustainability initiatives in the Italian wine sector", *Sustainability (Switzerland)*, Vol. 6 No. 4, pp. 2133-2159, doi: 10.3390/su6042133.

Cortina, J.M. (1993), "What is coefficient alpha? An examination of theory and applications", *Journal of Applied Psychology*, Vol. 78 No. 1, pp. 98-104.

Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F.N. and Leip, A. (2021), "Food systems are responsible for a third of global anthropogenic GHG emissions", *Nature Food*, Vol. 2 No. 3, pp. 198-209, doi: 10.1038/s43016-021-00225-9.

Cristiani, E. (2018), "Modelli di agricoltura 'sostenibile' con particolare attenzione al settore vitivinicolo", *Przegląd Prawa Rolnego*, Vol. 1 No. 22, pp. 133-141, doi: 10.14746/ppr.2018.22.1.9.

Csizmady, A., Csurgó, B., Kerényi, S., Balázs, A., Kocsis, V. and Palaczki, B. (2021), "Young farmers' perceptions of sustainability in a wine region in Hungary", *Land*, Vol. 10 No. 8, p. 815.

Cudeck, R. and MacCallum, R.C. (2007), *Factor Analysis at 100: Historical Developments and Future Directions*, Lawrence Erlbaum Associates, Mahwah, NJ.

D'amico, M., Di Vita, G. and Monaco, L. (2016), "Exploring environmental consciousness and consumer preferences for organic wines without sulfites", *Journal of Cleaner Production*, Vol. 120, pp. 64-71, doi: 10.1016/j.jclepro.2016.02.014.

Darnall, N., Ji, H. and Vázquez-Brust, D.A. (2018), "Third-party certification, sponsorship, and consumers' ecolabel use", *Journal of Business Ethics*, Vol. 150 No. 4, pp. 953-969, doi: 10.1007/s10551-016-3138-2.

De Steur, H., Temmerman, H., Gellynck, X. and Canavari, M. (2020), "Drivers, adoption, and evaluation of sustainability practices in Italian wine SMEs", *Business Strategy and the Environment*, Vol. 29 No. 2, pp. 744-762, doi: 10.1002/bse.2436.

Delmas, M.A. and Gergaud, O. (2021), "Sustainable practices and product quality: is there value in eco-label certification? The case of wine", *Ecological Economics*, Vol. 183, p. 106953, doi: 10.1016/j.ecolecon.2021.106953.

Delmas, M.A. and Lessem, N. (2017), "Eco-premium or eco-penalty? Eco-labels and quality in the organic wine market", *Business and Society*, Vol. 56 No. 2, pp. 318-356.

Depetris-Chauvin, N., Fernandez Olmos, M., Hu, W. and Malorgio, G. (2023), "Costs and benefits of sustainability-oriented innovation in the agri-food industry: a review", *New Medit*, Vol. 22 No. 3, pp. 23-45.

Dodds, R., Graci, S., Ko, S. and Walker, L. (2013), "What drives environmental sustainability in the New Zealand wine industry? An examination of driving factors and practices", *International Journal of Wine Business Research*, Vol. 25 No. 3, pp. 164-184, doi: 10.1108/IJWBR-2012-0015.

Easingwood, C., Lockshin, L. and Spawton, A. (2011), "The drivers of wine regionality", *Journal of Wine Research*, Vol. 22 No. 1, pp. 19-33, doi: 10.1080/09571264.2011.550759.

Eldesouky, A., Mesias, F.J. and Escribano, M. (2020), "Perception of Spanish consumers towards environmentally friendly labelling in food", *International Journal of Consumer Studies*, Vol. 44 No. 1, pp. 64-76, doi: 10.1111/ijcs.12546.

Elkington, J. (1998), "Partnerships from cannibals with forks: the triple bottom line of 21st-century business", *Environmental Quality Management*, Vol. 8 No. 1, pp. 37-51, doi: 10.1002/TQEM.3310080106.

European Commission (2021), "Commission implementing regulation (EU) 2021/2289 of 21 December 2021 laying down rules for the application of regulation (EU) 2021/2115 of the European Parliament and of the council on the presentation of the content of the CAP Strategic Plans and on the".

European Parliament (2022), "Resolution of 3 May 2022 on an EU action plan for organic agriculture [2021/2239(INI)]".

European Union (2023a), "Directive (EU) 2023/2413 of the European Parliament and of the council of 18 October 2023 amending directive (EU) 2018/2001, regulation (EU) 2018/1999 and directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing council".

European Union (2023b), "Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on European Union geographical indications for wine, spirit drinks and agricultural products, as well as traditional specialities guaranteed and optional quality terms for agricultura".

Fanasch, P. (2019), "Survival of the fittest: the impact of eco-certification and reputation on firm performance", *Business Strategy and the Environment*, Vol. 28 No. 4, pp. 611-628.

Festa, G., Shams, S.R., Metallo, G. and Cuomo, M.T. (2020), "Enhancing stakeholder networks in wine tourism – evidence from Italian small municipalities", *EuroMed Journal of Business*, Vol. 15 No. 3, pp. 349-360, doi: 10.1108/EMJB-02-2019-0027.

Flores, S.S. (2018), "What is sustainability in the wine world? A cross-country analysis of wine sustainability frameworks", *Journal of Cleaner Production*, Vol. 172, pp. 2301-2312, doi: 10.1016/j.jclepro.2017.11.181.

Forbes, S.L., Cullen, R. and Grout, R. (2013), "Adoption of environmental innovations: analysis from the Waipara wine industry", *Wine Economics and Policy*, Vol. 2 No. 1, pp. 11-18, doi: 10.1016/j.wep.2013.02.001.

Frigon, A., Doloreux, D. and Shearmur, R. (2020), "Drivers of eco-innovation and conventional innovation in the Canadian wine industry", *Journal of Cleaner Production*, Vol. 275, p. 124115, doi: 10.1016/j.jclepro.2020.124115.

Galati, A., Crescimanno, M., Tinervia, S., Iliopoulos, C. and Theodorakopoulou, I. (2017), "Internal resources as tools to increase the global competition: the Italian wine industry case", *British Food Journal*, Vol. 119 No. 11, pp. 2406-2420.

Galati, A., Schifani, G., Crescimanno, M. and Migliore, G. (2019), "'Natural wine' consumers and interest in label information: an analysis of willingness to pay in a new Italian wine market segment", *Journal of Cleaner Production*, Vol. 227, doi: 10.1016/j.jclepro.2019.04.219.

García-Cortijo, M.C., Ferrer, J.R., Castillo-Valero, J.S., Gonçalves, T., Marta-Costa, A., Pinilla, V., Rebelo, J. and Serrano, R. (2021), "Sustainability determinants in the Iberian wine industry", *New Medit*, Vol. 22 No. 4, pp. 3-22, doi: 10.30682/nm2304a.

Gastaldello, G., Livat, F. and Rossetto, L. (2022), "Does covid scare wine travelers? Evidence from France and Italy", *Wine Economics and Policy*, Vol. 11 No. 1, pp. 89-106, doi: 10.36253/wep-11550.

Gilardoni, G. (2020), '"The culture and sustainability of Italian wine: comparison between these two elements", *Economia Aziendale Online 2000 Web*, Vol. 11 No. 3, pp. 359-368, doi: 10.13132/2038-5498/11.3.359-368.

Gorsuch, R.L. (1997), "Exploratory factor analysis: its role in item analysis", *Journal of Personality Assessment*, Vol. 68 No. 3, pp. 532-560, doi: 10.1207/s15327752jpa6803_5.

Hart, S.L. (1995), "A natural-resource-based view of the firm", *The Academy of Management Review*, Vol. 20 No. 4, pp. 986-1014.

Hauck, K., Szolnoki, G. and Pabst, E. (2021), "Motivation factors for organic wines: an analysis from the perspective of German producers and retailers", *Wine Economics and Policy*, Vol. 10 No. 2, pp. 61-74, doi: 10.36253/wep-9893.

Heckman, J.J. (2010), "Selection bias and self-selection", in Durlauf, S.N. and Blume, L.E. (Eds), *Micro Econometrics*, The New Palgrave Economics Collection, Palgrave Macmillan, London, doi: 10.1057/9780230280816_29.

Hinkin, T.R. (1998), "A brief tutorial on the development of measures for use in survey questionnaires", *Organizational Research Methods*, Vol. 1 No. 1, pp. 104-121.

Ingrassia, M., Chironi, S., Lo Grasso, G., Gristina, L., Francesca, N., Bacarella, S., Columba, P. and Altamore, L. (2022), "Is environmental sustainability also 'economically efficient'? The case of the 'SOStain' certification for Sicilian sparkling wines", *Sustainability*, Vol. 14 No. 12, p. 7359, doi: 10.3390/su14127359.

Kemp, R. and Pearson, P. (2007), "Final report MEI project about measuring eco-innovation", *UM Merit, Maastricht*, Vol. 32 No. 3, pp. 121-124.

Lebacq, T., Baret, P.V. and Stilmant, D. (2013), "Sustainability indicators for livestock farming: a review", *Agronomy for Sustainable Development*, Vol. 33 No. 2, pp. 311-327, doi: 10.1007/s13593-012-0121-x.

Lofrano, G. and Meric, S. (2016), "A comprehensive approach to winery wastewater treatment: a review of the state-of the-art", *Desalination and Water Treatment*, Vol. 57 No. 7, pp. 3011-3028, doi: 10.1080/19443994.2014.982196.

Maghssudipour, A., Lazzeretti, L. and Capone, F. (2020), "The role of multiple ties in knowledge networks: complementarity in the Montefalco wine Cluster", *Industrial Marketing Management*, Vol. 90, pp. 667-678, doi: 10.1016/j.indmarman.2020.03.021.

Maicas, S. and Mateo, J.J. (2020), "Sustainability of wine production", *Sustainability (Switzerland)*, Vol. 12 No. 2, p. 559, doi: 10.3390/su12020559.

Malorgio, G., Camanzi, L. and Grazia, C. (2008), "Geographical indications and international trade: evidence from the wine market", *New Medit*, Vol. 7 No. 3, pp. 4-13.

Marco-Lajara, B., Martínez-Falcó, J., Millan-Tudela, L.A. and Sánchez-García, E. (2023), "Analysis of the structure of scientific knowledge on wine tourism: a bibliometric analysis", *Helyon*.

Mariani, A. and Vastola, A. (2015), "Sustainable winegrowing: current perspectives", *International Journal of Wine Research*, pp. 37-48, doi: 10.2147/IJWR.S68003.

Marola, E., Schöpfner, J., Gallemore, C. and Jespersen, K. (2020), "The bandwidth problem in telecoupled systems governance: certifying sustainable winemaking in Australia and Chile", *Ecological Economics*, Vol. 171, p. 106592.

Martucci, O., Arcese, G., Montauti, C. and Acampora, A. (2019), "Social aspects in the wine sector: comparison between social life cycle assessment and VIVA sustainable wine project indicators", *Resources*, Vol. 8 No. 2, p. 69, doi: 10.3390/resources8020069.

Mastroberardino, P., Calabrese, G., Cortese, F. and Petracca, M. (2020), "Sustainability in the wine sector. An empirical analysis of the level of awareness and perception among the Italian consumers", *British Food Journal*, Vol. 122 No. 8, pp. 2497-2511, doi: 10.1108/BFJ-07-2019-0475.

Merli, R., Preziosi, M. and Acampora, A. (2018), "Sustainability experiences in the wine sector: toward the development of an international indicators system", *Journal of Cleaner Production*, Vol. 172, pp. 3791-3805, doi: 10.1016/j.jclepro.2017.06.129.

Montaigne, E. and Coelho, A. (2012), "Structure of the producing side of the wine industry: firm typologies, networks of firms and clusters", *Wine Economics and Policy*, Vol. 1 No. 1, pp. 41-53, doi: 10.1016/j.wep.2012.12.002.

Montalvo-Falcón, J.V., Sánchez-García, E., Marco-Lajara, B. and Martínez-Falcó, J. (2023), "Sustainability research in the wine industry: a bibliometric approach", *Agronomy*, Vol. 13 No. 3, p. 871.

Moscovici, D. and Reed, A. (2018), "Comparing wine sustainability certifications around the world: history, status and opportunity", *Journal of Wine Research*, Vol. 29 No. 1, pp. 1-25, doi: 10.1080/09571264.2018.1433138.

Moscovici, D., Rezwanul, R., Mihailescu, R., Gow, J., Ugaglia, A. A., Valenzuela, L. and Rinaldi, A. (2021), "Preferences for eco certified wines in the United States", *International Journal of Wine Business Research*, Vol. 33 No. 2, pp. 153-175, doi: 10.1108/IJWBR-04-2020-0012.

Mosgaard, M.A. and Kristensen, H.S. (2023), "From certified environmental management to certified SDG management: new sustainability perceptions and practices", *Sustainable Futures*, Vol. 6, p. 100144, doi: 10.1016/j.sftr.2023.100144.

Muscio, A., Nardone, G. and Stasi, A. (2013), "Drivers of eco-innovation in the Italian wine industry", Proceedings of the 6th International European Forum on System Dynamics and Innovation in Food Networks, Universität Bonn-ILB Press, *Bonn*.

Neumayr, L. and Moosauer, C. (2021), "How to induce sales of sustainable and organic food: the case of a traffic light eco-label in online grocery shopping", *Journal of Cleaner Production*, Vol. 328, p. 129584, doi: 10.1016/j.jclepro.2021.129584.

Nomisma (2023), "Bio Italiano: +9% le vendite sul mercato interno e +8% l'export rispetto al 2022", available at: www.nomisma.it/press-area/comunicato-stampa-sana-2023/

Nuttavuthisit, K. and Thøgersen, J. (2017), "The importance of consumer trust for the emergence of a market for green products: the case of organic food", *Journal of Business Ethics*, Vol. 140 No. 2, pp. 323-337, doi: 10.1007/s10551-015-2690-5.

OIV (2021), "Focus OIV: the World Organic Vineyard", available at: www.oiv.int/public/medias/8514/en-focus-the-world-organic-vineyard.pdf

Péti, M. (2012), "A territorial understanding of sustainability in public development", *Environmental Impact Assessment Review*, Vol. 32 No. 1, pp. 61-73, doi: 10.1016/j.eiar.2011.03.004.

Piracci, G., Boncinelli, F. and Casini, L. (2022), "Wine consumers' demand for social sustainability labeling: evidence for the fair labor claim", *Applied Economic Perspectives and Policy*, Vol. 44 No. 4, pp. 1742-1761, doi: 10.1002/aepp.13260.

Point, E., Tyedmers, P. and Naugler, C. (2012), "Life cycle environmental impacts of wine production and consumption in Nova Scotia, Canada", *Journal of Cleaner Production*, Vol. 27, pp. 11-20, doi: 10.1016/j.jclepro.2011.12.035.

Pomarici, E. and Sardone, R. (2020), "EU wine policy in the framework of the CAP: post-2020 challenges", *Agricultural and Food Economics*, Vol. 8 No. 1, pp. 1-40.

Pomarici, E., Vecchio, R. and Mariani, A. (2015), "Wineries' perception of sustainability costs and benefits: an exploratory study in California", *Sustainability (Switzerland)*, Vol. 7 No. 12, pp. 16164-16174, doi: 10.3390/su71215806.

Poppe, K and Koutstaal, H. (2020), "Eco-schemes and private sustainability initiatives: creating synergies", *EuroChoices*, Vol. 19 No. 1, pp. 36-40.

Pomarici, E., Amato, M. and Vecchio, R. (2016), "Environmental friendly wines: a consumer segmentation study", *Agriculture and Agricultural Science Procedia*, Vol. 8, pp. 534-541, doi: 10.1016/j.aaspro.2016.02.067.

Porter, M.E. and Van Der Linde, C. (1995), "Green and competitive: ending the stalemate Harvard business review".

Porter, M.E. and Kramer, M.R. (2011), "Creating shared value: redefining capitalism and the role of the corporation in society", *Harvard Business Review*, Vol. 89 Nos 1/2, pp. 62-77.

Potter, C., Bastounis, A., Hartmann Boyce, J., Stewart, C., Frie, K., Tudor, K., Bianchi, F., Cartwright, E., Cook, B., Rayner, M. and Jebb, S.A. (2021), "The effects of environmental sustainability labels on selection, purchase, and consumption of food and drink products: a systematic review", *Environment and Behavior*, Vol. 53 No. 8, pp. 891-925, doi: 10.1177/0013916521995473.

Pullman, M.E., Maloni, M.J. and Dillard, J. (2010), "Sustainability practices in food supply chains: how is wine different?", *Journal of Wine Research*, Vol. 21 No. 1, pp. 35-56, doi: 10.1080/09571264.2010.495853.

Recanati, F., Maughan, C., Pedrotti, M., Dembska, K. and Antonelli, M. (2019), "Assessing the role of CAP for more sustainable and healthier food systems in Europe: a literature review", *Science of The Total Environment*, Vol. 653, pp. 908-919, doi: 10.1016/j.scitotenv.2018.10.377.

Rocchi, B. and Gabbai, M. (2013), "Territorial identity as a competitive advantage in wine marketing: a case study", *Journal of Wine Research*, Vol. 24 No. 4, pp. 291-310, doi: 10.1080/09571264.2013.837382.

Rugani, B. and Lamastra, L. (2023), "A common framework for sustainability indicators in the wine sector: dream or reality?", *Current Opinion in Environmental Science and Health*, Vol. 31, p. 100408, doi: 10.1016/j.coesh.2022.100408.

Ruggeri, G., Corsi, S. and Mazzocchi, C. (2023), "A bibliometric analysis of wine economics and business research: insights, trends, and future directions", *International Journal of Wine Business Research*, Vol. 36 No. 1, pp. 14-39, doi: 10.1108/IJWBR-06-2023-0032.

Ruiz Pulpón, Á.R. and Cañizares Ruiz, MdC. (2022), "Intangible heritage and territorial identity in the multifunctional agrarian systems of vineyards in castilla-la mancha (Spain)", *Land*, Vol. 11 No. 2, p. 281.

Santini, C., Cavicchi, A. and Casini, L. (2013), "Sustainability in the wine industry: key questions and research trends", *Agricultural and Food Economics*, Vol. 1 No. 1, pp. 1-14.

Sardone, R., De Leo, S., Longhitano, D. and Henke, R. (2023), "The new CAP and the challenge of sustainability: a synthetic indicator for the Italian wine sector", *Wine Economics and Policy*, Vol. 12 No. 1, pp. 63-80.

Schäufele, I. and Hamm, U. (2017), "Consumers' perceptions, preferences and willingness-to-pay for wine with sustainability characteristics: a review", *Journal of Cleaner Production*, Vol. 147, pp. 379-394, doi: 10.1016/j.jclepro.2017.01.118.

Schimmenti, E., Migliore, G., Di Franco, C. P. and Borsellino, V. (2016), "Is there sustainable entrepreneurship in the wine industry? Exploring Sicilian wineries participating in the SOStain program", *Wine Economics and Policy*, Vol. 5 No. 1, pp. 14-23, doi: 10.1016/j.wep.2016.05.001.

Sedita, S.R., Hoffmann, V.E., Guarnieri, P. and Toso Carraro, E. (2021), "Prosecco has another story to tell: the coexistence of multiple knowledge networks in the same value chain", *International Journal of Wine Business Research*, Vol. 33 No. 4, pp. 502-522, doi: 10.1108/IJWBR-06-2020-0024.

Sellers-Rubio, R. and Nicolau-Gonzalbez, J.L. (2016), "Estimating the willingness to pay for a sustainable wine using a Heckit model", *Wine Economics and Policy*, Vol. 5 No. 2, pp. 96-104, doi: 10.1016/j.wep.2016.09.002.

Sgroi, F. and Modica, F. (2022), "Localized agri-food systems: the case of Pecorino Siciliano PDO a food product of the tradition of Mediterranean gastronomy", *International Journal of Gastronomy and Food Science*, Vol. 27, p. 100471, doi: 10.1016/j.ijgfs.2022.100471.

Sgroi, F., Maenza, L. and Modica, F. (2023), "Exploring consumer behavior and willingness to pay regarding sustainable wine certification", *Journal of Agriculture and Food Research*, Vol. 14, p. 100681, doi: 10.1016/j.jafr.2023.100681.

Shi, J., Yang, D., Zheng, Z. and Zhu, Y. (2022), "Strategic investment for green product development and green marketing in a supply chain", *Journal of Cleaner Production*, Vol. 366, p. 132868, doi: 10.1016/j.jclepro.2022.132868.

Siepmann, L. and Nicholas, K.A. (2018), "German winegrowers' motives and barriers to convert to organic farming", *Sustainability (Switzerland)*, Vol. 10 No. 11, pp. 1-17, doi: 10.3390/su10114215.

Signori, P., Flint, D.J. and Golicic, S.L. (2017), "Constrained innovation on sustainability in the global wine industry", *Journal of Wine Research*, Vol. 28 No. 2, pp. 71-90, doi: 10.1080/09571264.2017.1302413.

Silva Barbosa, F., Scavarda, A.J., Sellitto, M.A. and Marques, D.I.L. (2018), "Sustainability in the winemaking industry: an analysis of Southern Brazilian companies based on a literature review", *Journal of Cleaner Production*, Vol. 192, pp. 80-87, doi: 10.1016/j.jclepro.2018.04.253.

Simeone, M., Traill, W.B. and Russo, C. (2017), "New dimensions of market power and bargaining in the agri-food sector: organisations, policies and models", *British Food Journal*, Vol. 119 No. 8, pp. 1650-1655.

Simpfendörfer, C. and Fischer, S. (2022), "Statistics of the biodynamic federation Demeter international", *The World of Organic Agriculture*, Bonn, pp. 133-137.

Sinha, P. and Akoorie, M.E.M. (2010), "Sustainable environmental practices in the New Zealand wine industry: an analysis of perceived institutional pressures and the role of exports", *Journal of Asia-Pacific Business*, Vol. 11 No. 1, pp. 50-74, doi: 10.1080/10599230903520186.

Sogari, G., Mora, C. and Menozzi, D. (2016), "Factors driving sustainable choice: the case of wine", *British Food Journal*, Vol. 118 No. 3, pp. 632-646.

Spielmann, N. (2017), "Larger and better examining how winery size and foreign investments interact with sustainability attitudes and practices", *International Journal of Wine Business Research*, Vol. 29 No. 2, pp. 178-194, doi: 10.1108/IJWBR-10-2016-0036.

Stranieri, S., Varacca, A., Casati, M., Capri, E. and Soregaroli, C. (2022), "Adopting environmentally-friendly certifications: transaction cost and capabilities perspectives within the Italian wine supply chain", *Supply Chain Management: An International Journal*, Vol. 27 No. 7, pp. 33-48, doi: 10.1108/SCM-12-2020-0598.

Svanidze, A. and Costa-Font, M. (2023), "Revealing the challenges facing Georgia's wine industry from a natural winemaker perspective using Q-methodology", *International Journal of Wine Business Research*, Vol. 35 No. 1, pp. 89-120, doi: 10.1108/IJWBR-06-2021-0036.

Szolnoki, G. (2013), "A cross-national comparison of sustainability in the wine industry", *Journal of Cleaner Production*, Vol. 53, pp. 243-251, doi: 10.1016/j.jclepro.2013.03.045.

Tinsley, H.E. and Tinsley, D.J. (1987), "Uses of factor analysis in counseling psychology research", *Journal of Counseling Psychology*, Vol. 34 No. 4, pp. 414-424.

Van Cauwenbergh, N., Biala, K., Bielders, C., Brouckaert, V., Franchois, L., Garcia Cidad, V., Hermy, D., Mathijs, E., Muys, B., Reijnders, J., Sauvenier, X., Valckx, J., Vanclooster, M., Van der Veken, B., Wauters, E. and Peeters, A. (2007), "SAFE-A hierarchical framework for assessing the sustainability of agricultural systems", *Agriculture, Ecosystems and Environment*, Vol. 120 Nos 2/4, pp. 229-242, doi: 10.1016/j.agee.2006.09.006.

Vecchio, R., Annunziata, A., Parga Dans, E. and Alonso González, P. (2023), "Drivers of consumer willingness to pay for sustainable wines: natural, biodynamic, and organic", *Organic Agriculture*, Vol. 13 No. 2, pp. 247-260, doi: 10.1007/s13165-023-00425-6.

Warner, K.D. (2007), "The quality of sustainability: agroecological partnerships and the geographic branding of California Winegrapes", *Journal of Rural Studies*, Vol. 23 No. 2, pp. 142-155.

Wine News (2019), "If Italy turns out to be greener: 300,000 companies invested in the green economy in 2019", available at: https://winenews.it/en/if-italy-turns-out-to-be-greener-300000-companies-invested-in-the-green-economy-in-2019_402366/

Winkler, K.J., Viers, J.H. and Nicholas, K.A. (2017), "Assessing ecosystem services and multifunctionality for vineyard systems", *Frontiers in Environmental Science*, Vol. 5, p. 15, doi: 10.3389/fenvs.2017.00015.

Supplementary material

The supplementary material for this article can be found online.

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