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What's in organic wine consumer mind? A review on purchasing drivers of organic wines

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Abstract. Consumer interest in organic wine is growing, but the effects of organic label, consumer quality perception and the support for the benefits claim of organic wine are not yet fully understood and at times doubtful. The literature shows a very heterogeneous picture regarding consumer behaviour and preferences for organic wine. This study seeks to understand the link between organic wine and consumer' purchasing drivers. Using a systematic literature review, the paper explores the characteristics of consumer of organic wine, the motivation on consumer behaviour and preferences for organic wine, as well as the sensory quality and the presence of additives when evaluating wine quality and in shaping consumers' attitudes. The results show how socio-economic and psychological characteristics of consumer as well as quality perception affect their behaviour for organic wine. Little consensus on the benefits in terms of improved sensory quality of organic wine compared to conventional one. Among sensory qualities, taste has been found to be both a key driver and barrier to organic wine consumption. Based on literature studies, consumers have positive opinions toward organic wine, which is perceived as healthy and environmental friendly. However, despite the growing market interest in wine, scientific information about the organoleptic differences between conventional and organic remains scarce and the topic requires more in-depth analysis. Understanding the profile of consumer and the factors that influence consumer' behaviour provide information to the organic wine industry.

Keywords: organic wine, consumer behaviour, taste, sensory quality, wine additive, sustainability, wtp.

1. INTRODUCTION

Consumer demands for safer, better quality, and healthier foods has led to an increased demand for organic products [1].

The belief that organic products provide benefits for health [2,3], environment [4,5,6] and the high quality standards, such as better taste, are positively related to the attitude towards organic wine [7,8,9]. However, the sup-

port for the benefits claim for organic wines is not yet fully understood and at times doubtful in the literature.

Studies comparing organic and conventional wine show that positive attitudes and buying intentions consumers have about organic food in general do not seem to extend to organic wine. Interestingly, a study on wine consumption identified different consumer segments with preferences for organic food, but heterogeneous preferences for organic wine [9]. In line of this, in the survey of Janssen et al. [10] a quarter of the organic food consumers declared to not buy organic wine and may willing to buy more organic wine if their favourite type and variety of conventional wine would be available in organic production at similar quality and price levels [10].

The organic label on wine has been associated with a lower quality product, which is the reason why consumers tend to prefer organic wine to the conventional equivalents at lower prices [11]. Olsen et al. [12] provide possible explanations for consumers' resistance to purchasing organic wine showing that wine is primarily associated with sensory quality, which is the main feature underlying wine consumption [13].

Nowadays, even if there is the image of organic wines has improved, an important obstacle to its consumption is still the bad reputation linked to the wine taste [13,14].

From producer's point of view, because of the lack of clarity on the value added by organic method production and relative label, some wineries currently adopt organic practices without being certified. According to Delmas and Grant [14] some American organically wine-makers do not use organic label on the bottle or become certified but do not provide the information on their bottle label. The reason could be that most of these wineries think that there is a negative image linked to lower sensory quality, associated with organic wine. Also in Australian market the organic attribute receives a low value by the so-called "average Australian wine consumer" not willing to pay premiums for it [15,16]. Australians consumers do not value organic products in general, more than conventional ones and are not willing to pay more for sustainability features [17].

Despite the relatively low weight of organic wine in the overall wine market, many consumer studies identified the potential for increasing organic wine purchases [18].

In light of contrasting empirical findings on consumer perceptions of organic wine, there is an on-going debate about growth potential of organic wine. As a consequence, by examining the existing literature on preference's and consumers' behaviour that characterize the organic wine demand, we investigate the role that socio-demographic characteristics, motivations, beliefs, sensory features and wine additives play in directing consumer choices towards organic wines.

The objectives of the study therefore are: (1) to identify the socio-demographic characteristics of organic wine consumers trying to detect their profile; (2) to understand the drivers and motivations on consumer behaviour and preferences for organic wine; and (3) to determine consumer perception when evaluating sensory quality of organic wine and in shaping consumers' attitudes.

This study would contribute to further understanding of wine consumers in relation to their preferences and perception of organic wine. The aim of the paper is to generate a set of findings regarding consumer behaviour towards organic wines in order to provide a brief summary of the current literature on this topic.

The paper explores the characteristics of consumer of organic wine, the motivation on consumer behaviour and preferences for organic wine, as well as the sensory quality and the presence of additives when evaluating wine quality and in shaping consumers' attitudes in order to solve the gap in the economic literature. Understanding the profile of consumers and the factors that influence consumer' behaviour provide information to the organic wine industry.

2. METHODOLOGY

The review was carried out in order to select studies and to summarize the literature about consumer preferences, purchasing behaviour, willingness to pay and quality perception towards organic wine.

The review followed a detailed and replicable protocol [19]. A flow chart is provided in Figure 1. The review was carried out following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) [20,21,22].

Data were collected using the main scientific/economic electronic research databases. The literature searching was conducted in the on-line scientific database: Google Scholar, Web of Science, Scopus, and Science Direct in order to include the relevant literature [20].

The search was carried out from April to June 2020, and it included studies that were conducted after 2004, which was considered to be a suitable range for including the recent trends on the topic under investigation and to avoid outdate articles. We finished the search on the 3th of June 2020.

The keywords used in this searching method, combined with the word "wine" and "organic", were the following: "preferences", "perception", "consumers", "con-

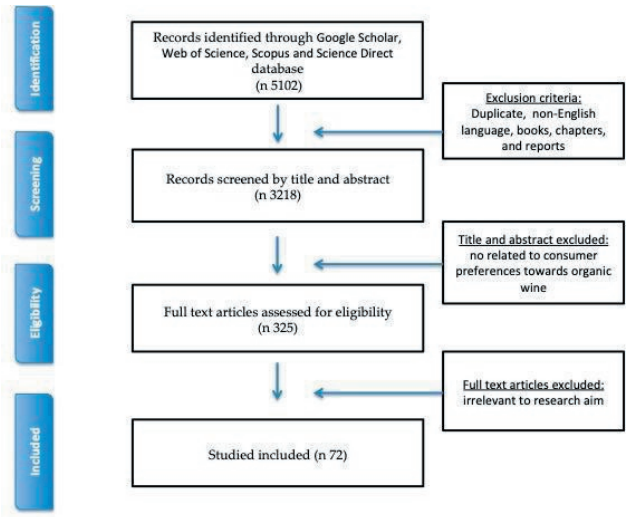

Figure 1. Flow chart diagram visualizing the database literature searching procedure. The exclusion criteria are indicated. Source: prepared by authors for use in this investigation.

sumption", "attitudes", "behaviour", "willingness to pay", "motivation", "choices", "attributes", "label" "taste". The first keywords were used to limit the search to studies that consider organic wine, while the second group to identify the studies based on consumer behaviour analysis and preferences.

Only research papers written in English were included in the database in order to delimit the literature characterized by high visibility within the scientific community.

Because of the problems of availability and readability for some related literature, it is hard to include all studies in this field.

Figure 1 shows a flowchart of the database searches and the exclusion criteria followed. The search initially produced a total of 5102 records.

The screening process for the selection of relevant literature was conducted in two stages: Screening and Eligibility [21,22].

In the Screening phase, the selected papers were examined and the number decreased to 3218 by applying the primary exclusion criteria. Only articles written in

Table 1. Attributes related to organic wine chosen for the review.

Variable	Reference
Consumer behaviour and preferences	Chinnici et al. [23]; McEachern and McClean [24]; Fotopoulos et al. [25]; Loureiro [26]; Chang and Zepeda [27]; Poveda et al. [28]; Krystallis et al. [29]; Olsen et al. [12]; Bazoche et al. [30]; Bernabeu et al. [31]; Remaud et al. [15]; Stolz and Schmid [13]; Barber et al. [32], Forbes et al. [33]; Zepeda and Deal [34]; Barber et al. [35]; Brugarolas et al. [2]; Mueller and Remaud [36]; Siriex and Remaud [16]; Chiodo et al. [37]; Mann et al. [3]; Olsen et al. [38]; Barber and Taylor [39]; Corsi and Strøm [40]; Loose and Lockshin [41]; Loose and Remaud [42]; Pagliarini et al. [43]; Vecchio [44]; Ay et al. [45]; Costanigro et al. [46]; Pomarici and Vecchio [47]; Rahman et al. [48]; Wiedmann et al. [7]; Bazoche et al. [49]; Kim and Bonn [50]; Ogbeide [51]; Rojas-Méndez, et al. [52]; Saltman, et al. [53]; van Tonder and Mulder [54]; Bonn et al. [4]; D'Amico et al. [5]; Delmas et al. [55]; Pomarici et al. [56]; Sellers [57]; Sogari et al. [8]; Abraben et al. [58]; Amato et al. [59]; Seralini and Douzelet [60]; Deneulin and Dupraz [61]; Espinoza et al. [62]; Pomarici et al. [63]; Sarabia-Andreu and Sarabia-Sánchez [64]; Schäufele et al. [9]; Capitello and Sirieix [65]; Di Vita et al. [66]; Dominici et al. [67]; Gassler et al. [68]; Mauracher et al. [69]; Rahmani et al. [70]; Séralini, et al. [71]; Streletskaya et al. [72]; Janssen et al. [10]; Jorge et al. [73]; Lim et al. [74]; Sohn, et al. [75]; Szolnok, et al. [76]; Taghikhah et al. [77].
Purchasing Motivation	Chinnici et al. [23]; McEachern and McClean [24]; Fotopoulos et al. [25]; Chang and Zepeda [27]; Poveda et al. [28]; Olsen et al. [12]; Bazoche et al. [30]; Bernabeu et al. [31]; Stolz and Schmid [13]; Barber et al. [32]; Forbes et al. [33]; Zepeda and Deal [34]; Barber et al. [35]; Brugarolas et al. [2]; Siriex and Remaud [16]; Mann et al. [3]; Olsen et al. [38]; Barber and Taylor [39]; Rahman et al. [48]; Wiedmann et al. [7]; Bazoche et al. [49]; Kim and Bonn [50]; Rojas-Méndez et al. [52]; Bonn et al. [4]; D'Amico et al. [5]; Pomarici et al. [56]; Sogari et al. [8]; Pomarici et al. [63]; Schäufele et al. [9]; Capitello and Sirieix [65]; Di Vita et al. [66]; Dominici et al. [67]; Gassler et al. [68]; Rahmani et al. [70]; Janssen et al. [10]; Jorge, et al. [73].
Sensory quality perception	Loureiro [26]; Stolz and Schmid [13]; Forbes et al. [33]; Siriex and Remaud [16]; Mann et al. [3]; Loose and Lockshin [41]; Pagliarini et al. [43]; Delmas and Grant [14]; Rahman et al. [48]; Wiedmann et al. [7]; Garaguso and Nardini [78]; Kim and Bonn [50]; Ogbeide [51]; Delmas et al. [55]; Abraben et al. [58]; Seralini and Douzelet [60]; Espinoza et al. [62]; Gassler et al. [68]; Séralini, et al. [71].
Willingness to pay	Deneulin and Dupraz [61]; Loureiro [26]; Poveda et al. [28]; Krystallis et al. [29]; Bazoche et al. [30]; Remaud et al. [15]; Forbes et al. [33]; Barber et al. [35]; Brugarolas et al. [2]; Mann et al. [3]; Olsen et al. [38]; Corsi and Strøm [40]; Loose and Lockshin [41]; Loose and Remaud [42]; Pagliarini et al. [43]; Vecchio [44]; Ay et al. [45]; Costanigro et al. [46]; Pomarici and Vecchio [47]; Wiedmann et al. [7]; Ogbeide [51]; D'Amico et al. [5]; Pomarici et al. [56]; Sellers [57]; Sogari et al. [8]; Abraben et al. [58]; Amato et al. [59]; Espinoza et al. [62]; Pomarici et al. [63]; Schäufele et al. [9]; Di Vita et al. [66]; Gassler et al. [68]; Mauracher et al. [69]; Rahmani et al. [70]; Streletskaya et al. [72]; Jorge et al. [73]; Lim et al. [74].

Source: prepared by authors for use in this investigation.

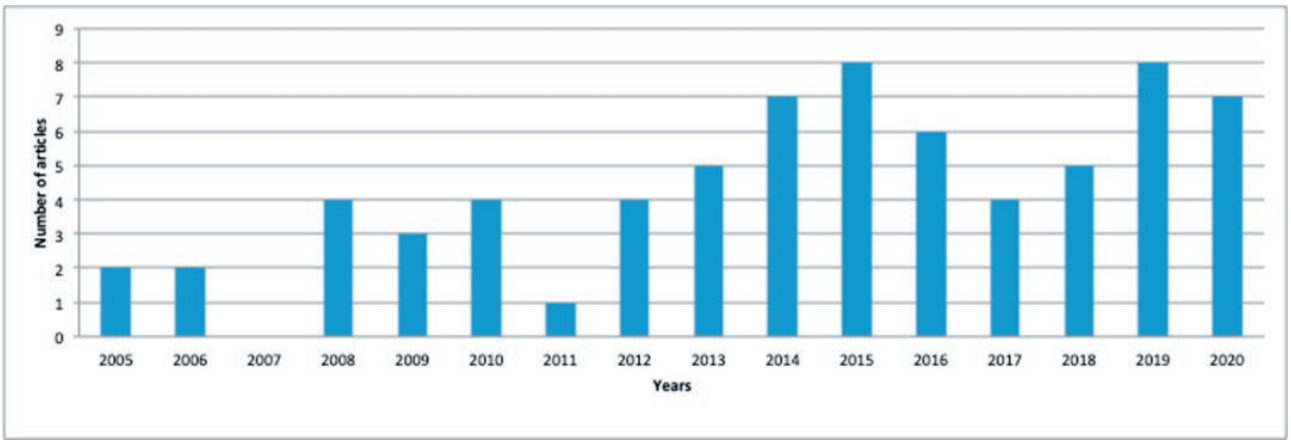

Figure 2. Numbers of articles per year (2005–2020). Source: prepared by authors for use in this investigation.

English were included in this study [21]. Duplicates from different databases were excluded at this stage.

In the Eligibility phase, articles were selected based on information in the title and then in the abstract [21,22]. The examination of the title and abstract led to the elimination of several articles that were not focused on consumer behaviour or not focused on consumer behaviour in relation to organic wine. In this stage, the number of papers was reduced to 325.

Subsequently, in the Inclusion phase, each paper was further reviewed based on the information contained in the full text in order to decide whether each study meets the eligibility criteria for the purpose of this review [21].

Finally, after excluding irrelevant articles based on their objectives, a sample of 72 articles was selected to respond to our research question in the categorization and analysis stage.

2.1. Overview of selected studies

The final set of articles was divided in four sections, according to the core-investigated topic (Table 1):

- Consumer behaviour and preferences (n = 67)
- Purchasing Motivation (n = 36)
- Willingness to pay (n = 37)
- Studies on organic wine sensory quality (n = 19). Within this section, two sub-sections were found with articles that dealt specifically with taste and sensory quality perception and additive wine perception.

A total number of 72 articles were selected as suitable for the literature review. Several articles investigated more than one topic. Therefore, the sum of the figures is greater than 72.

Figure 2 describes the temporal distribution per year of the reviewed articles from 2005 to 2020. Although the total number of articles was quite limited, there was an increasing trend of papers published in the latest years. This attests the growing attention toward the topic under investigation in this review. Nevertheless, the relative small number of articles demonstrates the need for further research on specific issues that will hereby be presented.

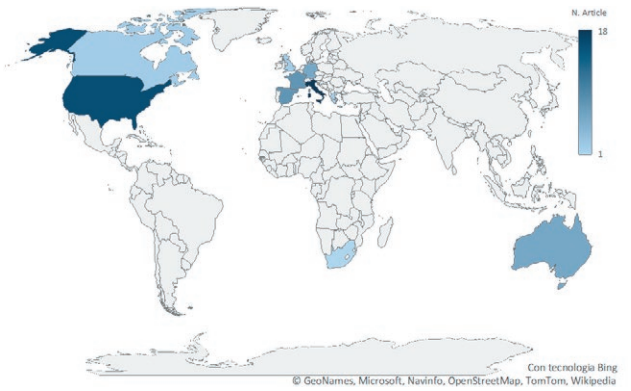

Figure 3. Area where the selected studies were conducted. Source: prepared by authors for use in this investigation.

The studies analyzed in this review were carried out worldwide. Figure 3 shows an overview of the countries where the selected studies were carried out: 48 studies were from in European countries, including Italy (18), France (8), Germany (6), Spain (8), Switzerland (4), the United Kingdom (2) and Greece (2); 16 studies were conducted in the USA; and the rest were from Canada (2) and South Africa (1).

Several articles investigated more than one Country. Therefore, the sum of the figures is greater than 72.

3. RESULTS

3.1. Socio-demographic characteristics

Gender

As occurred for organic products in general, previous research shows also for wine the relevance of gender in buying organic, highlighting that women are more organic wine-sensitive than man [3]. In addition, also a high WTP may be due to a gender status: women tend to pay more attention to such products compared to men [36,35,26,3,44,47,57]. Controversy, D'Amico et al. [5] and another study carried out by Di Vita et al. [66] found that Italian women are those less willing to spend a large amount of money for organic wine.

Age

There are lots of early studies on the age influence consumer's organic attitude and behaviour by different researchers. Most of them are likely to support the statement that - younger individuals are likely to be more sensitive to environmental issues [31,8,69]. However, despite being interested in eco-friendly practices might not have a financial budget to buy organic products, which are considered more expensive [3,8]. Conversely, other research shows that being older significantly increases the probability of buying organic wines and a high WTP [44,47,57,63].

Education

Level of education is another demographic variable positively correlating with organic attitudes. The positive relationship has been identified by large amount of previous studies [79,80]. Based on studies carried out by Diamoantopoulos et al. [81], consumers with high level of education are expected to have much clearer and full perspective understanding on ecological issues. In addition, a high level of information regarding wine in general, but also specific claim for the sustainability of the wine, led consumers to prefer organic wine [3].

Income

Income is another social-demographic variable affecting organic attitudes and behaviours described by Straughan and Roberts [82]. They pointed a common belief: the higher income level the person has, the more he/she is likely to support organic food purchasing.

Besides, as one of social-demographic factors, income is usually taken as a predictor of sustainable behaviour [82]. Schäufele and Hamm [9] demonstrated that the German attitude consumers buying organic wines are in line with their real behaviour. However, the higher price of these products is an obstacle for some low-income consumer segments. According to these findings, high WTP may be due to a higher household income [26,56,57,9]. However, D'Amico et al. [5] did not found this correlation.

3.2. Value and Belief

Environmental concerns

Consumers with an environmental orientation show a better willingness to buy organic wine [28,32,39] and are more likely to pay higher price premium [35,38,5,8]. Consumers who had the highest expenditure share for organic wine showed strong pro-environmental attitudes and a preference for sustainable products [18].

The analysis conducted by Pomarici et al. [56] on Italian wine consumers revealed an interest in eco-friendly wine and the demand to preserve natural resources and reduce water consumption when producing wine. In addition, consumers with a higher interest in environmentally friendly wines spent more for wines consumed at home and the consumer segment with a low involvement in environmentally friendly wines was mainly focused on the price when it comes to wine choice [56].

A study carried out by Schäufele and Hamm [18] indicated that ethically concerned wine consumers accounted for 35% of all German wine-purchasing households. However, only 21% showed a relatively high level of action when it came to environmentally conscious wine purchase behaviour. The rest of the ethically concerned wine consumers were indeed sustainably oriented, but did not convert these attitudes into actual purchase behaviour, probably because of the so-called "price barrier".

Controversy, in some studies, environmental concerns do not appear to be good predictors of attitude toward organic wine [52] and consumers' perception of environmental friendliness had neither an effect on the purchase of organic wine [3,50] nor on the consumption of organic wine [3], nor on the preference for organic wine [48]. The authors explain these results with an absence of trust in the organic label or a lack of information regarding organic certification. That's because wine follows different trends and mechanism compared to other organic food products.

Studies show that some consumers have a low involvement and interest in sustainability issues and very low WTP for eco wine. They consider price the only important attribute for their purchasing decision [31] and do not consider an eco-label as a strong element of differentiation and they identify these wines with a low overall quality [26]. In a study conducted by Bazoche

et al. [30] it seems that some consumers are not willing to pay any price premium for environmental benefit of sustainable wine even when they are informed about the possible negative effects of pesticides used in the wine-growing process and think that sustainability issues do not concern the wine industry.

Healthy concern

Studies demonstrate that organic grapevines suffer more biotic stresses than conventional one and therefore produce higher amounts of secondary metabolites, such as phenolic compounds [83]. Higher amounts of phenolic compounds or other health-related compounds in organic wine comply with consumer perception that these products are healthier. Nevertheless, such trends are still not fully demonstrated [84,85,83].

According to literature [32,52], organic wines are perceived to be healthier and with lower amounts of pesticide than conventional wine. Many studies in the literature compare the health properties of organic and conventional wine [85,86,87]. However, these studies showed little or no significant differences between organic and conventional products.

Positive health effects are strong determining factor in organic wine preferences [7,4]. Perceiving organic wine as healthier than other wines was the best predictor for Swiss consumers' choice of organic wine [3]. Even for Greek organic food buyers, the organic label had a health-related aspect and was found very important in purchasing wine [25]. Moreover, consumers with a healthy life style are willing to pay a higher price for an organic wine [28].

In studies performed by McEachern and McClean [24], Stolz and Schmid [13], and later by Sirieix and Remaud [16], organic wine was perceived to be healthier than conventional wine, mainly due to the absence of synthetic pesticides and additives in the winemaking process. However, the authors found that organic wines still face some problems in terms of sensory perception.

Jorge et al. [73] studied the role of consumer tolerance of ambiguity in explaining organic wine purchase behaviour, showing that the positive influence of consumers' healthy attitude on their willingness to pay for organic wine is weak in individuals less tolerant of ambiguity. Evidence shows that positive consumer attitudes are not always reflected in their willingness to pay for organic wine.

Geographical and local origin

Geographical origin has been indicated as important purchasing criteria in wine consumption [5] and its role has discussed by several authors of consumer studies showing that origin attribute was more important purchase criteria than production method [31,37,3,10].

The study carried out by Mann, et al. [3] on Swiss consumers revealed that the country of origin attribute was more important than the organic attribute in wine chose [3]. Also for 'Protected Designation of Origin' (PDO) label was considered more important than production method (organic or conventional) since it was the most important attribute in wine choice. In addition, consumers who appreciate organic wine assign greater importance to the local claims [88].

Interestingly, an important finding that came from the survey carried out by Remaud et al. [15] was the strong link between the region of origin and organic attributes in wine preferences. However, authors underlying that consumer do not always associate the regional product with the organic process [15].

The literature is full of studies that have investigated the role of geographical indication - such as PDO - and organic label on consumer's choice, showing that PDO certification prevails on the organic claim [89,90,91]. The role of Geographical Indications certification over organic certification has been also detected for organic wines [92].

With regard to locally attribute, the organic wine consumption is different from the dynamics related to the locally produced food [3]. Locally produced wines have received particular attention by scholars [5,93], but the studies that analysed the connection between local and organic wines are still limited.

3.3. Attitudes

Habits

Habits play a major role in food purchasing decisions. They are affected by contextual variables and the formation of attitudes and thus conciliate between behaviour and attitudes/context [34]. The study of Capitello et al. [65] found that consumers involved with wine demonstrate a greater ability to evaluate product-attribute associations for sustainable wines than do ethically minded consumers who are not involved with wine.

According to the result of studies carried out by Barber et al. [32] and Gassler et al. [68] organic wine consumer generally had a higher intention to buy organic food, in general.

Being responsible for food shopping, wine purchasing and consumption frequency, and interest in sustainable food shopping may increase the purchase probability for social, environmental or ethical labelled wine as well as the willingness to pay a price premium [44,56].

Vecchio [44] found wine consumption frequency and caring about environmental sustainability in wine

shopping to be significant factors influencing the WTP premiums for wines with an environmental and an ethical feature.

Additionally, Pomarici et al. [56] showed that the consumer segment, which was highly interested in environmentally friendly wines, was characterised by individuals who drink wine more frequently. In general, environmentally oriented consumers spend more for wines consumed at home, and their wine choices are more influenced by grape variety [56]. Mauracher et al. [69] found that consumers characterized by a low consumption frequency have a higher WTP for organic wine.

Organic wine is regularly being purchased by only 3% of the German wine drinkers, merely 4% of consumers purchase organic wine at least once a month, 25% at least once a year and approximately 75% do not buy organic wine at all [76].

Based on these results, they assumed that a certain share of the estimated total consumption of approximately 1 million hectolitres organic wines in Germany is being purchased unintentionally.

This result underlines the outcomes of Corsi and Strøm [40] who stated that the attribute organic wine is not the key driver for buying wine.

External environment

Contextual factors are external conditions, which can be constraints or incentives for the purchase of wine with organic characteristics.

The study of Sarabia-Andreu and Sarabia-Sánchez [64] is the first to report on the potential influence of implicit and explicit attitudes on organic wine purchase intention. It has been found that only explicit attitudes significantly influence organic wine purchase intention. In contrast, implicit attitudes, more strongly connected with non-conscious behaviour drivers, are not significant predictors of this intention. Moreover, only attitudes towards intrinsic attributes and arousal feelings significantly explain purchase intention.

In 2020 for the first time, the study of Sohn, et al. [75], provided insights into the impact of the product-unrelated retail atmospherics on organic wine purchase intentions, discovering the psychological mechanisms between social cues and organic wine purchase intentions, and showing that consumers seem to integrate the mere presence of social cues in their virtual shopping environment to form these purchase intentions.

Trust

Trust was important in efforts to enhance perceptions of sustainability practices of retailers and the impact of organic wine's health-related benefits [4].

Bonn et al. [4] revealed that trust in either the producer or retailer may completely reverse the impact of price on the purchase of organic wine from negative to positive. This points to the importance of consumers' attitudes when looking at the influence of context on purchase behaviour. Trust in the winery was found, besides taste, the main factor influencing consumers' behavioural intentions to purchase organic wine [50].

This suggests that consumers are more likely to purchase organic wine if they trust the retailer selling the product.

Curiosity

For the first time, Chinnici et al. [23] in a study on consumption of organic food highlighted consumer' curiosity as driver affecting consumers preferences towards organic wine. This result was confirmed by Tsourgiannis, et al. [94], whom founded curiosity as one of the main factors in organic wine purchase, and later by D'Amico et al. [5] in a study on consumer preferences for organic wines without sulphites that identified curiosity as relevant buying motivation. Di Vita et al. [66] also found that consumers attached greater importance to personal motivations such as curiosity.

3.4. Information and knowledge

Information and awareness

Regarding the influence of information, the studies of Wiedmann et al. [7] and Ay et al. [45] provided empirical evidence that a higher level of information was related to a more positive perception or preference for organic wine.

Different results were reported by Bazoche et al. [30]: whereby information on the harmful consequences of pesticide use did not have a significant effect on consumers' WTP for organic and environmentally friendly wine. However, adding visual information (labels, no tasting) compared to blind tasting significantly increased consumers' WTP. In this regard, van Tonder and Mulder [54] revealed the importance of images when buying organic wine in a retail environment because organic labels should contain 'natural' images.

Espinoza et al. [62] compared French preferences for wines from resistant varieties, certified organic wine, and conventional wine. They showed that providing consumers with environmental and health information improve strongly consumers' preferences and WTP for organic wine, while it penalises those for conventional wine.

Streletskaya et al [72] investigated consumer demand when information about production standards is provided. They found that while organic labels carry a willing-

ness to pay price premium, information about certification standards and conventional wine making practices could reduce WTP for all wines. Providing information about organic certification standards reduced consumer WTP for both absence labelled and conventional wine categories. This effect largely disappears for organic wine, but not wine made with organic grapes, when information about conventional winemaking practices is also provided.

Knowledge and expert rating

Research has shown that knowledge, in general, is directly related to consumer wine purchase behaviours determining that what consumers think they know about a subject is a better predictor than what they actually knew [32].

The level of knowledge about organic products was directly related to the acceptance of organic wine for Spanish consumers [2] and the probability of paying a premium price for organic wine with no added sulphites for Italian consumers [5]. In the study of Kim and Bonn [50], consumers declaring a greater knowledge of organic wine stated a significantly higher willingness to purchase and to recommend organic wines. On the other hand, people with a higher overall wine knowledge only had a higher behavioural intention to recommend organic wine.

Purchase intention and label awareness correlated significantly [42] and knowledge of the environmental label increased Italian consumers' WTP premiums for the environmental labelled wine [44]. Sellers [57] showed that Spanish consumers with a higher level of knowledge about sustainable products had higher WTP values, while the level of knowledge about wine culture had a negative impact on the willingness-to-pay a price premium. However, Pomarici et al. [56] showed that the consumer segment found to be highly interested in environmentally friendly wines was characterised by individuals who considered themselves more experienced regarding wine, paid more attention to the information on the back-label and were more affected by grape variety when choosing wine.

3.5. Sensory properties of organic wine

Taste

Taste is one of the most important key factors in assessing wine quality both for organic and conventional wines [48]. However, its role in the organic wine consumer perception is quite controversial.

In recent study, Rahmani et al. [70] showed that wine taste, evoked emotions and actual liking significantly influenced consumers' preferences, especially in the case of organic and selected vintage organic wine.

The taste attribute of organic wine received some criticism and constitutes a perceived risk [51] and a purchase barrier [18]. Some consumers express disappointment as they think that organic wine tastes worse than conventional wines, mainly due to too much acidity; and only very few consumers indicated that they appreciate the taste of organic wine [13].

In a survey on US consumers, the taste alone has always influenced the participant's preference for wines. After tasting wine, the attribute organic had no further influence their purchase decision [48]. In the study of Rojas-Méndez, et al. [52] on Canadian consumers, organic wine was not consumed by wine drinkers since they do not associate it with good taste or positive past experience.

Controversy, other studies showed that consumer detected advantages in terms of taste of organic wine [3]. In the recent study carried out by Lim et al. [74] the preference for organic wine was correlates positively with the perception of quality implied by the eco labels.

Kim and Bonn [50] found that organic wines have a significantly better taste compared to the conventional ones. Furthermore, Wiedmann et al. [7] showed that appearance and taste of organic wine was judged to be better than conventional wine, regardless of their knowledge and attitude towards organic products in general. Seralini and Douzelet [60] found that the tastes of organic wines were judged by consumers to be less artificial and to last longer.

Pagliarini et al. [43] found that consumers would be willing to pay more for organically produced wines than traditional ones those. However, consumers were not able to distinguish between organic and conventional wines in a blind tasting. This result indicates that the willingness to pay a premium price for organic wine may be due to consumers' attitudes and involvement in sustainability issues. Also New Zealand consumers believed sustainable wines to be of equal or better quality than conventional wines and were prepared to pay a higher price for these wines [33].

Gassler et al. [68] studied taste and quality perceptions of German consumers and their WTP for organic wine with a blind tasting and found that organic wine was perceived as tastier and of higher quality and value.

Delmas and Gergaud [55] showed that eco-labelled and organic wines receive better ratings by wine critics. When eco-labelled and regular wines were tasted, without respecting similar varieties, soils, and years, in another large study using 74,148 bottles from 3,842 Californian vineyards, the organic wines were also significantly pre-

ferred. According with their results, eco certification is associated with a statistically significant increase in wine quality rating. Being eco certified increases the scaled score of the wine by 4.1 points on average [55]. This result was confirmed in a study analysing French wines in a blinded manner, but using this time similar varieties, soils, and years, for two neighbour vineyards, one being sprayed with synthetic pesticides, the other not [60].

Controlling for a variety of wine attributes, the analysis carried out by Abraben et al [58] finds that wines produced with organic practices, but not certified as organic and wines certified, but not labelled as organic receive a higher price compared to conventional wine, for wines with low quality ratings. According with their results, as the wine's quality rating increases, the positive effects of organic practices and certification on price decrease, and for wine with higher quality ratings, organic practices and certification is associated with lower prices relative to other- wise comparable conventional wine.

Aroma

Regarding to the aroma attribute, it has been considered as relatively unimportant [25] or significant only for specific target of organic wine consumers. Therefore, this attribute has been generally taken into consideration jointly with other sensory features [25]. Controversy, few studies comparing sensory and hedonic qualities of organic and conventional wine highlighted differences in sensory perception among consumers [43]. However, although the health benefits of wine consumption are published in medical studies, the research has not made the link of added personal benefits due to environmental practices. For example, the study carried out by Garaguso and Nardini [78] showed that organic red wines produced without addition of sulphites are comparable to conventional red wines with regard to the total polyphenol and flavonoid content, the phenolic profile, and the antioxidant activity.

Interestingly, consumers take into account also the processing methods for the sensory qualities of wine, while production methods are considered to have a lower impact on the taste. In purchasing decision, the major role is played by processing method, and look at production of wine merely as a purchasing criterion of minor importance [13].

Dominici et al. [67] investigated the impact of the hand-harvested method on consumer wine preferences. According to their results, consumers prefer wine produced with hand-harvested grapes, but there is not interaction between organic and hand-harvested attributes in consumer preferences.

Colour

As regards the role of colour attribute of wine, it has been extensively investigated in consumer studies on conventional wines [95], but its role is still limited in the literature of organic wine consumer. However, it has been observed that colour attribute is not considered a relevant attribute in organic wine consumption [3]. The survey carried out on Swiss consumers [3] revealed that the organic attribute was more important than wine colour, but, at the same time, less important than the price and the country of origin. The study of Šottníková et al. [96] deals with the colour and sensory evaluation of conventional and organic wines, showing that colour evaluation and sensory evaluation did not showed any noticeable differences between conventional organic and wines.

Phenolic profiles of organic wine

According to a study by Mulero et al. [85], wines produced from organic and conventional grapes harvested in the same location and fermented using a similar protocol showed difference in their respective phenolic profiles.

Cozzolino et al. [84] compared the mid-infrared spectra of both commercial organic wines and non-organic wines and found that organic and conventional wines do result in different phenolic profiles [84].

Martin and Rasmussen [83] used geographically paired monovarietal wines produced in California, using the same winemaking protocol. In these wines, the concentration of total phenolic compounds was significantly higher in organic Pinot noir wines compared to conventional ones, whereas conventional Syrah wines showed higher levels of total phenolic compared to organic ones, suggesting that grape varieties may react differently to organic production methods. However, wine sensory analysis showed no noticeable difference in the visual aspect, the aroma intensity and quality, nor the taste of organic and conventional wines [83].

3.6. The role of additives in organic wine perception

Sulphite taste perception

Organic wines contain less preservative such as sulphur dioxide, a natural substance used in both conventional and organic processes for inhibiting unwanted yeasts and bacteria [59].

As described by Provost at al. [97], besides being free of synthetic pesticides, many organic wines contain lower amounts of sulphur dioxide than conventional wines [98], which may constitute a commercial advantage [46].

Garaguso and Nardini [78] examined total polyphenols and flavonoids content, phenolic profile and anti-

oxidant activity of organic red wines produced without sulphur dioxide/sulphites addition in comparison to conventional red wines. Polyphenols and flavonoids content were slightly higher in organic wines in respect to conventional wines, however differences did not reach statistical significance. The phenolic acids profile was quite similar in both groups of wines. Antioxidant activity was higher in organic wines compared to conventional wines, although differences were not statistically significant. Their results indicate that organic red wines produced without sulphites addition are similar to conventional red wines with regard to the total polyphenols and flavonoids content, the phenolic profile and the antioxidant activity.

The use of sulphites is perceived as the least natural feature [99] and has attracted attention among scholars, since it is perceived as risky additive and unhealthy by consumers [46].

With this regard, there are evidences that consumers are willing to pay higher price for wines without sulphites, confirming the negative perception of this additive [46,5,59]. Nowadays, the use of sulphites is widespread in winemaking; thus, consumers may be more familiar with the attribute from wine labels compared to other attributes about additives, processing aids and technologies.

D'Amico et al. [5] found a higher willingness to pay for wines without added sulphites, but inadequate information discourages consumers from paying a price premium for wine without sulphites in Italy [5].

In the study of Capitello et al. [65] on Italian and French consumers, wine with no added sulphites was perceived differently from the other types of sustainable wines.

In line with these results, Italian and Spanish consumers were willing to trade conventional wine with wine without sulphites, and more than 80% of the consumers were willing to pay additional premium prices [60].

As found in the review carried out by Deneulin and Dupraz [61], even for Swiss consumers the sensory quality is considered the main value for wine. They are also willing to pay more for wines with the label "no-added sulphites" or "organic and biodynamic".

The content of copper in organic wine

Copper is the major chemical component authorized for treatments of organic agriculture. Most Copper-containing agricultural inputs are fungicides [60]. The copper concentration may influence the taste of wine, and this could explain why wines with less copper may be preferred to wines with synthetic pesticides.

Research confirm that copper pollution has been found to affect the phenolic compound content, colour, and antioxidant activity of wine, which may change the taste [100].

Séralini et al. [72] have studied the levels, taste, and toxicity of copper in wines compared the use of copper in chemically treated and organic vineyards. They asked to describe the tastes detected, founding that tasters were able to detect the taste of copper in a wine spiked in a blinded manner to a level of 0.15 mg/l. When added at 1 or 1.5 mg/l it was found to clearly modify the taste of wine. Tasters were asked also to describe the nose or mouth detection in primary and preliminary testing at the minimal level of copper that was found in organic wines. According with results, copper breaks the complexity of nose and mouth sensations, especially for red wine. The description was easier for white wine: a brisk nose and a slightly acidic taste. Around 1 mg/l, it was always identified in comparison with the same natural wine that was not spiked and negatively disrupted the taste for tasters.

Provenzano et al. [101] determined the copper content in organic grapes and wines in relation to the total and available copper content in soil. It was shown that if the use of copper-containing products in the vineyard complies with the EU rules for organic viticulture. The level of copper in organic wines ranged from 0.1-0.4 mg/l, within the legal limits established for safeguarding the health of consumers.

It has been shown [102] that from 10 mg/l it inhibits fermentation, as do agrochemicals residues, but often this is compensated for in treated wines by adding significant amounts of modified yeasts. This is a common practice in wines when fungicides are applied in the vineyard and detected as major pesticides in non-organic wines [60], since most natural yeasts are killed by fungicides. Briefly, more copper and cupric residues are found in non-organic wines than in organic ones, due to less chemical applications in the latter case, and more time between the last application and the harvest.

4. DISCUSSION

The results obtained from literature studies on consumer perceptions of organic wine are at times doubtful and cannot automatically be translated or applied to identify a homogenous class of organic wine consumers.

The multidisciplinary study of consumer' science has highlighted that several factors can motivate consumer' behaviour towards a more sustainable consumption: among these are relevant cognitive aspects, such as values,

belief, attitudes and motivation – but also external factors – such as incentives, norms and public policies [103].

As has been shown by the many studies already carried out, the profile of organic consumers is highly variable, since its behaviour is strongly influenced by socio-demographics and psychological characteristics of consumer as well as quality perception of organic wine.

The results of the literature research categorise six different variables influencing the purchase of organic wine: (1) consumer' socio-demographics characteristics, (2) value and belief, (3) attitude, (4) information and knowledge, (5) sensory properties of organic wine, and (6) the role of additives in organic wine perception.

Intrinsic characteristics of consumer, such as socio-demographic characteristics influence consumer preferences for organic wine [18] and have resulted useful to identify an organic consumer 'profile. The stereotypical organic wine consumer is female and with a comparatively high level of education and income. We found also that gender and income have a positive correlation with the willingness to pay an additional price for organic wine.

Our study confirms the high relevance of other different factors that shape behaviour towards organic wine consumption. Among these, value and belief towards healthy and the environment concerns are positively associated with consumer behaviour toward organic wine. Most wine consumers, in fact, purchase organic wine for its perceived health and environmental benefits [3].

There is a linkage between environmental values and the purchase of organic wines [38]. Environmental consciousness of consumers was identified as one of the most important drivers in their buying behaviour towards organic products [27,34,33,4].

Health-related aspect was found as good predictor in purchasing wine [25,3] and consumers with a healthy life style are willing to pay a higher price for an organic wine [28]. Also values and beliefs regarding geographical and local origin are often motivators for the purchase of organic wine [3].

With regard to attitude, habits play a major role in food purchasing decisions. They are affected by contextual variables and the formation of attitudes and thus conciliate between behaviour and attitudes/context [34]. Also curiosity [66] and trust [4] represents important drivers for promoting the consumption of wine produced from organic grapes.

Studies provided empirical evidence that also a higher level of information and knowledge were related to a more positive perception and preference for organic wine [7,45] determining that what consumers think they know about a subject is a better predictor than what they actually knew [32].

In wine consumption, hedonic aspects have a higher impact on the purchase behaviour than the utilitarian aspect [104]. Despite the importance of extrinsic cues for determining the quality and influencing the purchasing decision, consumers are mainly driven by sensory qualities of wine [13]. Considering the hedonic features of wine [105], the organic attribute is subordinate to sensory characteristics, which were found very influential in determining wine purchasing decisions [106].

A concern among consumers is that organic wine might require a trade-off between sensory quality and organic features [107]. While consumers wish to protect the environment, they are not willing to do this choosing a product of inferior sensory quality [108]. In other words, in order to achieve low environmental impact, green products would have not to be of lower sensory quality [14].

Among sensory qualities, taste has been found an important determinant influencing consumers' behavioural intentions to purchase organic wine [43,7,50]. Taste constitutes both a key driver and barrier to wine consumption [107] and one of the major perceived risks, as outlined by Mitchell and Greatorex [109]. However, in general, wine consumers do not have an adequate level of sensory perception expertise [32], and they are not always able to identify sensory difference between organic and conventional wines [43].

Several studies focused on the role of sensory attributes in consumer behaviour for conventional wines [110,111,95]. But the number of studies focused on sensory attributes for organic wines is still limited [3,43,7]. For these reasons, the role of sensory attributes in organic wine consumption is not well defined or at time doubtful and could be deeply analysed in future researches.

A segment of research dealing with organic wine consumption has been addressed to investigate the role of additives in organic wines [13]. Outcomes also revealed the prominent role in the absence of sulphites. Saltman, et al. [53] have found that consumers would like that additives used during winemaking be mentioned on the wine label.

Studies comparing organic and conventional growing systems mostly addressed the carry-over of mineral pesticides such as copper from grape to grape juice or wine [101,112], and the impact of organic management on grape and wine composition [84,85], wine's sensory attributes [83] and wine's healthiness [113,86,87]. It is not fully clear the potential impact of organic grape management on wine and properties. Studies comparing the quality of organic to conventional wine may face many challenges related to, for example, the increase

of wine healthiness for organic wine, the improve wine sensory attributes of organic wine or mineral pesticides such as copper carry over to wine.

Given the review's findings, we assume that there is a segment of consumers with positive perceptions concerning to organic production methods of wine, who are willing to pay a premium price for such a wine. However, the results underline that the effect of the variable "price" depends on consumers' attitude, values and beliefs regarding organic wine. Consumers are willing to pay an additional price for organic wine since they attach greater importance than conventional wine to personal motivations [66]. In fact, overall, our findings show that the additional price premium for organic wine seems to be due to attributes not pertaining directly to the organic wine. Intrinsic characteristics of organic wine such as sensory attributes (i.e. taste, colour and aroma) do not affect the additional price whereas consumer' characteristics such as value and belief and attitude significantly affect the evaluation of organic wine [66].

Price is another factor that affects preferences for organic wine. In particular, consumers that state that price is a very important factor in the wine choice are less willing to pay for organic wine. In line with previous studies, consumers who are less interested in the sustainability of wine mainly pay attention to the price when choosing a bottle, while in contrast, the more environmentally oriented consumers spend, on average, more for wines consumed at home [56].

Several authors concluded that price and origin were more important purchase criteria than production method [31,37,3,10], pointed out a negative image regarding quality and higher price of organic wine [13,38]; while other studies emphasised the importance of the organic label as a cue for quality [43,7,10].

Consumers value the organic claim more than the other social responsibility and environmental claims and are willing to pay a price premium for organic wines [74]. However, the attitude is not due to the perception of organic wine sensory quality [42]. When consumers perceive a wine as having high quality they might be less willing to pay for further environment-friendly certifications [114,115]. Environmental sustainability is less important than taste of the wine [41] and consumers are not willing to pay more for the environmentally friendly wine when quality is perceived lower [26].

5. CONCLUSION

The increasing of demand for organic food is an important pathway towards sustainable food systems [77] since organic food has important environmental and health benefits. Increasing consumers' demand for organic food reinforces the rate of organic farming adoption and the level of farmers' risk acceptance.

The available results suggest that producing wine with sustainability features, particularly for organic wine, is a promising strategy for quality differentiation. In this regard, the role of consumers and their preferences is an important factor in shaping the transition to a sustainable food supply chain.

Understanding what is in consumer mind and what drives consumers wine choice, as well as their individual motivations and perceptions has always been crucial for successfully marketing wine, especially as the consumption patterns and preferences for wine have changed significantly since the late 1980s [116,25].

The future of organic wine will depend, to a large extent, on consumer demand. Thus, a consumer-oriented approach to understanding organic wine preferences is important not only in its own right, but also in terms of shifting market dynamics.

The organic wine characteristics such as health and environmental benefits should be reinforced into the mind of wine consumers. Aside from the health and environmental benefits, marketing effort should promote the taste of organic wine. In order to influence consumers' attitudes, organic wines should be extended to them as a package of product that has health and environmental benefits, better taste, and positive experience.

The benefits associated with health have to be highlighted since health-conscious people are more likely to have positive attitudes toward organic wine. The inclusion of "no added sulphite" could appear clearly and promote to consumers [52].

Previously, organic wine was perceived as healthier but less tasty than conventional wine [13]. The results highlight that there is still prejudice concerning the sensory characteristics related to organic wine. In fact, many consumers still have the idea that is good for the environment but not for those who drink it. This prejudice has its roots at the early beginning of organic winemaking, when organic producers focussed on grape production rather than on processing.

In more recent times, organic wines have reached better reputation, giving clear evidence that good sensory quality can be achieved even with organic techniques. In this regard, blind testing of organic and conventional wine would help to clarify whether the rather negative image of organic wine is just a prejudice or if organic wine still faces a lack of sensorial quality. Therefore, regular organic wine tasting events should be conducted with the wine makers.

Interestingly, some consumers perceive organic wine as genuine taste compared to conventional wine [13,16]. The authors suggest trying to incorporate terms such as genuine and distinctive taste in the communication strategy of these wines.

The review also indicated that, due to the low awareness of the broad concept of "sustainability", marketers and retailers should disseminate relevant information on environmental aspects of organic wine production to raise consumers' knowledge of sustainable wine production in order to influence purchase behaviour.

Environmental and health benefits can require scientific analyses to determine; this is above the scope of most consumers thus creating difficulty in convincing individuals about these benefits. Therefore, taste must be promoted just as vigorously as environmental and health benefits in the organic equation in order to attract a premium.

Finally, nowadays despite the importance that consumer attach to natural wine as well resveratrol enhanced wines [117,118], no study was addressed to test the preference and the environmentally consciousness of consumers for healthier and natural organic wine. In addition, health aspects of organic production processes like the absence of pesticide residues will be an important argument for potential consumers of organic wine [119,120]. This is even more important than to improve the only moderate taste image of organic wine.

Understanding the profile of consumers, purchasing drivers and the quality perception towards organic wine provide useful information to the organic wine industry [121].

Further research should be addressed to analyse also the role of high polyphenols content in organic wines, both naturally enhanced or artificially enriched, as well as for the natural wines, in order to gain a better understanding of the current trends. Furthermore, new marketing research techniques such as neuromarketing and eye tracking could be useful to identify future market perspectives of organic wine.

With regard to the limitations of this study, we highlight that, due to the relative restricted number of studies analysed, the results should be generalized with caution.

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Micro-Wineries as drivers for local economic development and innovation in lagging areas

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Abstract. For a long time mainstream economics has neglected the non-economic side related to economic growth. Yet, today there is increasing awareness of the role that social capital can play in spurring Local Economic Development especially in underdeveloped, remote, or lagging contexts. Microwineries represent a good example of SMEs, being small realities serving the local markets and spaces that strengthen local communities. The European Mediterranean regions have commonly been connected with these sectors. This study aims at pushing the body of knowledge in the development of microwineries in the lagging-behind contexts of Southern Europe, particularly in Southern Italy. To support the discussion, the present study will adopt a deductive approach, by analysing the San Diego wine cluster taken as a case study, since its wine market recently boomed. Findings will highlight the microwineries symbiosis with the territory itself. Useful lessons will be drawn for encouraging policymakers in undertaking actions towards strengthening the potential of microwineries and building networks among them.

Keywords: microwineries, SMEs, innovation, economic growth, business.

INTRODUCTION

Microwineries can be defined referring to the official classification provided by the European Commission [12]. This framework can be used to define Small and Medium Enterprises (SMEs), identifying micro, small and medium-sized enterprises with two main indicators, namely the number of employees and total assets. Microwineries are those firms that count less than 9 employees and produce less than 2 million euros in total assets.

They are considered as a new specialized organizational form that is proliferating recently in the wine market and is smaller in size than the farm winery, in that they tend to produce about 2,000 cases per year compared to the 40,000 cases of farm wineries [52].

Being categorized as small and medium enterprises (SMEs), microwineries are of a crucial importance as they are responsible for a country's wealth, and they furnish employment, as emphasized in various reports and academic papers [15].

Several studies have analysed the multifaceted thematic related to wine in various areas: some have deepened the topic of resilience between micro and small wineries, investigating approaches for helping businesses to be more resilient [24,29,10]. Under a different perspective, other studies have analysed the innovative marketing behaviour of small and medium wine enterprises in Italy [8] and the influence of size on winery performances [47]. Some scholars have provided a study of the internationalisation procedures related to the wine industry in southern Italy [43,38]; other studies highlight the "tourism and marketing characteristics of family-owned wineries" [21].

Similarly to microwineries, microbreweries, considered as small businesses specialised on the production of distinctive styles of beer through their own process [2], are growing in numbers in recent years. Some studies have focused on the role that craft breweries play for the innovation processes [11].

A few studies have had the objective of analysing and perceiving microwineries as pockets of specialisation and innovation, places in which creating and sharing knowledge accumulated through a millennial-long process of improvement of the product and resilience of the whole wine-related business.

In particular, scholars explored the innovation pattern of micro and small operators in the wine industry, by means of the theory of innovation [10].

This study is grounded on the following hypothesis:

H1: Microwineries have a strong linkage with the territory and the society itself, and thanks to them innovation can be spurred to the agricultural sector.

This study aims at pushing the body of knowledge in the development of microwineries in Southern Italy and, more in general, in Southern Europe and Mediterranean countries, with the goal to regenerate the existent wineries and transform them in actual places of knowledge sharing, where innovation can be applied to the agricultural sector. Microwineries can be seen also as places where tourists have the possibility to live a real experience, in contact with the real local culture of the place they visit.

The present study can also be seen as a source of ideas and information that could be useful to family-owned businesses, micro and small-size wine-related firms, that compose about the 99 per cent of all firms in the European Union [13].

INNOVATION

For a long time, mainstream economics has neglected the non-economic side related to economic growth. Yet, today, there is increasing awareness of the role that social capital can play in spurring the local economic development especially in underdeveloped, remote, or lagging contexts. The social capital encompasses different aspects, such as the network of relationships, allowing knowledge exchange and spurring innovation.

While before innovation was considered as a process of creative destruction [46], or a function or activity among entrepreneurs [53], more recently, innovation has been understood as the driving force of long-term competitiveness, growth, and employment [9]. It has been found a positive relation between employment and innovation in relation to small manufacturing firms [38].

Therefore, it is a process that takes to a result that is by definition new, in the sense that it is a thing or a way of making a thing that was not there [22].

Thus, today the main goal and input of most of the organizations and companies is to build interactions, strengthening the social capital as both an input and an output of the development process [47] and as a key component of social innovation [22].

Microwineries, being small realities serving especially the local market, represent a good way for studying craft-based economic activities of small and medium-size. It is thanks to them that the social capital thrives, since crafts and SMEs are entrusted with the long-term development of the local economy and are embedded into local societies. This is in line with the fact that the majority of Italian wineries are family-owned and family-operated businesses [20].

Microwineries can help to foster the networks of relationships and the sharing of knowledge between people, consequently thriving social capital and boosting innovation, which can act as engines of the Local Economic Development.

Under this point of view, the concept of microwineries can be associated to the one of Rural Innovation Centres, whereas "Rural innovation is defined as the introduction of something new (a novel change) to economic or social life in rural areas, which adds new economic or social value to rural life" [33].

Thus, this perspective can let us consider microwineries as co-working spaces as well, defined as membership-based workplaces where freelancers, remote workers, and other autonomous professionals work together in a shared, common setting [50].

Around the world several co-working spaces that are also craft breweries are sprouting [51]. Cobrew, a local community for people with a common vision about sharing, collaborating and creating, in Australia, is depicted as a local co-working spacecraft where people from all innovative disciplines have at their disposal the

tools and the facility to cultivate and brew project and ideas about their own craft. Galvanize, in Fort Collins, Colorado is a place where entrepreneurs from Fort Collins collaborate in the heart of this historic city. This city was classified in 2013 as the second most entrepreneurial city in America by Catherine Clifford [7].

The Workbar, in Cambridge, MA, is another example of working space that provides free tastings, events, and recommendations for beer aficionados. Apart from this aspect, there is also the fact that this is a place where people go to work on shared projects in an attractive working environment, which in turn increases the workers' productivity.

Overall, it emerges that microwineries can constitute the pockets of entrepreneurship and sustainability where to innervate innovation in rural areas.

This can be carried out through different funding projects in Europe: the policy framework of the Smart Specialisation Strategies [18] can help creating new competitive advantages for enhancing the economic growth.

Another example of policies for rural innovation and growth of firms is "Innogrow", a funding project that is constituted by 9 partners from 8 different countries, bringing together managing bodies and regional entities shaping local and national policies, to share knowledge and best practices, and how to better implement policies that promote the adoption of innovation and spurring the growth of small businesses linked to the rural economy [28].

RuralGrowth is another project with the aim of improving the policies related to small rural enterprises linked to the industry of hospitality. To carry out this, the project supports the adoption of sustainable and technologically advanced solutions as a way of fostering SMEs competitiveness and can serve as a push for the sustainable development in the rural regions [29].

SCOPE OF WORK

The present study aims at pushing the body of knowledge in the development of microwineries in Southern Italy and, more in general, in Southern Europe and Mediterranean countries, which rank among the first global places in terms of production of wine.

At the same time, recent economic indicators have shown that Mediterranean regions, including the Southern Italian and Greek areas, Cyprus, Malta, Southern Spain, Portugal, represent the poorest European areas and have lower GDP levels, if compared with the other European regions.

In Europe, urban regions can be classified as economic hubs that provide relatively high levels of wealth creation, while several social and economic problems are enduring in rural areas [16].

If we have a look at Italy, there is a unique situation, like a dramatic economic division between Northern regions and Southern ones, the so-called "Mezzogiorno", that has economic and social characteristics very similar to the ones of other Mediterranean countries [4].

Looking at the economic indicators of Centre-Northern Italian regions, they have a GDP per capita of €31,124, comparable with Germany, where the GDP per capita is €31,703. Vice versa, the "Mezzogiorno" richness levels are closer to poorer countries like Greece. As an example, Southern Italy has a GDP per capita of €18,000, while Greece showed a GDP per capita of €18,500 [6].

Other particular striking facts are referring to the post economic crisis period 2009-2013, in which the "Mezzogiorno" lost 39,500 firms; almost 10,000 of them were belonging to the manufacturing sector. A similar situation has been observed in other Mediterranean areas, and still most of Mediterranean areas have not fully recovered from the period of recession experienced after the economic crisis [6].

The Southern part of Italy has been one of the more affected by the economic crisis, which lasted about 7 years and has widened the gap between North and South. The South, in fact, has grown at a rate of 13% between 2000 and 2013, registering a more structured desertification process of the economic system. Its stagnant economy contrasts with the ones of the other EU disadvantaged regions, with a GDP per capita downward of about a 80% compared to a decade ago [37].

Another serious problem to be faced in different Mediterranean areas is the demographic decline. This can be appreciated from the study done by the German Institute BBSR where it has been observed a negative demographic trend in Mediterranean areas like Southern Italy, Greece, Portugal, and part of Spain. Some of these areas showed an average annual population fall of 2 percent or more. From recent reports emerged that the area of Southern Italy Apennines faced a demographic decline from 2001 to 2011 [1].

The phenomenon of population decline can be explained by several factors, including the economic crisis of the last years, which caused a reduction of job opportunities, especially for younger people.

A factor that influences the demography is the crude birth rate that was 10 births per 1,000 inhabitants or lower across southern Italy, with a similar trend with Eastern Europe (Bulgaria, Croatia, Hungary, Poland and Romania), Southern Europe (Greece, Spain, Malta and Portugal).

Mediterranean regions like Southern Italy have one of the lowest fertility rates among European NUTS 3 regions [14].

Another problem linked to Mediterranean cities is the lack of environmental awareness and environmental sustainability of Mediterranean areas. This problem can be traced also in Southern Italian regions as it has been indicated in a report published by Legambiente, which is an Italian environmentalist association. This report is called "Ecosistema urbano", translation of urban ecosystem, and it depicts the situation of Italian cities by studying the performances by means of indicators and numbers coming from analysis inside cities, like public transportation, mobility, air pollution, waste management, energy and others. In particular, most of the cities classified at the bottom of the ranking published in the report are Southern cities. More in depth, in the whole Italy there are 104 provinces, and fourteen southern Italian provinces in 2017 ranked among the last twenty positions of this report [32].

OPPORTUNITIES IN SOUTHERN EUROPE LINKED TO MICROWINERIES

Mediterranean areas, which are the target of this study, have been widely connected with wine production. Nevertheless, only lately, as regions come to tackle the effects of global rural reorganisation, wine and oenological tourism have been used for local development and economic regeneration strategies.

The production of wine in Mediterranean countries constitutes an important asset for the economy. Italy is the first country in the world for production of wine and other Mediterranean countries present significant levels of wine production as well. France and Spain, for instance, are respectively the second and third producer of wine in the world [55]. In Italy the sector is characterised by an important fragmentation and a strong dichotomy, with more than half of the firms growing less than 3ha of grapes and with only 4% owning over 30ha. Therefore, on the one hand, the sector accounts a large number of small businesses, often being family-owned and managed and for self or local consumption, and, on the other hand, businesses of a medium and big size with significant levels of professionalism [47].

Local and self-consumption against high levels of vertical integration in the production process. This leads to an improved connection between micro wine players, which could potentially increase their added value.

As highlighted above in the section dedicated to innovation, in view of the positive link between employment and innovation when it comes to micro sized manufacturing firms, this could also have a triple down effect on the employment numbers of large amount of young people attracted by the triggered innovation of this appealing sector. Demographically, it can be deducted that the above explained phenomenon of population decline in the Southern regions of Europe could be also narrowed.

The sector includes wine making and growing of grapes, but also wine-related tourism. In this regard, several studies have deepened the concept of wine tourism and its development in the last years. The concept of Themed Touring Routes (TTRs) refers to paths and road segments that connect proximate tourism attractions intended as nodal points of a network, under a principal topic or product. Many studies have characterised the concept of TTR [56] and analysed the role of wineries and vineyards collaborating to magnetise tourists and sponsor their products [52].

Microwineries can, indeed, become places where tourists can live a real experience, being in contact with the real local culture of the place they visit. This same concept could be applied to the Calabrian context, where wineries could contribute to the ecotourism and serve as a trigger for the Economic Development of Calabria [5].

As examined by several studies, TTRs, in turn, have positive effects on local economic development, particularly in rural areas [3].

METHODOLOGY

As stated in the introduction, microwineries can be considered as local clusters constituting pockets of specialisation where it is possible to innervate innovation. Since innovation and specialisation are the two parameters of competitiveness, this process helps to develop new competitive advantages for the territory, helpful to enhance the economic growth. As stated by Foray [19], regions need to "specialize themselves", developing strategic visions, locating investments where regional strengths indicate opportunities to move up in the international value chains. The strategy takes the activities with more potential out of the territory, through a vertical logic transforming them into domains of specialization for a certain length of time and bringing them into the broader Regional Innovation Strategy, that is more horizontal [47].

For supporting the discussion, the research design will be based on the case study [57]; this descriptive and exploratory approach has been implemented in order to adopt a grade of detailed analysis to define the relevance of themes treated in the present study.

RATIONALE FOR RESEARCH APPROACH

Research approaches explain the factors on which the researchers can frame the steps of gathering data and examine different literatures from different school of thoughts. There are two main approaches of research in this sense, specifically the inductive approaches and deductive approaches. In the circumstance of inductive approach, the researcher relies on the process of data collection for setting up a new theory that can eventually lead them to construct the structure required to build up concepts and theories that may emerge from the research.

On one side there is the deductive approach, which leads a researcher to adopt initiatives for studying different concepts and literatures in the beginning [31]. This aids in originating ideas and then attempts to defend them with the help of data collection. From another point of view this suggests that if the practise of data collection follows the procedure of literature review then it can be said that it has adopted a deductive approach. The present study has followed the deductive approach.

The rationale adopted for the present study has been constructed by means of deductive approach then; this study has been able to classify the different theories that exist regarding the concept of innovation management in the microwineries sector.

The wine cluster of San Diego, California, become an important case study for understanding key characteristics and implications of a sector that is growing in parallel and complementarily with innovation spaces. According to the San Diego County Vintners Association [45], there are currently about "142 active and planned wineries in San Diego County. Local wineries are located throughout the region, and satellite tasting rooms reach many of the urban and coastal communities that dot the San Diego landscape." These include an abundance of microwineries that are occupying the innovation spaces in the city centre.

The next section will deepen meanings, implications and evidence of this phenomenon.

RESULTS

The San Diego wine cluster has been deepened as a case study, since its wine market recently boomed, challenging the historic worldwide producers and constituting an important slice of the local market.

As a matter of fact, in the recent years, California has emerged as one of the major players in the global wine industry [40], so that about 90% of wine from the United States is produced in this State [55].

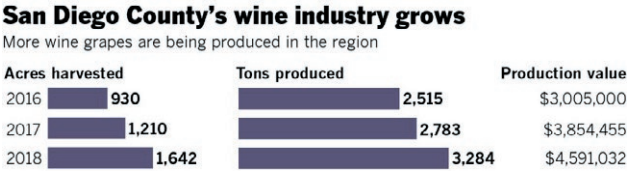

Figure 1. San Diego County Vintners Association [45].

Looking at the sectors composing its market, while the agricultural branch decreased by 9% between 2007 and 2012 and manufacturing jobs went down as well by 4% between 1998- 2016, the wine market of the county of San Diego is now among the leading sectors of the local economy [54], registering $30.4 million regional economic impact in 2016.

Moreover, from 2010 to 2017 the "total acres of wine grapes harvested" have grown by 111% [45] and, according to Professor Porter there has been a +53% in terms of job creation between 1998 and 2015, a growth of +68% in terms of establishments (1998-2015) and a +8% increase in wages (2001-2015) [54].

In 2017, 116 are the "artisan and family-owned wineries and vineyards" that have been registered throughout the County [45]. In 2018, wineries generated $41.59 million in gross sales, which is about 57% more compared to 2017 and about 72% increase from 2016 sales [45].

Moreover, according to the scholar Showley, about 45% of 2016 rented office space went to coworking spaces [49] that include microbreweries and microwineries.

Overall, this growing phenomenon gives the picture of an environment that is socially and economically growing thanks to the links of the microbreweries and microwineries with the local innovation ecosystem in general, and with the other spaces of innovation located in the area. Microwineries can work as innovation spaces and are places where the two aspects of getting work done and experiencing a work/life balance merge together.

Figure 2 shows the co-working spaces and other innovation spaces present in the San Diego urban context as of 2018, it is possible to appreciate the high density of such spaces of innovation and knowledge sharing:

The Rural Innovation Centre (RIC) is an example of an existing place of knowledge sharing located in an urban context, and it was funded by the University and the Frank Parkinson Trust. This centre entails many activities such as teaching, mentoring and functions as a hub for events, with laboratory research workshop, a machinery workshop, a demonstration hall and has extensive external training capacity [44].

An existing example like the one of RIC can suggest how a knowledge and innovation centre in an urban

Figure 2. Map of San Diego Innovation centres (Authors' elaboration).

Table 1. Economic Dynamics of San Diego Wineries [45].

Impact Type	Employment	Wages	Economic Impact	Sales
Direct Effect	611.7	$27,384,200	$32,356,633	$41,059,126
Indirect Effect	149.55	$6,777,197	$10,520,649	$17,768,378
Induced Effect	167.47	$8,379,492	$15,738,777	$25,331,462
Total Effect	928.72	$42,540,889	$58,616,060	$84,158,966

area with the support of anchor institutions (an academic institution and a charity) can have a key role in spurring individuals' capabilities and pushing local communities towards an entrepreneurial spirit for attaining business development, personal success and the growth of an entire community.

Moreover, it has the potential to create a direct, indirect and induced effect on the creation of new jobs in the region, as evidenced in Table 1:

DISCUSSION

The case studies provided emphasised an example that can give the guidelines for defining a new role of microwineries in southern Italy and Mediterranean areas. The process hypothesised could be seen as a shift in the way the industry works: a modernisation of the microwineries industry framework could in turn generate different spill-over effects that could change and improve the classical framework of the industry, as explained in previous studies. This can be displayed in the following infographics in figures 3 and 4:

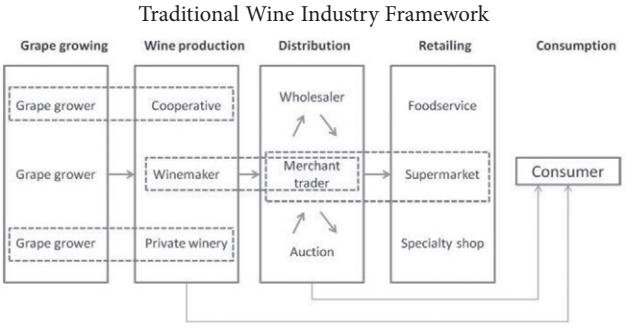

Figure 3. The Framework of Wine Value Chain [24].

In the following the proposed new Framework for microwineries conceived as Knowledge and Innovation Spaces and links with other actors of the innovation ecosystem:

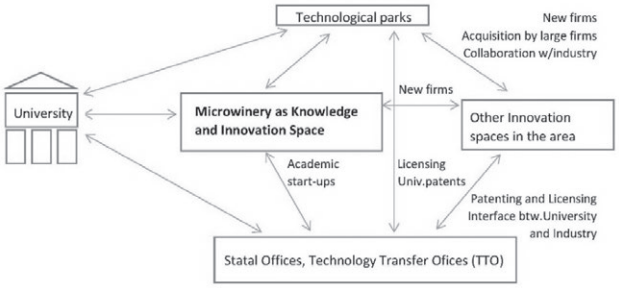

Figure 4. Framework of Knowledge Transfer and effect on an area's level of innovation (Authors' elaboration, adapted from Olcay & Bulu [36]).

The effects of microwineries as innovation centres and co-working spaces could be many. One of them could be in the transformation of the rural areas in more knowledge-based areas, based on the theory of knowledge-based rural development, known as KBUD [58]. Microwineries could serve as Knowledge and Innovation spaces, where holding events, sharing knowledge on the industry and entrepreneurship, and places where

transmitting to younger generation the passion and the secrets of crafting wines.

We can appreciate the differences between the two frameworks compared in fig.3-4, where in the former we have a classical approach, aimed at the consumption of the wine to the final consumer; in the latter we have a completely revolutionised approach, where the final aim is not the mere consumption of the produce, but the knowledge sharing and the connected spill-over effects such as the creation of new firms and improved connections with anchor institutions such as the university, the enlargement of the entrepreneurial community of the area, and the major collaboration with public stakeholder as state offices and technological transfer offices (TTOs).

In the present study the development approach is applied to rural areas, therefore it assumes the terms of knowledge-based rural development (KBRD), with the aim of spurring the economy of small villages and urban areas of European rural peripheral regions, seeking prosperity, environmental sustainability, and more social cohesion, as some of the results of the action of microwineries as rural innovation centres.

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

Findings from the research highlighted the microwineries symbiosis with the territory and the society itself, therefore meeting the hypothesis (H1) formulated by the researchers. Microwineries are able to strengthen the urban-rural link, revitalizing rural realities that are commonly considered out of the touristic channels as well. Indeed, they can offer to tourists' unique experiences in contact with local cultures, proposing tours, courses and workshops. Thus, positive relations between them and the broad regional innovation strategy emerge as well, showing the snowball effect on the levels of social capital and Local Economic Development in lagging contexts. Useful lessons are drawn for encouraging policy makers and planners in undertaking actions towards strengthening the potential of microwineries and building a network of relations among them.

Finally, comparative, benchmarking studies, addressing the lessons learned from the incorporation of new innovation centres inside microwineries also imply considerations regarding policy framing in the southern Europe and in Mediterranean areas. Addressing the lessons learned would also be of significance in generating greater understanding of the issues in this area [42].

Therefore, this paper advocates a significant change in the way that microwineries in lagging-behind contexts, like the ones of Southern Europe, are managed.

Since microwineries can act as co-working spaces, strengthening local communities, it is necessary to consider them as spots of knowledge-sharing.

Thus, in essence, they can be considered as pockets of specialization where to innervate innovation by means of the Smart Specialization Strategies, creating new competitive advantages for enhancing the economic growth in lagging behind contexts.

The ideas drawn from the paper try to push towards a regeneration of the existing realities, creating spots of knowledge-sharing where also tourists can live experiences in contact with local cultures. This matter encompasses sustainable tourism development, innovation, and wider domains of social and economic policy, which are hypothesized in the present work. The approach is to recognize the importance of innovation, and advocating towards a cultural shift that would lead to the regeneration of existing structures and small businesses, but also to the evolution of social innovation within policy and planning. These issues can be considered only if a holistic approach will be embraced, which comprehends the inter-dependencies of urban planning with other political, social, economic and cultural issues. These, in turn, can be perceived as key drivers for the creation of economic stability and the spur of local innovation and knowledge sharing, making the notion of achieving an improved culture sharing and a realistic proposition for improved local economic development, innovation, and tourism reinforcement.

The research does come with its limitations. First, conclusions generalise from the San Diego case study and this should be done with caution. Second, primary data referring to microwineries in Southern Italy, including interviews and surveys should have been conducted to support the results.

Future lines of research should address these limitations, identifying a sample of microwineries in Southern Italy and Mediterranean areas to include the variables and evidence that are not considered in this study.

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Wine price determinants. Is there a homogeneous international standard?

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Abstract. This article presents an international comparison of the main determinants of wine prices in specialist online wine shops. Hedonic price functions were estimated for 9624 wines spread among four datasets from France, Italy, Germany and Australia. To explain price variation data was collected on wine classification, closure type, wine origin, medals or awards, vintage, alcohol content, color, and grape variety. Results from quantile regression models show that the wine vintage is a common price driver in all markets and quantiles. A quite similar effect was found for alcohol content. In terms of color, the implicit prices for red and white wines are also structurally different between countries, particularly in origin, blend, closure, awards and age. Thus, the markets should be assumed as heterogeneous, and the extrapolation of the results from one market to another may lead to erroneous management decisions.

Keywords: country-based comparison, hedonic analysis, pricing, quantile regression models, specialist retailer prices.

1. INTRODUCTION

Inherent to globalization, in the last two decades, the wine industry has undergone profound changes, highlighting the entrance of new firms in the international market, especially from new producing countries, the decrease in wine consumption in traditional ones, and changes in consumer habits and behavior. Wine is increasingly becoming an experience and complex good, with different and new attributes valued by the consumer, driving the wineries to reconfigure their behavior and the type of wine to be produced to be successful in the market [43]. The change in consumer profile is reflected in the requirement of more and better information, access to new communication technologies, the way and the time to make purchasing and consumption decisions, leading to choices based on attributes such as the type of wine, age, grape variety, color, geographical origin, expert and consumer opinion, and price.

Therefore, price is a core component in both wineries and consumers' decision-making process, being the relationship between wine price and its

determinants a widely addressed topic in the wine economics literature [42]. Since the wine market is characterized by a large number of firms with different sizes and supplying different wines, the wines´ prices are not only affected by the quantity demanded but most importantly by a set of attributes considered by consumers. In light of this finding, the wine prices are typically studied using a hedonic pricing model based on Lancaster's approach, which associates the price of a good to its various objective and subjective attributes or characteristics taken by consumers when facing a buying decision.

The main theoretical foundation of the hedonic price function studies comes from Rosen's [45] pure competition model for differentiated products, which assumes that the demand and supply for attributes interact to determine the implicit marginal attribute market prices. The empirical application of the hedonic price theory in the wine industry started in the early 1990s. It remains a widely used methodology, whose findings are most relevant in wine marketing [e.g.2,4,6,10,15,16,26,28 ,32,37,41,42,44,46,49,51].

In general, the estimation of a hedonic price function comprises three main types of explanatory variables. Firstly, the so-called objective attributes, such as color, vintage, alcohol content and grape variety, which tend to be detailed on the label and are therefore easy to identify [15,16,20,32,33,34,46,49]. Secondly, the sensory attributes, such as aroma, finish or harmony, information that usually comes from expert opinions (ratings) or medals awarded [8,9,11,25,28,35,41,48]. Finally, the third category of variables addresses the influence of reputation, both individual and collective, of wines and producers amongst consumers. The individual reputation is essentially based on the producer and own brand, while the collective reputation refers to variables such as umbrella brand, geographic origin, wine classification (e.g. reserve) and the type of producer [5,10,14,22,23,31, 32,36,38,39].

A recent study by [42] [1]offers a thorough classification of all the determinants of wine prices, using a hedonic framework, developed by the academic research (117 papers published) between 1993 and 2018. In addition to the determinants referred above as objective and sensory attributes, included in their classification as "public information" price determinants (information on the label, information given by experts or rating agencies), these authors also emphasized the importance of other determinants such as weather/climate [3,7,24,26,28,54] or the supply for wine [17,26,40,46,50]. Ashenfelter et al. [3] found that increasing the temperature of 1 °C results in a price increase of 61.6% of Bordeaux Grands Cru, a result confirmed by Jones and Storchmann [28] for the Bordeaux wine region. More recently Ashenfelter and Storchmann [7] presented a notable review of the economic implications of climate change on wine prices. Additionally, focusing on how wine supply impacts wine prices, and considering the quantity supplied as a significant determinant of prices, some studies have shown that the impact on prices is positive for small wineries and negative for the largest ones [40,46]. Moreover, other studies, where the quantity supplied is measured by the number of cases of wine or the number of bottles produced [17,26,50], seem to indicate that both the quantity produced and the producer size hurt prices.

Considering the increasing heterogeneity of the wine in the markets as well as in the distribution channels, the analysis of the price determinants has been extended to price segments and distribution channels [1,12,18,45], including the on-line or e-commerce channel. For example, using a hedonic price approach for the Portuguese wine market, drawing on data from a specialist retailer and a large supermarket, the recent study of [45] found that the significance of the various price determinants differs between distribution channels.

The online or e-commerce channel is growing and gaining market share [44] against the traditional distribution, which constitutes a challenge, but also an opportunity for wineries, namely for the small and medium ones.

Moreover, assuming that the wine price determinants do not vary according to wine color, several studies on wine pricing literature mentioned above include an analysis of wine in a broad sense (comprising both white and red wine). However, for specific characteristics, this hypothesis may be unsuitable [17], and in fact, recent studies corroborate the assumption that some attributes perform differently for red and white wines [e.g., 13]. For this reason, there is a trend to a market segmentation based on red versus white wine [52], which leads us to the estimation of different hedonic functions depending on color, in the cases under study.

Even though the empirical studies typically use data from a specific country market, there is a trend towards the generalization and conveyance of the results from certain markets to other markets. This is a strong assumption that should be tested since it neglects the heterogene-

[1] The review is organized according to four main categories of wine price determinants: geographical and agricultural factors (weather/climate, soil and terroir, region of origin/appellation/grape varieties); temporal factors (age and vintage year); public information (information on the label, information given by experts or rating agencies and the causality between perceived quality and revealed prices); the impact of supply on wine prices (producer size or quantity produced, production costs).

ity of international markets, preferences, and behavior of consumers. In other words, a better understanding and generalization of the empirical results raise the issue of homogeneity of wine price determinants not only between different price-segments but also among different countries, driving to the research question of this paper of whether the results for one market are transferable to other markets. Thus, the main contribution of this paper is to strengthen the empirical knowledge on the determinants of wine price, in general, and for red and white wines, in particular, and to point clues for more detailed knowledge of the consumer preferences.

Following the mainstream of the literature and based on the hedonic price approach[2] we analyze the wine price determinants in different countries (Australia, Germany, France and Italy) using the same data structure, a specialist online wine shop in each country. These four countries are all large producers/consumers' countries, three of them, France, Germany and Italy, are regarded as "Old World wine countries", while the remaining one, Australia, is included in the "New World wine countries".

The paper is organized as follows. The second section presents the material and method used, providing details about the data sources and the model applied. The third section includes the results, where these are presented for the whole sample of still wine (pooled data) and for subsamples of red and white wines, for each country. Finally, section four concludes the paper.

2. MATERIAL AND METHODS

2.1 Data

The four countries referred above were selected according to their importance on the world wine industry, both in terms of their production and consumption. In 2018 (OIV, 2019), regarding world production (in volume) Italy ranks the first place, France the second, Australia the ninth and Germany the tenth. Concerning world consumption, also in volume, France ranks the second place, Italy the third, Germany the fourth and Australia the tenth. In France, almost 83% of the consumption is covered by domestic wine [53] where a large share is sold as PDO (Protected Designation of Origin) and PGI (Protected Geographic Indication). Similarly, in Italy, almost 95% of the wine consumed comes from the domestic market [1] and it is mainly sold under the PDO and PGI classifications. The Australian market is almost 90% supplied by domestic production, with a growing dominance of supermarket distribution and increased relevance of online sales [29]. Contrary to Australia, France, and Italy, which are big wine exporters, in Germany imports represent almost 50% of the domestic wine consumption, and sales are 85% off-premise and 15% on-premise [19].

Different sources of wine prices have been used in the literature [21], namely the suggested prices, as published in prominent guides; en primeur prices obtained from broker houses; retailed prices reported in consumer or websites, obtained through the direct survey, or gathered by private data provider such as Nielsen; auction prices; and restaurant prices. The choice of the data source seems to depend both on the goal of the study and data availability and can influence the results and its economic interpretation. In this research, we focus on specialist retailers (wine stores) in each market, selling through brick-and-mortar outlets and online, as a representative part of the off-trade more sophisticated retailers, compared to supermarkets. We consider these specialty stores as they generally are more selective in their wines and carry wines in more price segments. A preliminary survey on wine forums and wine news was carried out to identify wine stores in each country under analysis.

Therefore, four databases, in a total of 9624 bottled wines, were used to achieve the intended goals of this study. French data were retrieved from "Vinatis" online shop, www.vinatis.com, with 2094 observations after refinements on outliers' detection. Data for Italy were collected from "XtraWine", www.xtrawine.com, comprising 2803 observations. Data for Australian market were collected from "Vintage Cellars" online shop, www.vintagecellars.com.au, which gave a total of 2063 observations. Finally, data for Germany were collected from "Vinexus", www.vinexus.de, with 2664 observations. The period for data collection was from May 22 to October 27, 2019.

A first glance of the sites indicates that the information is more detailed by French and Italian wineries than by the Australian and German ones. The French site highlights the type, country, region, appellation, grape variety, color, price, award, alcohol, style, and store instructions. The Italian market reports about the type, origin (zone), award, producer, appellation, price, and food matching. The Australian site features the country, brand, region, and price range, while Germany includes type, country, region and variety. In summary, based on the assumption that the information provided by stores is demand-driven, we can conclude that consumers in tra-

[2] Since our aim is to compare information that is homogeneous within the sample, the terroir attribute is not included due to its specificity in location, and thus varying from country to country.

Table 1. Variables included in the analysis.

Variables	Description
Price	Continuous variable expressed in euros
Classification	1 if the wine is classified as Reserve/Grand Reserve 0 otherwise
Closure	1 if the wine has a cork cap 0 if screw cap
Wine origin	1 if the wine is a national production 0 otherwise
Medals/Awards	1 if the wine is an awarded wine 0 otherwise
Age	Continuous variable
Alcohol	Continuous variable
Color	1 if red wine 0 otherwise
Grape	
Blend	1 if the wine is Blended 0 otherwise
Cabernet Sauvignon	1 if the grape varietal is 100% Cabernet Sauvignon 0 otherwise
Syrah	1 if the grape varietal is 100% Syrah 0 otherwise
Other Red	1 if the wine has another red varietal 0 otherwise
Sauvignon Blanc	1 if the grape varietal is 100% Sauvignon Blanc 0 otherwise
Chardonnay	1 if the grape varietal is 100% Chardonnay 0 otherwise
Other white	1 if the wine has another white varietal 0 otherwise

ditional markets (France and Italy), seem to be looking for more complex information, although in all of them there is common information, such as the type of wine, the brand, and region. However, a more robust and incisive analysis is needed to verify whether the information presented is relevant for price formation in each market and whether its effects are similar within markets, taking also into account the segmentation by color.

Thus, accordingly to the literature review and constrained by the information collected the price explanatory variables used in this paper are a drawn on objective attributes (alcohol content, wine age, grape varieties, wine color), sensory attributes as the result of medals or awards won (rating by experts), and reputation (wine origin – imported or domestic, wine classification as Reserve/Grand Reserve, and closure type – cork or screw cap). The price (explained variable) is expressed in euros per bottle with a standard 75cl size. In order to reduce heterogeneity, a natural log is applied to the price. Table 1 includes the description of the variables used in the hedonic price function.

Table 2 includes a summary of the descriptive statistics for the variables included in the estimation of the hedonic price function and Appendix A includes the Phi correlation between binary variables in each country. This coefficient shows that, in general, the variables are not correlated or show a very low degree of correlation, except for a positive correlation between medals and cap type in the Italian market, which means that an awarded wine is associated with a cork cap. Additionally, in Australia, we found a negative correlation between wine origin and closure type, which suggests that domestic wine is negatively associated with cork cap, and positively with screw cap closure.

Regarding the descriptive statistics, the average alcohol level is similar in the four markets (between 13% and 14%), with a high concentration around the average (Coefficient of variation[3] or CV of 6% and 7%). The average age (vintage) is also similar, around 4 years, being slightly higher in Italy, although there is a higher relative dispersion in Australia, a CV of 97%, against 51% in France and 47% in Germany and Italy. Relatively to the behavior of the explanatory discrete variables we have to emphasize that: there is a predominance of red wine, especially in Germany (82% of observations); the awards or medals are relevant in Europe, especially in France and Italy (81% and 72% of the sample, respectively); in the producing countries (Australia, France, and Italy) the supply is mainly characterized by domestic wines, while in Germany it only represents 14% of this feature; cork stoppers predominate in the traditional producer and consumer countries (97% in France and 70% in Italy), being only 17% in Australia and 38% in Germany; the "reserve" label appears as irrelevant in any of the markets; and in terms of grape varieties, the blend has more expression in France (46%), followed by Italy (31%). Single varietals (Cabernet Sauvignon, Syrah and Chardonnay) have more prominence in Australia, with Chardonnay having some weight in France (10%) and Germany (9%).

The average price is roughly €22 in Germany, €32 in Italy, €35 in Australia and €44 in French, with dispersion around the average of 96%, 120%, 189% and 148%, respectively. The average price of red wine is substantially higher than that of white wine, except in Italy. Considering the supply structure by price segments, as we can observe in Figures 1 and 2, the German retailer has the highest share of wine bottles in the lowest class (up to 10 €), 27% of the total. Moreover, close to 70% of its wines on sale cost up to €20 and 83% cost up to €30.

[3] Coefficient of variation, which shows the extent of variability in relation to the mean of the population.

Table 2. Descriptive statistics.

Variable	Specialist shop															
	Vintage Cellars – 2063 observations Australia				Vinexus – 2664 observations Germany				Vinatis – 2094 observations France				XtraWine – 2803 observations Italy			
	Mean	CV	Min	Max	Mean	CV	Min	Max	Mean	CV	Min	Max	Mean	CV	Min	Max
Wine price (euro) (Median)	35.28 (16.11)	1.89	2.48	576.59	21.85 (14.9)	0.96	4.2	200	43.63 (21.9)	1.48	5.9	530	32.69 (20.0)	1.20	5.06	378.81
Red wine price	44.19	1.79	2.48	576.59	22.5	0.97	4.2	200	50.0	1.41	5.9	530	32.9	1.19	5.06	378.20
White wine price	17.05	0.89	3.34	154.99	19.1	0.87	4.6	179	33.0	1.56	6	470	32.4	1.21	5.86	378.81
Alcohol Content (AlcCont)	13.50	0.07	9	16.5	13.39	0.07	9.5	16.5	13.44	0.06	9	17	13.59	0.06	9	17
Age	3.93	0.97	1	69	3.99	0.47	1	23	3.94	0.51	1	50	4.61	0.47	2	23
	Prop.1				Prop.1				Prop.1				Prop.1			
Color (Red=1; White+Rosé=0)	0.67				0.82				0.64				0.56			
Awards or medals (yes=1; no=0)	0.14				0.51				0.81				0.72			
Wine origin (national=1; imported=0)	0.75				0.14				0.90				0.77			
Closure (cork=1; screw cap=0)	0.17				0.38				0.97				0.70			
Reserve (yes=1; no=0)	0.01				0.04				0.02				0.07			
Grape																
Blend (yes=1; no=0)	0.05				0.12				0.46				0.31			
Cabernet Sauvignon (yes=1; no=0)	0.15				0.06				0.01				0.01			
Syrah (yes=1; no=0)	0.28				0.04				0.08				0.01			
Other Red (yes=1; no=0)	0.20				0.61				0.23				0.32			
Sauvignon Blanc (yes=1; no=0)	0.08				0.07				0.02				0.04			
Chardonnay (yes=1; no=0)	0.11				0.09				0.10				0.05			
Other white (yes=1; no=0)	0.13				0.01				0.11				0.25			

Note: Prop.1= proportion of 1

Only 1% cost more than €100. Comparatively, the Australian retailer has a lower percentage of low-price wine (16%), exhibiting the majority of its bottles (60%) a cost up to €20. In this retailer, the more expensive wines represent 6% of the total. Distinctly, the French winery has the highest proportion of high-priced wines (8%, above €100) and the lowest proportion of cheap wines (12%, up to 10€). Despite the lower proportion of more expensive wines (5%), the price structure of the Italian wines tends to be closer to the French one.

Overall, this analysis shows that the indication provided by the average prices is aligned with the finer analysis given by price segments, suggesting that the price structure is not identical between the wine cellars, which reinforces the relevance of investigating its determinants for price quantiles.

2.2 Method

The traditional linear regression models describe the average relationship between a set of explanatory variables and the dependent variable, based on the conditional mean function. However, this approach may

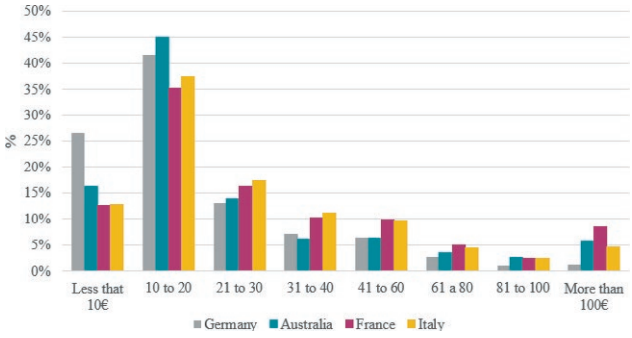


Figure 1. Wine price segments.

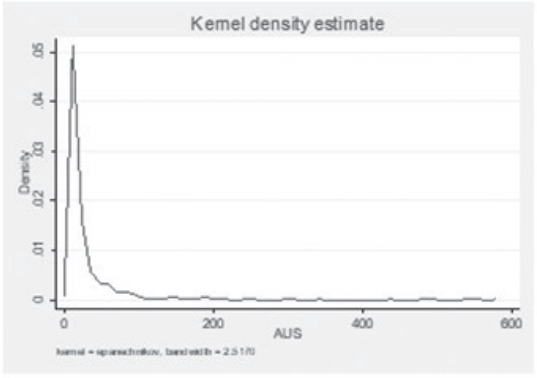
provide only a partial view of this relationship, where we can only focus on different points of the conditional distribution. For his reason, quantile regression models have been a useful and popular alternative to the traditional linear regression models. Introduced by [30], these models provide appropriated modelling in the presence of different parts of the conditional response distribution changing at different rates. The quantile regression model for $Q_Y(\tau|x)$, at the τth quantile of Y given a vector of covariates X=x is:

$$Q_Y(\tau|x)=\beta_0(\tau)+\beta_1(\tau)x_{i1}+\cdots+\beta_p(\tau)x_{ip},\ i=1,\ldots,n \quad (1)$$

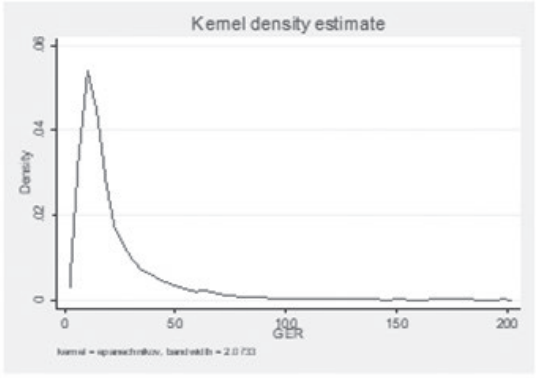
being $\beta_0(\tau)$ the scalar intercept and $\tau\in(0,1)$. $\beta(\tau)$ are estimated by solving the following minimization problem:

$$\min_{\beta(\tau)} \sum_{i=1}^{n} \rho_\tau \left(y_i - \beta_0(\tau) - \sum_{j=1}^{p} x_{ij}\beta_j(\tau)\right) \quad (2)$$

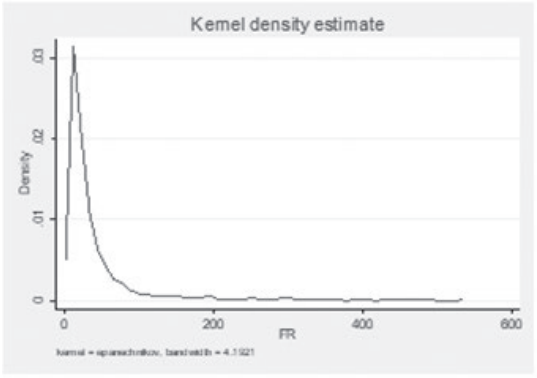
where $\rho_\tau(r)=\tau\ \max(r,0)+(1-\tau)\max(-r,0)$ is referred to as the check loss. The solution to the minimization problem estimates different regression curves for various points of the distribution and yields distinct sets of



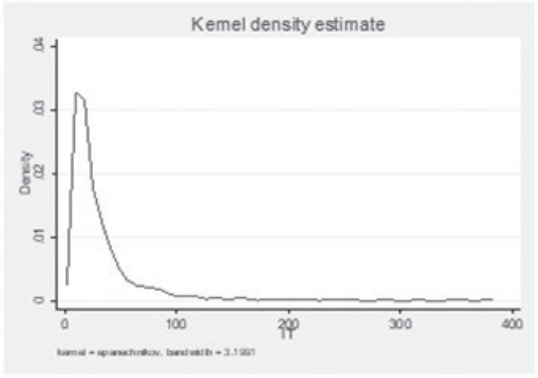
Australia



Germany



France



Italy

Figure 2. Kernel density estimate for Price.

regression coefficients. $\tau = 0.5$ corresponds to the median regression.

3. RESULTS

In order to test possible structural differences between the four markets, in a first stage (pooled data analysis) and using robust OLS, joint regressions for the four samples are estimated (without color separation), followed by an application of the Chow test. Results from this test on 22 dataset combinations (combinations between one dataset and the three others; combinations between one dataset and the two others; and combinations between paired datasets – see Table B.1, Appendix B) allow us to conclude that the determinants of wine prices in the four markets are structurally different. Given the Kernel density of the dependent variable, quantile regressions were considered, estimated and tested. In a second stage (red and white wines analysis), after the application of the Chow test for structural differences between wine color (see Table B.2, Appendix B), a separated analysis for red and white wine was made to check whether the determinants of prices vary among both wines.

3.1 Pooled data analysis

With a general overview by markets, and for all price segments, the results from quantile regressions (Tables 3 and 4) and interquantile differences tests (Appendix C) show that the greatest divergences in price determinants occur between the 25th and 50th and 25th and 75th quantiles. The importance of alcohol and blend in price formation in all countries but France seem to be homogeneous in all ranges.

Results show that in the Australian retailer, closure type, age, medals and color are the positive price determinants. For the European samples, age, medals, Chardonnay variety and alcohol content are significant in Germany and France, while in the Italian sample the Sauvignon Blanc variety has a negative effect in the formation of higher price ranges. In the case of Chardonnay, it performs differently in the lower range of German retailer´s prices (25-50 quantiles) and in Italy, but homogeneously in France. Additionally, national origin is only important for all price ranges in France, which contrasts with Italian results, where imported wines have higher prices. Thus, the only similarity for the four markets, and in all price segments, is the positive and significant effect of wine vintage for price determination, showing a different influence in all price ranges, except for higher-priced wines in Australia (50-75 quantile). Moreover, for all but the upper price category (75-quantile) in Australia, the alcohol content is also a positive and significant driver of the wine price. A similar pattern was found for Australian, German and French shops, with the price being determined by medals in all segments. Alcohol content influences the price determination in all European shops, while in Australia it only influences the medium-low price range. In the German and Australian retailers, the wine origin appears to be important only for cheaper wines. Additionally, cork closure type has a positive effect on wine prices in French and Australian shops, in the medium-low price range (25-quantile and 50-quantile) and in all segments, respectively. The other variables seem to influence wine prices with different magnitude and sign, across price quantiles and retailers.

Regarding grape variety, Chardonnay is a positive determinant in the case of the most expensive wines (50-quantile and 75-quantile) in Australia, for cheaper wines in Italy and in all segments in the German and French retailers. Regarding color effect (red wine), it is positive in all price segments in Australia and only for cheaper wines in Germany. On the contrary, it penalizes all price groups in Italy and the cheaper segment in France. Sauvignon Blanc variety has a positive influence on the definition of wine prices only in the German retailer, but only in the low price range. In France, Syrah variety has a positive effect on all price levels.

Results for closure types may suggest that, in Europe, perceptions that associate screw-capped bottles with low-quality wine may be declining, as the cork closure does not affect the Italian retailer price formation and a negative effect in the medium-high price segments in Germany. On the other hand, despite being phased out by the majority of Australian winemakers since 2000, the cork cap seems to be a positive determinant of wine prices in Australia in all price ranges. Also, Reserve or Grand Reserve status has a positive and homogeneous effect in the determination of wine prices in the low-price segment and for the most expensive wines in Australia, which contrasts with the other retailers under analysis. This seems to suggest that this quality signal may not be important in these markets, or other wine quality classifications may take place. The negative effect found for Blend coefficient suggests the importance of single-varietal wines in all retailers.

3.2 Red and white wines analysis

Appendix D includes the detailed results of the quantile regression by color for each country, being all the regressions globally and statistically significant, and

Table 3. Quantile regression results for Australian and German shops.

	Vintage Cellars – Australia				Vinexus - Germany			
	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]
Reserve	0.130**	0.081	0.150*	0.085	-0.030	-0.106***	-0.150***	−0.103***
	(0.065)	(0.061)	(0.084)	(0.053)	(0.024)	(0.027)	(0.032)	(0.019)
Closure	0.353***	0.450***	0.466***	0.432***	-0.013	-0.040***	-0.039**	−0.042***
	(0.031)	(0.032)	(0.044)	(0.024)	(0.012)	(0.014)	(0.015)	(0.010)
Wine origin	0.047**	-0.017	-0.037	−0.017	0.055***	0.009	-0.004	0.028**
	(0.019)	(0.018)	(0.024)	(0.016)	(0.015)	(0.017)	(0.018)	(0.013)
Age	0.015***	0.020***	0.026***	0.022***	0.059***	0.077***	0.089***	0.067***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)
Awards or medals	0.074***	0.164***	0.240***	0.174***	0.092***	0.096***	0.097***	0.098***
	(0.021)	(0.027)	(0.041)	(0.023)	(0.012)	(0.013)	(0.014)	(0.009)
AlcCont	0.032***	0.030***	0.009	0.027***	0.075***	0.065***	0.071***	0.081***
	(0.010)	(0.011)	(0.012)	(0.009)	(0.008)	(0.010)	(0.009)	(0.007)
Blend	-0.080**	-0.081***	-0.060	-0.042	-0.040***	-0.038*	-0.024	−0.011
	(0.035)	(0.028)	(0.051)	(0.032)	(0.019)	(0.022)	(0.028)	(0.016)
Cabernet Sauvignon	-0.053*	-0.049**	-0.017	0.001	-0.070***	-0.072**	-0.084***	−0.069***
	(0.029)	(0.027)	(0.041)	(0.024)	(0.019)	(0.029)	(0.032)	(0.022)
Syrah	-0.005	-0.008	0.037	0.047**	-0.037	-0.023	-0.050	−0.024
	(0.023)	(0.021)	(0.035)	(0.021)	(0.035)	(0.037)	(0.045)	(0.028)
Sauvignon Blanc	-0.054***	-0.087***	-0.079***	−0.078***	0.102***	0.042	0.023	0.059**
	(0.019)	(0.022)	(0.028)	(0.018)	(0.035)	(0.029)	(0.038)	(0.023)
Chardonnay	-0.004	0.073***	0.147***	0.082***	0.067***	0.075***	0.135***	0.097***
	(0.025)	(0.022)	(0.033)	(0.022)	(0.021)	(0.023)	(0.031)	(0.018)
Color	0.072***	0.122***	0.206***	0.128***	0.060*	0.034	0.043	0.058**
	(0.027)	(0.021)	(0.027)	(0.021)	(0.035)	(0.029)	(0.038)	(0.023)
Constant	0.491***	0 .644***	1.005***	0.658***	-0.296****	-0.042	-0.014	−0.237***
	(0.138)	(0.147)	(0.159)	(0.130)	(0.109)	(0.129)	(0.117)	(0.086)
Observations	2063				2664			
R-squared	0.14	0.23	0.32	0.44	0.17	0.20	0.24	0.35

*, **, *** denotes significance at 10%, 5%, 1%.
[a]Bootstrap standard errors in parentheses; Replications=1000.
[b]Robust standard errors in parentheses; OLS = ordinary least squares, included as reference.

Table 5 summarises these findings, showing the sign and statistical significance of the estimated coefficients.

In the Australian shop (Table D.1), the determinants of wine prices, excluding closure, perform very differently for red and white wines, and the reserve category became now insignificant. Cork closure, origin, age, medals, alcohol, and blend are important attributes for the red wines price setting. We may highlight the positive and homogeneous effect of alcohol content in all price segments, while blended wines receive a negative price premium in all price ranges and a red wine produced in Australia has a negative premium in the highest one. In the case of white wines, some predictors became irrelevant in price formation – reserve, origin, age, and blend – and the remaining, except Chardonnay, have a homogeneous effect in the different quantiles. The alcohol content is a significant predictor only for cheaper wines, and awards or medals do not influence the medium range.

In the German wine retailer (Table D.2), the price of red wines is negatively influenced by the reserve category, cork closure, blended varieties, and cabernet sauvignon. On the other hand, the national origin is a positive determinant for cheaper red wines, but a negative determinant for higher-priced white wines. The wine vintage, alcohol, and awards received have a positive influence, both in the red and white wine prices. In the case of the most expensive white wines, medals and awards do not influence pricing. Inversely to the reds, a blended white wine receives a positive price premium, particularly in higher segments, and the two white varieties under analysis have a homogeneous and positive effect on price setting.

In the French retailer (Table D.3), all wine characteristics are important for red and white wine's price for-

Table 4. Quantile regression results for French and Italian shops.

	Vinatis – France				XtraWine - Italy			
	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]
Reserve	-0.114***	-0.137***	-0.215***	−0.186***	0.011	0.006	-0.031	−0.005
	(0.033)	(0.032)	(0.058)	(0.036)	(0.017)	(0.025)	(0.025)	(0.017)
Closure	0.141***	0.156***	0.075	0.174***	0.017	0.056	0.058	0.043
	(0.028)	(0.040)	(0.067)	(0.031)	(0.046)	(0.068)	(0.070)	(0.039)
Wine origin	0.042**	0.082***	0.090**	0.036	-0.177***	-0.259***	-0.344***	−0.273***
	(0.019)	(0.027)	(0.043)	(0.027)	(0.015)	(0.019)	(0.030)	(0.015)
Age	0.078***	0.104***	0.115***	0.092***	0.059***	0.073***	0.084***	0.061***
	(0.007)	(0.006)	(0.007)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)
Awards or medals	0.058***	0.076***	0.106***	0.104***	0.052	0.029	0.051	0.073*
	(0.015)	(0.018)	(0.025)	(0.014)	(0.046)	(0.068)	(0.070)	(0.039)
AlcCont	0.070***	0.095***	0.104***	0.081***	0.089***	0.093***	0.102***	0.108***
	(0.009)	(0.012)	(0.015)	(0.009)	(0.007)	(0.008)	(0.011)	(0.006)
Blend	-0.096***	-0.134***	-0.158***	−0.122***	-0.073***	-0.076***	-0.085***	−0.104***
	(0.016)	(0.019)	(0.027)	(0.016)	(0.010)	(0.012)	(0.015)	(0.011)
Cabernet Sauvignon	-0.141*	-0.266*	-0.092	−0.165	-0.113*	-0.067	-0.024	−0.049
	(0.076)	(0.147)	(0.258)	(0.011)	(0.061)	(0.065)	(0.071)	(0.048)
Syrah	0.141***	0.084**	0.079*	0.077***	-0.036	-0.007	-0.042	−0.008
	(0.025)	(0.036)	(0.046)	(0.027)	(0.038)	(0.058)	(0.125)	(0.048)
Sauvignon Blanc	-0.005	-0.038	-0.161***	−0.076***	0.005	-0.007	-0.102***	−0.074***
	(0.042)	(0.037)	(0.039)	(0.027)	(0.021)	(0.022)	(0.019)	(0.021)
Chardonnay	0.108***	0.112***	0.115***	0.114***	0.093***	0.039*	-0.033	0.006
	(0.029)	(0.030)	(0.044)	(0.025)	(0.021)	(0.023)	(0.035)	(0.022)
Color	-0.047**	-0.029	-0.021	−0.007	-0.063***	-0.054***	-0.074***	−0.059***
	(0.019)	(0.020)	(0.028)	(0.017)	(0.010)	(0.012)	(0.016)	(0.011)
Constant	-0.219*	-0 .526***	-0.435**	−0.279**	-0.149*	-0.081	-0.012	−0.204***
	(0.117)	(0.150)	(0.197)	(0.121)	(0.089)	(0.091)	(0.131)	(0.078)
Observations	2094				2803			
R-squared	0.20	0.23	0.24	0.37	0.26	0.29	0.29	0.43

*, **, *** denotes significance at 10%, 5%, 1%.
[a]Bootstrap standard error in parentheses; Replications=1000.
[b]Robust standard errors in parentheses; OLS = ordinary least squares, included as reference.

mation, except wine origin, which became insignificant for white wines pricing. The effect of Sauvignon Blanc variety is positive for cheaper wines, while negative in the case of the most expensive segments. The majority of red wine price determinants perform differently across the different quantiles, except closure type, wine origin and Cabernet Sauvignon variety. According to the interquartile differences tests' results, in the case of white wines, the determinants of price have a more homogeneous effect in the price formation.

Finally, for the Italian retailer (Table D.4), both wine origin and vintage have a similar effect in both red and white wine prices but perform differently across wines quantiles. Italian wines receive a negative price premium, with a higher magnitude for more expensive wines, while vintage positively affects prices in all segments. Alcohol content has a homogeneous and positive effect in all quantiles, while a blended wine receives a negative price premium. The analysis by wine color, revealed that closure type became statistically significant while having a cork cap negatively affects the price of cheaper red wines but having a positive impact on the price of white wines. Syrah variety also became a determinant of price, having a negative influence on the medium-lower range prices. Sauvignon Blanc variety appears to particularly have a negative impact in the prices setting in the most expensive segments of white wines.

Broadly, the results show that the implicit prices of wine attributes such as wine origin and blend category differ for red and white wines, in line with [13], in all retailers except for the Italian. Additionally, closure type also performs differently in Germany and Italy, adding to this last one, the different effects of awards or medals. In Australia, the ageing potential for red

Table 5. Summary of quantile regression results by color, for each country.

Variable	Quantile											
	Australia						Germany					
	Red			White			Red			White		
	25	50	75	25	50	75	25	50	75	25	50	75
Reserve	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	(-) ***	(-) ***	(-) ***	(-) **	(-) ***
Closure	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(-) *	(-) ***	(-) ***	n.s.	n.s.	n.s.
Wine origin	(+) **	n.s.	(-) **	n.s.	n.s.	n.s.	(+) ***	n.s.	n.s.	n.s.	n.s.	(-) **
Age	(+) **	(+) ***	(+) ***	n.s.	n.s.	n.s.	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***
Awards or medals	(+) ***	(+) ***	(+) ***	(+) **	n.s.	(+) *	(+) ***	(+) ***	(+) ***	(+) **	(+) ***	n.s.
AlcCont	(+) ***	(+) ***	(+) **	(+) ***	n.s.	n.s.	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***
Blend	(-) ***	(-) ***	(-) *	n.s.	n.s.	n.s.	(-) **	(-) *	(-) *	n.s.	(+) *	(+) **
Cabernet Sauvignon	n.s.	n.s.	n.s.				(-) ***	(-) ***	(-) ***			
Syrah	n.s.	n.s.	n.s.				n.s.	n.s.	n.s.			
Sauvignon Blanc				(-) ***	(-) ***	(-) **				(+) ***	(+) ***	(+) ***
Chardonnay				n.s.	(+) ***	(+) ***				(+) ***	(+) ***	(+) ***
	France						Italy					
	Red			White			Red			White		
	25	50	75	25	50	75	25	50	75	25	50	75
Reserve	(-) **	(-) **	(-) ***	(-) ***	(-) **	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Closure	(+) ***	(+) **	(+) **	(+) ***	(+) ***	n.s.	(-) **	n.s.	n.s.	(+) **	(+) ***	(+) **
Wine origin	(+) **	(+) **	n.s.	n.s.	n.s.	n.s.	(-) ***	(-) ***	(-) ***	(-) ***	(-) ***	(-) ***
Age	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***
Awards or medals	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) *	(+) ***	(+) ***	(+) *	n.s.	n.s.	n.s.
AlcCont	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***
Blend	(-) ***	(-) ***	(-) ***	(-) *	(-) *	n.s.	(-) ***	(-) ***	(-) ***	(-) ***	(-) ***	(-) ***
Cabernet Sauvignon	n.s.	(-) **	n.s.				n.s.	n.s.	n.s.			
Syrah	(+) ***	(+) *	n.s.				(-) *	(-) *	n.s.			
Sauvignon Blanc				(+) *	n.s.	(-) **				n.s.	n.s.	(-) ***
Chardonnay				(+) ***	(+) ***	(+) ***				(+) ***	n.s.	n.s.

*, **, *** denotes significance at 10%, 5%, 1%; n.s. stands for non-significant effects

wines is very distinct from that of white wines, corroborating [17].

4. CONCLUSIONS

This investigation aimed to understand whether exists a homogeneous international standard on the attributes that influence wine prices sold in a similar distribution channel. To achieve this goal, we estimated hedonic price functions on four different wine markets, using data from specialist retailers.

The results led us to conclude that, despite the standardization of the world wine market, locally and by market and market segment, there is still differentiation in the consumer appraisal of wine price attributes and therefore in the price determinants. Data collected show that, on average, the demand structure in Australia, Germany, France and Italy is very similar in terms of alcohol content, vintage and Reserve/Grand Reserve category. Domestic wine is dominant in producing countries. Moreover, while Old World (Italian and French) privilege blend, cork cap and awarded wine, New World stress the varietal component of wine and screw tops. The price structure is heterogeneous, both within the country and between countries. French wine presents the highest average price while German wine shows the lowest one; additionally, the wine share in the lowest and highest price segments is also distinct within each market.

The findings show that the price determinants are structurally different (i) among countries, (ii) for price segments in each country, and (iii) whether the wine is red or white, disallowing to extrapolate results from one market to other markets, and from red to white wines. However, both between the four markets and across market segments there are similarities and differences in the effects of wine attributes on prices.

Regarding similarities, the age or vintage is a positive driver of the price for all ranges in all countries, except for Australia when comparing red to white wines. The alcohol content plays an identical positive effect (for total wine or pooled data, and by color), except for the highest-priced wine in Australia, which also applies in the case of white wines. For total wine, medals or awards are positive wine determinants in all markets, except in the Italian market. However, when segmenting by color, it has distinct effects. In the case of Australia, medals or awards positively contribute to increasing the price of the cheapest and the most expensive white wines. Oppositely, in Italy, this attribute is only relevant for red wines, and in Germany, the price of the most expensive white wines is not determined by an award or medal. Being a blended wine decreases the price of wine (total, red, and white) and Cabernet Sauvignon presents consistently a negative influence, particularly on the medium-low price range. When compared to other varieties, Chardonnay is a positive determinant, excluding the lowest price range in Australia and the highest in Italia, signing that it is one of the most recognized varieties in the world. Indeed, this is the most popular white variety in Australia, with an increasing effect and especially relevant in the medium-higher priced wines. Additionally, in this country, for the definition of white wine' prices in all segments, it is also important to have a cork closure.

In summary, despite some similarities, we found that the wine price determinants are very specific of each market, and also depending on the wine color. This demonstrates that wine is a complex and heterogenous product, and that there is not a homogeneous international standard.

In fact, in Australia the prices of wine (total) and the red one are positively influenced by a cork closure, vintage, awards or medals received, and alcohol level, and blended wines receive a negative price premium, as happens with national red wines in the highest segment of prices.

In Germany, the price of total wine, and also by color, is positively influenced by age, awards, and alcohol, being its effects increasing with price segments. However, in the case of white blended wines they receive a price premium in higher segments (contrasting with other countries). The white varieties positively influence all price ranges, and for an increase in price segments, Sauvignon Blanc has a decreasing effect, while Chardonnay registers an increasing contribution.

In France, for total wine and the red, cork cap, vintage, awards, and alcohol level have a positive effect in the majority of price ranges. French wines and Syrah variety are important predictors of the price for cheaper/medium red segments. In the case of white wines, and as it happens with the reds, age, awards, and alcohol level are determinants of wine prices, with Chardonnay playing an important role similar to Germany. The cork closure is only relevant for cheaper wines.

In Italy, age and alcohol are the most important attributes for higher prices of wine (total) and also for red and white wines. Adding to what was stated above regarding awards/medals, these only produce a positive effect on the price of red wine. The cork closure in whites has an increasing impact as price segments increase, which registers an opposite effect for cheaper red wines, and no influence in higher segments. Contrary to the other retailers, Chardonnay variety is only important for cheaper wines.

Our results lead to the robust conclusion that there is not a single world wine and even a single country market but different wine markets, which is also true for red and white wines, with the significance or sign of attributes in wine price determination changing among countries and across price market segments. Thus, generalizing results based on country data and neglecting the effects of market segmentation on wine price determinants may lead to erroneous conclusions and managerial decisions that should be avoided.

The findings of this study recommend wineries to define marketing strategies and to supply wines according to the characteristics of the target market and to achieve a better match between supply and demand, to enhance their market shares, not only for different price segments but also different wine styles.

This work is not free of drawbacks, since the data sources from specialized wine retailers tend to cover only a small market share and/or market shares, unlike those of supermarkets/large distributors. Additionally, specialist retailers are off-trade channels who purchase wine through an agent or a wholesaler, leading to a double mark-up reflected in higher consumer prices, when compared to supermarkets, and the determinants of wine prices tend to be different when comparing specialist shops with other channels [18, 45]. Future research should include other important determinants, such as the specific wine varieties (for white and red wines) for

each country, and to address the effect of appellations and terroir on prices, which we believe may have a significant effect on price.

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APPENDIX A

Table A1. Phi correlation between binary variables for each country.

	Reserve	Cap	Origin	Medals	Blend	CabSauv	Syrah	SauvBlanc	Chardonnay	Color
France										
Reserve	1.0000									
Cap	-0.0119	1.0000								
Origin	-0.1305***	0.2301***	1.0000							
Medals	0.0164	0.1227***	0.0489**	1.0000						
Blend	-0.0265	0.0613***	0.0703***	0.0498**	1.0000					
CabSauv	0.0357	-0.0711***	-0.1160***	-0.0022	-0.0502**	1.0000				
Syrah	-0.0438**	0.0166	0.0284	0.0123	-0.2644***	-0.0198	1.0000			
SauvBlanc	-0.0203	-0.0654***	0.0071	-0.0117	-0.1224***	-0.0092	-0.0378*	1.0000		
Chardonnay	-0.0205	-0.0170	0.0444**	-0.0340	-0.3138***	-0.0235	-0.0969 ***	-0.0449**	1.0000	
Color	-0.0297	0.1017***	-0.0626***	0.1261***	0.1601***	0.0525**	0.2165***	-0.1745***	-0.4475***	1.0000
Italy										
Reserve	1.0000									
Cap	0.0032	1.0000								
Origin	0.0808***	0.0977***	1.0000							
Medals	-0.0033	0.9454***	0.0105	1.0000						
Blend	0.0163	0.0648***	0.0680***	0.0434**	1.0000					
CabSauv	-0.0328*	-0.0562***	-0.0277	-0.0084	-0.0804***	1.0000				
Syrah	-0.0215	-0.0140	-0.0541***	0.0003	-0.0815***	-0.0143	1.0000			
SauvBlanc	-0.0344*	-0.0014	-0.0877***	-0.0108	-0.1368***	-0.0240	-0.0243	1.0000		
Chardonnay	-0.0554***	0.0175	-0.2550***	0.0337*	-0.1517***	-0.0266	-0.0270	-0.0453**	1.0000	
Color	0.1047***	0.0458**	0.1050***	0.0400**	0.1463***	0.1063***	0.1076***	-0.2259***	-0.2505***	1.0000
Australia										
Reserve	1.0000									
Cap	-0.0077	1.0000								
Origin	-0.0404*	-0.4023***	1.0000							
Medals	-0.0214	0.0947***	0.0082	1.0000						
Blend	0.0366*	0.0300	-0.0071	-0.0193	1.0000					
CabSauv	-0.0232	0.1204***	0.0445	0.0786***	-0.0895***	1.0000				
Syrah	-0.0348	-0.0138	0.2723***	0.1274***	-0.1370***	-0.2596***	1.0000			
SauvBlanc	-0.0041	-0.1063***	-0.1725***	-0.0299	-0.0657***	-0.1246***	-0.1908***	1.0000		
Chardonnay	0.0413*	-0.1039***	0.0810***	-0.0645***	-0.0764***	-0.1448***	-0.2217***	-0.1064***	1.0000	
Color	-0.0194	0.2139***	0.0823***	0.1272***	0.0971***	0.2877***	0.4407***	-0.4329***	-0.5031***	1.0000
Germany										
Reserve	1.0000									
Cap	0.0715***	1.0000								
Origin	-0.0812***	-0.1250***	1.0000							
Medals	0.0371*	0.1722***	-0.1564***	1.0000						
Blend	0.1507***	0.1241***	-0.1435***	0.0719***	1.0000					
CabSauv	0.0428**	0.0510***	-0.0941***	0.0500***	-0.0933***	1.0000				
Syrah	-0.0296	-0.0229	-0.0796***	0.1012***	-0.0752***	-0.0484**	1.0000			
SauvBlanc	-0.0243	-0.1015***	-0.0371*	0.0043	-0.1037***	-0.0668***	-0.0538***	1.0000		
Chardonnay	-0.0294	0.0111	-0.0848***	-0.0127	-0.1195***	-0.0770***	-0.0620**	-0.0855***	1.0000	
Color	0.0323*	0.1175***	0.0501***	-0.0244	0.0362*	0.0735***	0.0593***	-0.7895***	0.0942***	1.0000

Notes: 0.90 to 1.00 (−0.90 to −1.00) Very high positive (negative) correlation; 0.70 to 0.90 (−0.70 to −0.90) High positive (negative) correlation; 0.50 to 0.70 (−0.50 to −0.70) Moderate positive (negative) correlation; 0.30 to 0.50 (−0.30 to −0.50) Low positive (negative) correlation; 0.00 to 0.30 (0.00 to −0.30) negligible correlation (Hinkle, Wiersma, & Jurs, 2003).
***, **, * stands for significance at 1%, 5%, 10%, respectively.

APPENDIX B – STRUCTURAL DIFFERENCES BETWEEN DATASETS

Table B1. Chow test results for the 22 combinations between datasets.

H_0	Result
β_A-$\beta_{F,G,I}$=0	F(13, 9671) = 96.6821; p-value=0.0000
β_F-$\beta_{A,G,I}$=0	F(13, 9671) = 18.6034; p-value=0.0000
β_G-$\beta_{A,F,I}$=0	F(13, 9671) = 78.2422; p-value=0.0000
β_I-$\beta_{A,G,F}$=0	F(13, 9671) = 61.9454; p-value=0.0000
β_A-$\beta_{F,I}$=0	F(13, 6985) = 59.7917; p-value=0.0000
β_A-$\beta_{F,G}$=0	F(13, 6859) = 86.2516; p-value=0.0000
β_A-$\beta_{I,G}$=0	F(13, 7551) = 122.783; p-value=0.0000
β_F-$\beta_{A,I}$=0	F(13, 6985) = 28.8852; p-value=0.0000
β_F-$\beta_{A,G}$=0	F(13, 6859) = 12.0781; p-value=0.0000
β_F-$\beta_{I,G}$=0	F(13, 7592) = 31.7239; p-value=0.0000
β_G-$\beta_{A,I}$=0	F(13, 7551) = 91.5821; p-value=0.0000
β_G-$\beta_{A,F}$=0	F(13, 6859) = 69.2847; p-value=0.0000
β_G-$\beta_{I,F}$=0	F(13, 7592) = 27.6741; p-value=0.0000
β_I-$\beta_{A,F}$=0	F(13, 6985) = 53.9544; p-value=0.0000
β_I-$\beta_{A,G}$=0	F(13, 7551) = 50.6602; p-value=0.0000
β_I-$\beta_{F,G}$=0	F(13, 7592) = 51.5812; p-value=0.0000
β_A-β_F=0	F(13, 4173) = 44.0896; p-value=0.0000
β_A-β_G=0	F(13, 4739) = 100.381; p-value=0.0000
β_A-β_I=0	F(13, 4865) = 76.3607; p-value=0.0000
β_F-β_I=0	F(13, 4906) = 33.0689; p-value=0.0000
β_F-β_G=0	F(13, 4780) = 15.4393; p-value=0.0000
β_G-β_I=0	F(13, 5472) = 31.7139; p-value=0.0000

Notes: A = Australia; G = Germany; I = Italy; F = France.

Table B2. Show test results between wine color.

Data	H_0	Result
Pooled data	β_R-β_W=0	F(8, 9681) = 12,3703 ; p-value=0.0000
Australia	β_R-β_W=0	F(8, 2047) = 9,03773 ; p-value=0.0000
Germany	β_R-β_W=0	F(8, 2648) = 5,03464 ; p-value=0.0000
France	β_R-β_W=0	F(8, 2078) = 4,60065 ; p-value=0.0000
Italy	β_R-β_W=0	F(8, 2787) = 5,6072 ; p-value=0.0000

Notes: R = Red; W = White.

APPENDIX C - INTERQUANTILE DIFFERENCES TESTS BY COUNTRIES

Table C1. Australia.

Variable	25–75 quantiles	25–50 quantiles	50–75 quantiles
Cap	F(1, 2050) = 4.30 Prob > F = 0.038**	F(1, 2050) = 10.86 Prob > F = 0.001***	F(1, 2050) = 0.15 Prob > F = 0.701
Reserve	F(1, 2050) = 0.10 Prob > F = 0.755	F(1, 2050) = 1.09 Prob > F = 0.297	F(1, 2050) = 0.97 Prob > F = 0.325
Color	F(1, 2050) = 31.29 Prob > F = 0.000***	F(1, 2050) = 9.46 Prob > F = 0.002***	F(1, 2050) = 29.69 Prob > F = 0.000***
Age	F(1, 2050) = 5.01 Prob > F = 0.025**	F(1, 2050) = 4.84 Prob > F = 0.028**	F(1, 2050) = 2.63 Prob > F = 0.105
Origin	F(1, 2050) = 14.59 Prob > F = 0.000***	F(1, 2050) = 14.23 Prob > F = 0.000***	F(1, 2050) = 1.69 Prob > F = 0.194
Medals	F(1, 2050) = 15.29 Prob > F = 0.000***	F(1, 2050) = 7.03 Prob > F = 0.005***	F(1, 2050) = 4.39 Prob > F = 0.036**
Alcohol	F(1, 2050) = 2.64 Prob > F = 0.104	F(1,2050) = 0.11 Prob > F = 0.737	F(1, 2050) = 2.28 Prob > F = 0.131
Blend	F(1, 2050) = 0.17 Prob > F = 0.676	F(1,2050) = 0.00 Prob > F = 0.963	F(1, 2050) = 0.30 Prob > F = 0.582
Cabernet Sauvignon	F(1, 2050) = 0.71 Prob > F = 0.3986	F(1,2050) = 0.03 Prob > F = 0.864	F (1, 2050) = 0.92 Prob > F = 0.338
Syrah	F(1, 2050) = 1.47 Prob > F = 0.225	F(1, 2050) = 0.02 Prob > F = 0.889	F (1, 2050) = 2.24 Prob > F = 0.135
Sauvignon Blanc	F(1, 2050) = 0.47 Prob > F = 0.4918	F(1,2050) = 1.95 Prob > F = 0.162	F (1, 2050) = 0.07 Prob > F = 0.786
Chardonnay	F(1, 2050) = 18.75 Prob > F = 0.000***	F(1,2050) = 14.90 Prob > F = 0.000***	F (1, 2050) = 5.89 Prob > F = 0.015**

***, **, * stands for significance at 1%, 5%, 10%, respectively.

Table C2. Germany.

Variable	25–75 quantiles	25–50 quantiles	50–75 quantiles
Cap	F(1, 2651) = 2.00 Prob > F = 0.158	F(1, 2651) = 3.81 Prob > F = 0.051*	F(1, 2651) = 0.01 Prob > F = 0.927
Reserve	F(1, 2651) = 14.71 Prob > F = 0.000***	F(1, 2651) = 17.53 Prob > F = 0.000***	F(1, 2651) = 3.08 Prob > F = 0.079*
Color	F(1, 2651) = 0.22 Prob > F = 0.638	F(1, 2651) = 1.40 Prob > F = 0.236	F(1, 2651) = 0.05 Prob > F = 0.819
Age	F(1, 2651) = 36.59 Prob > F = 0.000***	F(1, 2651) = 18.80 Prob > F = 0.000***	F(1, 2651) = 12.80 Prob > F = 0.000***
Origin	F(1, 2651) = 7.26 Prob > F = 0.007***	F(1, 2651) = 26.24 Prob > F = 0.000***	F(1, 2651) = 0.53 Prob > F = 0.470
Medals	F(1, 2651) = 0.09 Prob > F = 0.769	F(1, 2651) = 0.10 Prob > F = 0.750	F(1, 2651) = 0.00 Prob > F = 0.962
Alcohol	F(1, 2651) = 0.14 Prob > F = 0.707	F(1, 2651) = 1.48 Prob > F = 0.224	F(1, 2651) = 0.28 Prob > F = 0.600
Blend	F(1, 2651) = 0.21 Prob > F = 0.643	F(1, 2651) = 0.01 Prob > F = 0.937	F(1, 2651) = 0.43 Prob > F = 0.510
Cabernet Sauvignon	F(1, 2651) = 0.13 Prob > F = 0.714	F(1, 2651) = 0.00 Prob > F = 0.947	F (1, 2651) = 0.15 Prob > F = 0.697
Syrah	F(1, 2651) = 0.07 Prob > F = 0.791	F(1, 2651) = 0.17 Prob > F = 0.678	F (1, 2651) = 0.51 Prob > F = 0.476
Sauvignon Blanc	F(1, 2651) = 3.58 Prob > F = 0.058*	F(1, 2651) = 6.13 Prob > F = 0.013**	F (1, 2651) = 0.26 Prob > F = 0.613
Chardonnay	F(1, 2651) = 4.72 Prob > F = 0.029**	F(1, 2651) = 0.17 Prob > F = 0.680	F (1, 2651) = 3.80 Prob > F = 0.052*

***, **, * stands for significance at 1%, 5%, 10%, respectively.

Table C3. France.

Variable	25 – 75 quantiles	25 – 50 quantiles	50 – 75 quantiles
Cap	F(1, 2081) = 1.09 Prob > F = 0.296	F(1, 2081) = 0.46 Prob > F = 0.499	F(1, 2081) = 1.53 Prob > F = 0.218
Reserve	F(1, 2081) = 1.77 Prob > F = 0.183	F(1, 2081) = 0.49 Prob > F = 0.483	F(1, 2081) = 1.20 Prob > F = 0.274
Color	F(1, 2081) = 0.85 Prob > F = 0.355	F(1, 2081) = 0.70 Prob > F = 0.404	F(1, 2081) = 0.11 Prob > F = 0.737
Age	F(1, 2081) = 45.40 Prob > F = 0.000***	F(1, 2081) = 23.15 Prob > F = 0.000***	F(1, 2081) = 6.64 Prob > F = 0.010***
Origin	F(1, 2081) = 1.54 Prob > F = 0.214	F(1, 2081) = 2.29 Prob > F = 0.130	F(1, 2081) = 0.06 Prob > F = 0.802
Medals	F(1, 2081) = 3.23 Prob > F = 0.072*	F(1, 2081) = 3.00 Prob > F = 0.084*	F(1, 2081) = 1.39 Prob > F = 0.238
Alcohol	F(1, 2081) = 4.93 Prob > F = 0.027**	F(1, 2081) = 8.54 Prob > F = 0.004***	F(1, 2081) = 0.46 Prob > F = 0.499
Blend	F(1, 2081) = 6.51 Prob > F = 0.011**	F(1, 2081) = 5.04 Prob > F = 0.025**	F(1, 2081) = 1.25 Prob > F = 0.263
Cabernet Sauvignon	F(1, 2081) = 0.05 Prob > F = 0.827	F(1, 2081) = 0.30 Prob > F = 0.581	F (1, 2081) = 1.14 Prob > F = 0.285
Syrah	F(1, 2081) = 1.98 Prob > F = 0.159	F(1, 2081) = 3.88 Prob > F = 0.049**	F (1, 2081) = 0.01 Prob > F = 0.903
Sauvignon Blanc	F(1, 2081) = 9.66 Prob > F = 0.002***	F(1, 2081) = 1.08 Prob > F = 0.299	F (1, 2081) = 6.51 Prob > F = 0.011**
Chardonnay	F(1, 2081) = 0.04 Prob > F = 0.840	F(1, 2081) = 0.02 Prob > F = 0.901	F (1, 2081) = 0.01 Prob > F = 0.913

***, **, * stands for significance at 1%, 5%, 10%, respectively.

Table C4. Italy.

Variable	25–75 quantiles	25–50 quantiles	50–75 quantiles
Cap	F(1, 2790) = 0.17 Prob > F = 0.685	F(1, 2790) = 0.38 Prob > F = 0.539	F(1, 2790) = 0.00 Prob > F = 0.983
Reserve	F(1, 2790) = 3.00 Prob > F = 0.083*	F(1, 2790) = 0.04 Prob > F = 0.850	F(1, 2790) = 3.61 Prob > F = 0.057*
Color	F(1, 2790) = 0.86 Prob > F = 0.355	F(1, 2790) = 0.93 Prob > F = 0.334	F(1, 2790) = 3.04 Prob > F = 0.081*
Age	F(1, 2790) = 14.96 Prob > F = 0.000***	F(1, 2790) = 12.34 Prob > F = 0.001***	F(1, 2790) = 4.61 Prob > F = 0.032**
Origin	F(1, 2790) = 23.44 Prob > F = 0.000***	F(1, 2790) = 31.12 Prob > F = 0.000***	F(1, 2790) = 6.79 Prob > F = 0.009***
Medals	F(1, 2790) = 0.00 Prob > F = 0.998	F(1, 2790) = 0.13 Prob > F = 0.714	F(1, 2790) = 0.05 Prob > F = 0.828
Alcohol	F(1, 2790) = 1.07 Prob > F = 0.300	F(1, 2790) = 0.53 Prob > F = 0.469	F(1, 2790) = 0.59 Prob > F = 0.441
Blend	F(1, 2790) = 0.68 Prob > F = 0.409	F(1, 2790) = 0.05 Prob > F = 0.827	F(1, 2790) = 0.49 Prob > F = 0.484
Cabernet Sauvignon	F(1, 2790) = 1.24 Prob > F = 0.265	F(1, 2790) = 0.43 Prob > F = 0.514	F (1, 2790) = 1.16 Prob > F = 0.281
Syrah	F(1, 2790) = 0.00 Prob > F = 0.954	F(1, 2790) = 0.04 Prob > F = 0.838	F (1, 2790) = 0.01 Prob > F = 0.940
Sauvignon Blanc	F(1, 2790) = 16.32 Prob > F = 0.000***	F(1, 2790) = 0.29 Prob > F = 0.593	F (1, 2790) = 22.3 Prob > F = 0.000***
Chardonnay	F(1, 2790) = 15.54 Prob > F = 0.000***	F(1, 2790) = 8.14 Prob > F = 0.004***	F (1, 2790) = 5.45 Prob > F = 0.020**

***, **, * stands for significance at 1%, 5%, 10%, respectively.

APPENDIX D - QUANTILE REGRESSION RESULTS BY COLOR FOR EACH COUNTRY

Table D1. Australia.

	Red				White			
	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]
Reserve	0.159	0.081	0.062	0.715	0.103	0.045	0.128	0.104*
	(0.120)	(0.102)	(0.131)	(0.081)	(0.063)	(0.097)	(0.032)	(0.061)
Closure	0.406***	0.469***	0.468***	0.450***	0.253***	0.285***	0.367***	0.299***
	(0.031)	(0.030)	(0.047)	(0.027)	(0.052)	(0.050)	(0.015)	(0.050)
Wine origin	0.076**	-0.052	-0.124**	−0.024 (0.024)	0.017	-0.001	-0.002	−0.015
	(0.037)	(0.048)	(0.055)		(0.020)	(0.009)	(0.018)	(0.018)
Age	0.016**	0.023***	0.032***	0.022***	0.006	0.005	0.014	0.017***
	(0.007)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.009)	(0.005)
Awards or medals	0.113***	0.165***	0.240***	0.193***	0.041**	0.077	0.059*	0.085**
	(0.032)	(0.042)	(0.031)	(0.027)	(0.024)	(0.049)	(0.036)	(0.034)
AlcCont	0.050***	0.048***	0.051**	0.032**	0.022***	0.011	0.001	0.025**
	(0.016)	(0.018)	(0.024)	(0.014)	(0.008)	(0.011)	(0.012)	(0.011)
Blend	-0.101***	-0.073***	-0.078*	−0.049 (0.035)	-0.083	-0.034	0.145	0.009
	(0.036)	(0.028)	(0.045)		(0.070)	(0.101)	(0.124)	(0.077)
Cabernet Sauvignon	-0.054	-0.047	-0.037	−0.003 (0.025)				
	(0.034)	(0.030)	(0.034)					
Syrah	-0.025	-0.005	0.020	0.044**				
	(0.023)	(0.025)	(0.042)	(0.022)				
Sauvignon Blanc					-0.061***	-0.066***	-0.055**	−0.074***
					(0.019)	(0.020)	(0.022)	(0.018)
Chardonnay					0.009	0.069***	0.167***	0.087***
					(0.020)	(0.024)	(0.040)	(0.021)
Constant	0.279	0.514***	0.671**	0.715***	0.674***	0.928	1.112***	0.721***
	(0.228)	(0.250)	(0.336)	(0.194)	(0.119)	(0.155)	(0.152)	(0.150)
Observations	1386				677			
R-squared	0.14	0.24	0.30	0.42	0.06	0.09	0.17	0.23

*, **, *** denotes significance at 10%, 5%, 1%.
[a]Bootstrap standard errors in parentheses; Replications=1000.
[b]Robust standard errors in parentheses; OLS = ordinary least squares, included as reference.
Interquartile differences: Red: 25-75 (Age***; Origin***; Medals***); 25-50 (Closure**; Origin***); 50-75 (Age**; Origin**; Medals*); White: 25-75 (Chardonnay***); 25-50 (Chardonnay***); 50-75 (Chardonnay***).

Table D2. Germany.

	Red				White			
	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]
Reserve	-0.012 (0.020)	-0.083*** (0.029)	-0.127*** (0.029)	−0.089*** (0.021)	-0.096*** (0.036)	-0.118** (0.053)	-0.252*** (0.057)	−0.181*** (0.035)
Closure	-0.024* (0.014)	-0. 058*** (0.020)	-0.050*** (0.019)	−0.052*** (0.011)	0.044 (0.042)	0.039 (0.031)	0.021 (0.035)	0.010 (0.023)
Wine origin	0.060*** (0.016)	0.003 (0.018)	0.010 (0.015)	0.032** (0.014)	0.040 (0.035)	0.007 (0.041)	-0.054** (0.024)	−0.024 (0.031)
Age	0. 057*** (0.005)	0.075*** (0.003)	0.084*** (0.003)	0.064*** (0.003)	0.069*** (0.013)	0.097*** (0.013)	0.099*** (0.023)	0.081*** (0.010)
Awards or medals	0.097*** (0.012)	0.107*** (0.019)	0.129*** (0.016)	0.113*** (0.011)	0.068** (0.029)	0.085*** (0.031)	-0.007 (0.031)	0.034* (0.021)
AlcCont	0.075*** (0.009)	0.064*** (0.008)	0.078*** (0.006)	0.084*** (0.007)	0.078*** (0.023)	0.059*** (0.020)	0.057*** (0.022)	0.067*** (0.015)
Blend	-0.046** (0.021)	-0.044* (0.024)	-0.041* (0.024)	−0.020 (0.017)	0.107 (0.095)	0.132* (0.071)	0.217** (0.040)	0.163*** (0.063)
Cabernet Sauvignon	-0.062*** (0.017)	-0.073*** (0.016)	-0.097*** (0.030)	−0.071*** (0.022)				
Syrah	-0.054 (0.045)	-0.025 (0.035)	-0.067 (0.062)	−0.031 (0.028)				
Sauvignon Blanc					0.136*** (0.050)	0.111*** (0.034)	0.086*** (0.032)	0.126*** (0.029)
Chardonnay					0.137*** (0.049)	0.133*** (0.032)	0.214*** (0.050)	0.197*** (0.032)
Constant	-0.229** (0.107)	-0.016 (0.107)	-0.057 (0.079)	−0.210** (0.094)	-0.377 (0.299)	-0.054 (0.244)	0.659** (0.301)	−0.122 (0.195)
Observations	2183				481			
R-squared	0.18	0.21	0.25	0.34	0.15	0.18	0.24	0.31

*, **, *** denotes significance at 10%, 5%, 1%.

[a]Bootstrap standard errors in parentheses; Replications=1000.

[b]Robust standard errors in parentheses; OLS = ordinary least squares, included as reference.

Interquartile differences: Red: 25-75 (Reserve***; Age***; Origin**; Medals*); 25-50 (Closure**; Reserve***; Age***; Origin***); 50-75 (Age**).

White: 25-75 (Reserve**; Origin***; Medals*); 25-50 (Age**); 50-75 (Reserve**; Origin*; Medals**; Chardonnay*).

Table D3. France.

	Red				White			
	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]
Reserve	-0.190**	-0.142**	-0.258***	−0.239***	-0.067***	-0.131**	-0.145	−0.113***
	(0.082)	(0.059)	(0.075)	(0.054)	(0.024)	(0.053)	(0.095)	(0.043)
Closure	0.169***	0.175**	0.251**	0.242***	0.118***	0.117***	0.047	0.128***
	(0.044)	(0.076)	(0.124)	(0.052)	(0.030)	(0.043)	(0.063)	(0.037)
Wine origin	0.07**	0.092**	0.093	0.035 (0.037)	-0.011	-0.028	0.052	0.022
	(0.032)	(0.039)	(0.079)		(0.033)	(0.060)	(0.041)	(0.029)
Age	0.091***	0.111***	0.121***	0.097***	0.074***	0.080***	0.104***	0.088***
	(0.008)	(0.005)	(0.008)	(0.006)	(0.007)	(0.011)	(0.014)	(0.008)
Awards or medals	0.065***	0.067***	0.119***	0.123***	0.057***	0.067***	0.072*	0.074***
	(0.015)	(0.024)	(0.027)	(0.021)	(0.022)	(0.015)	(0.039)	(0.020)
AlcCont	0.061***	0.078***	0.093***	0.068***	0.100***	0.126***	0.141***	0.119***
	(0.013)	(0.019)	(0.018)	(0.013)	(0.012)	(0.015)	(0.027)	(0.014)
Blend	-0.142***	-0.179***	-0.237***	−0.166 ***	-0.042*	-0.050*	-0.002	−0.009
	(0.034)	(0.036)	(0.045)	(0.023)	(0.023)	(0.027)	(0.042)	(0.023)
Cabernet Sauvignon	-0.162	-0.288**	-0.099	−0.169				
	(0.126)	(0.027)	(0.240)	(0.109)				
Syrah	0.096 ***	0.071*	0.003	0.050*				
	(0.024)	(0.039)	(0.041)	(0.029)				
Sauvignon Blanc					0.057*	0.005	-0.075**	−0.012
					(0.031)	(0.041)	(0.031)	(0.027)
Chardonnay					0.137***	0.170***	0.188***	0.174***
					(0.027)	(0.034)	(0.047)	(0.026)
Constant	-0.218	-0.357	-0.484*	−0.185	-0.554***	-0.775***	-0.891***	−0.741***
	(0.194)	(0.268)	(0.275)	(0.194)	(0.169)	(0.197)	(0.334)	(0.183)
Observations	1330				764			
R-squared	0.18	0.21	0.22	0.32	0.25	0.26	0.27	0.43

*, **, *** denotes significance at 10%, 5%, 1%.
[a]Bootstrap standard errors in parentheses; Replications=1000.
[b]Robust standard errors in parentheses; OLS = ordinary least squares, included as reference.
Interquartile differences: Red: 25-75 (Age**; Medals**; Alcohol**; Blend***; Syrah**); 25-50 (Age***); 50-75 (Reserve*; Medals**; Blend*; Syrah*).
White: 25-75 (Age**; Sauvignon Blanc***); 25-50 (Alcohol*); 50-75 (Age**; Origin*; Blend*; Sauvignon Blanc**).

Table D4. Italy.

	Red				White			
	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]	25-quantile[a]	50-quantile[a]	75-quantile[a]	OLS[b]
Reserve	0.006	-0.008	-0.016	−0.004	0.039	0.019	-0.045	0.001
	(0.021)	(0.031)	(0.022)	(0.021)	(0.043)	(0.041)	(0.043)	(0.031)
Closure	-0.174**	-0.099	-0.031	−0.063	0.107**	0.128***	0.292**	0.148***
	(0.086)	(0.064)	(0.108)	(0.056)	(0.051)	(0.044)	(0.129)	(0.047)
Wine origin	-0.164***	-0.258***	-0.356***	−0.270***	-0.185***	-0.241***	-0.331***	−0.269***
	(0.028)	(0.023)	(0.049)	(0.021)	(0.019)	(0.029)	(0.034)	(0.022)
Age	0.060***	0.066***	0.073***	0.058***	0.057***	0.080***	0.099***	0.062***
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.008)	(0.007)
Awards or medals	0.254***	0.197***	0.176*	0.185***	-0.055	-0.056	-0.209	−0.036
	(0.087)	(0.071)	(0.105)	(0.056)	(0.045)	(0.041)	(0.131)	(0.048)
AlcCont	0.080***	0.081***	0.085***	0.097***	0.095***	0.098***	0.111***	0.118***
	(0.007)	(0.008)	(0.015)	(0.008)	(0.010)	(0.009)	(0.017)	(0.010)
Blend	-0.076***	-0.082***	-0.086***	−0.103 ***	-0.060***	-0.062***	-0.075***	−0.102***
	(0.012)	(0.014)	(0.015)	(0.013)	(0.010)	(0.020)	(0.027)	(0.017)
Cabernet Sauvignon	-0.100	-0.076	-0.086	−0.070				
	(0.073)	(0.067)	(0.054)	(0.046)				
Syrah	-0.059*	-0.100*	0.050	−0.017**				
	(0.033)	(0.054)	(0.103)	(0.045)				
Sauvignon Blanc					0.011	0.005	-0.095***	−0.072***
					(0.021)	(0.025)	(0.022)	(0.022)
Chardonnay					0.102***	0.051	-0.027	0.015
					(0.022)	(0.034)	(0.036)	(0.024)
Constant	-0.130	0.046	0.182	−0.103	-0.225*	-0.195*	-0.193	−0.337***
	(0.092)	(0.095)	(0.184)	(0.102)	(0.133)	(0.103)	(0.216)	(0.124)
Observations	1557				1246			
R-squared	0.24	0.25	0.22	0.38	0.29	0.34	0.38	

*, **, *** denotes significance at 10%, 5%, 1%.

[a]Bootstrap standard errors in parentheses; Replications=1000.

[b]Robust standard errors in parentheses; OLS = ordinary least squares, included as reference.

Interquartile differences: Red: 25-75 (Age***; Origin***); 25-50 (Age*; Origin***); 50-75 (Origin**); White: 25-75 (Reserve*; Age***; Origin***; Sauvignon Blanc***; Chardonnay***); 25-50 (Age***; Origin**); 50-75 (Age***; Origin***; Sauvignon Blanc***; Chardonnay***).

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Region of origin and perceived quality of wine: an assimilation-contrast approach

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Abstract. Wine quality perception involves both intrinsic and extrinsic attributes and is related to consumer liking and acceptability of a product. The main purpose of this paper is to evaluate the actual role of the region of origin cue on the experienced, expected, and perceived quality of wine, as well as on the discrepancies between them. Using an experimental design set up, real tasting sessions were applied to elicit consumer quality perception in three different information conditions: (1) blind tasting (2) labelled tasting (region informed evaluation); and (3) wine tasting under full information. In total, 136 wine consumers stated their preferences through liking score. The results from the assimilation-contrast framework show that region of origin affects the experienced, expected, and perceived quality, as well as the agreement between them. Thus, the region of origin may offer a good predictive value of the product, increasing the consumer expectations. These results have important implications for producers as they demonstrate that the region of origin may be used as a brand.

Keywords: Assimilation-Contrast approach, product quality, region of origin, wine.

1. INTRODUCTION

Increased competition between food suppliers, especially in terms of price and product differentiation [1], [2] has enhanced the complexity of the consumers' choice task.

The concepts of expected, experienced and perceived quality have been widely reported in the literature pertaining to food quality [3,4]. Cohen and Basu [5] defined expected quality as the expectation or belief regarding the anticipated performance of a product. It can then be compared with true evaluation of quality obtained through blind tasting, designated by experienced quality [6]. Perceived quality can be defined as the subjective response to several explicit features of a product and should be seen in relation to the perceptions and expectations of consumers [7]. In sum, consumer liking and acceptability of the product can be influenced by the available information which in turn affects expectations.

It is widely agreed that wine is one of the most differentiated products on the food market, where consumers have to choose from an extended product line with varying objective and subjective characteristics [8,9]. Wine perceived quality is influenced, simultaneously or successively, by non-sensory cues, and sensory cues when the product is tasted [3,4,10,11]. However, in a purchasing context, the intrinsic cues, such as sensory properties, are seldom available [12,13] and thus non-sensory cues tend to dominate the choice [15]. Many extrinsic cues, i.e. price, medals, ratings, region of origin, packaging, can affect consumers' choices by creating quality expectations.

Perrouty, et al. [16] showed how the region of origin is an extrinsic cue with added value to the consumers. In particular, existing literature supports that the expected quality of wine is strongly associated with the region of origin, which is the main extrinsic cue underlying choice (see for example [17-19]). Furthermore, the region of origin can play a direct effect in determining consumer behaviour, through the effective linkage between trust and authenticity [20–22]. For Madureira and Nunes [23] and Pettigrew and Charters [24] the influence of information on the region of origin depends on consumer's knowledge level, gender, and economic status. Empirical studies have revealed that expected quality and experienced quality may not match, showing differences between blind evaluations and extrinsic cue evaluations [3,6,25]. Also, the mismatch found between expected and perceived quality is generally understood as "disconfirmation of expectation" which meaning can depend on the sensory evaluation of wine, but also on its extrinsic cues. In this vein, the present research intends to measure the role of the region of origin cue on the experienced, expected, and perceived quality of wine, as well as on the discrepancies between them. Applying the conceptual framework of expectancy disconfirmation [26,27] this study empirically investigates whether there is a dissonance between perceived, expected and experienced quality among three Portuguese wine regions of origin (Douro, Dão and Alentejo) with different levels of notoriety and image content [28]. Furthermore, the influence of the consumer's knowledge level of wine in both experienced and perceived quality is analyzed. The novelty of the approach developed derives from the elicitation of the perceived quality obtained through real tasting sessions applied in 5 Portuguese geographical locations, using a specific experimental design based on hedonic evaluations under different information conditions. The next section presents the theoretical background and the research hypotheses.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

Experienced quality of food product depends on sensory characteristics, while perceived quality is also influenced by extrinsic cues, on the other hand expected quality depends crucially on extrinsic cues. When a product is consumed, expectation and sensory experiences are combined into a global product evaluation, designated as perceived quality [3,6].

Anderson [26] seminal work, proposed four psychological theories to explain the effect of the difference between the expected quality and the overall perceived product quality: (1) cognitive dissonance (assimilation); (2) contrast; (3) generalized negativity; and (4) assimilation-contrast. Dissonance or assimilation theory assumes that any discrepancy between expected quality and the perceived quality will be minimized or assimilated by a consumer adjustment of the evaluation of the product to be more consistent (less dissonant) with his expectations. This theory argues that an unconfirmed expectancy generates a state of dissonance or "psychological discomfort" given that the outcome contradicts the consumers' original hypothesis. Based on this proposition, the extrinsic attributes of a product should substantially lead to expected quality above perceived quality. In this case, the consumer receives two perceptions that are psychologically dissonant and attempts to reduce this mental discomfort by changing or distorting one or the two perceptions to make them more consonant [6,29]. Several criticisms emerged, especially because this theory assumes that the consumer instead of learning from his purchasing mistakes, increases the probability of making them again as he tries to reduce post-purchase dissonance by justification and rationalization of his decisions [26,30]. Contrast theory (2), argues that if the perceived quality of the product fails to meet the expected quality, the consumer will assess the product less favorably than if he had no prior expectations for it. In this sense, contrast theory assumes that the surprise effect or the contrast among expectations and evaluation will lead to exaggerate or magnify the disparity. Thus, contrast and assimilation theories predict opposing effects [26,30]. The third theory argues that any discrepancy between expected and perceived quality leads to a generalized negative hedonic state, in which the product will receive a more unfavorable rating than if it had coincided with expectations. Following this theory, even if perceived quality exceeds the experienced quality, the product will be perceived as less satisfying than its perceived quality would justify [26]. Finally, the assimilation-contrast theory (4), as the name

implies, combines the theories of assimilation (1) and contrast (2). This theory suggests that there are zones of acceptance, rejection, and neutrality in consumer perception. Therefore, if the disparity between expected quality and perceived quality is sufficiently small to fall into the zone of acceptance, consumers tend to assimilate the difference, rating the product more in line with expected quality than with perceived quality (assimilation effect). On the other hand, if the discrepancy between expected quality and perceived quality is too large that it falls into the zone of rejection, the consumer will tend to increase the perceived disparity between expected and perceived quality (contrast effect). Thus, an assimilation or contrast effect arises as a function of the relative disparity among expected and perceived quality [6,26, 29–31].

This conceptual framework is widely applied by marketing managers to study consumer satisfaction and the likelihood of purchase [6, 29]. Most empirical studies have shown that matching between expected, experienced and perceived quality is not a rule, and that the size of the discrepancy among expected and perceived quality may determine consumers' final behavior. Several authors call these discrepancies as "disconfirmation of expectations" [31–33]. The analysis of the competing theories requires the elicitation of consumers' perception of quality and acceptance, for which different approaches have been used: hedonic scores [25,34,35] incentive compatible mechanisms such as auctions [36–38] and a combination of hedonic scores and auctions [11,18, 39–41].

The application of the assimilation-contrast theory to analyze the effect of a region of origin on expected quality and therefore its strength [3,6,18], lead to the formulation the following research hypotheses:

a. The sensory perception of a wine is influenced by the knowledge of the region of origin;
b. The region of origin significantly affects the experienced quality;
c. The region of origin significantly affects the expected quality;
d. The region of origin significantly affects the perceived quality;
e. The region of origin significantly affects the differences between expected and experienced quality;
f. The region of origin significantly affects differences between perceived and experienced quality;
g. The consumers' wine knowledge type significantly affects experienced and perceived quality.

To test the research hypotheses, hedonic scores under different information conditions were gathered: (1) blind tasting (evaluates the intrinsic features of wine and provides a measure of experienced quality); (2) the evaluation of region of origin information (a measure of expected quality based on a wine region); and (3) wine tasting under full information (a measure of perceived quality). Moreover, specific indicators to test the assimilation-contrast theory were computed (see appendix for a detailed description).

3. MATERIALS AND METHODS

3.1 Experimental design and procedure

Following the approach adopted by D'Hauteville et al. [3], Kokthi and Kruja [6], and Stefani et al. [18], the hedonic scores were collected through real tasting applying an experimental design replicated over six sessions in five Portuguese regions (Figure 1).

The tasting session asked participants to evaluate red wines from three Portuguese wine regions (Douro, Dão and Alentejo) under different information conditions (blind evaluation; region informed or labelled evaluation; full information). In each session, two Scenarios were carried (A and B). Each participant took part in only one Scenario. The procedure started with a brief explanation of the research goals and tasks to be performed. In case of agreement, the participant signed an informed consent form and was endowed with a gift

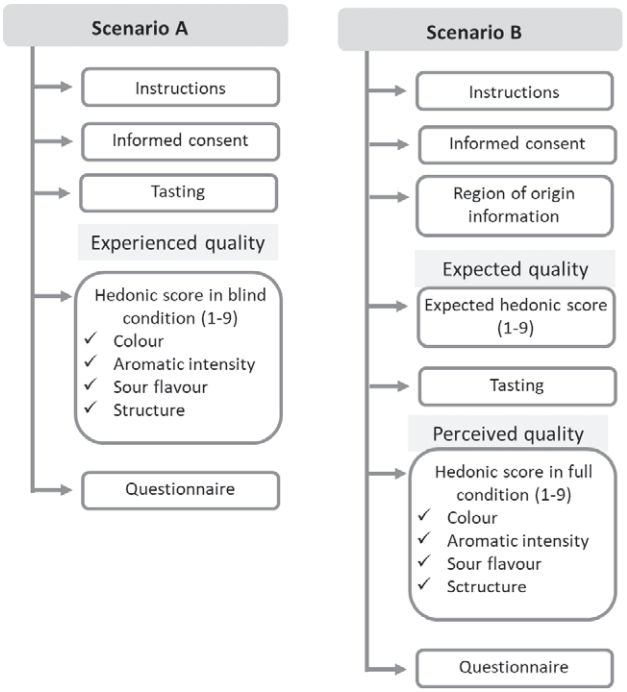

Figure 1. Summary of experimental protocol.

card as an incentive. To minimize session effects, the instructions were read aloud by the same experimenter in all sessions. Each red wine sample (30 mL) was served in standard glasses and identified with a three-digit code randomly assigned. The presentation order of wines was randomized across sessions according to a Williams' Latin square design, balanced for order and first carry-over effects [6]. The full set of six possible combinations was used. In Scenario A – blind Scenario, participants were asked to evaluate the wines on a hedonic scale using a 1-9 Likert scale (1= dislike extremely to 9= like extremely) and to evaluate the intrinsic attributes for each wine sample(colour, aromatic intensity, sour flavour, and structure).

In Scenario B- informed Scenario, participants received information about the region of origin before the expectation test liking score was obtained. Then, participants were invited to taste each wine and evaluate it using a 1-9 Likert scale (1= dislike extremely to 9= like extremely). Participants were also asked to assess intrinsic attributes as in Scenario A (Figure 1).

Finally, both Scenarios included a questionnaire to collect information regarding: i) socio-demographics; ii) wine consumption and purchasing habits; ii) objective wine knowledge; iii) subjective wine knowledge, following previous studies on wine consumer behaviour [42]. To identify objective knowledge, Forbes, Cohen, & Dean (2008) test was used (Table 1 reports the specific questions posed and the alternative answers, identifying in italics the correct option). Moreover, to assess subjective knowledge, Flynn and Goldsmith [43] eight-item measure was used. In addition, the two six-item measures proposed by Flynn et al. [44] were applied to measure opinion leadership and opinion seeking.

Table 1. Objective wine knowledge test.

Question	Answer choice (correct choice in italics)
Which of the following is a grape of red wine?	Alvarinho Chardonnay *Touriga Nacional* Loureiro Don't know
A peppery character is most associated with which wine?	Merlot *Shiraz/Syrah* Semillion Pinot Noir Don't know
Which is not a famous French wine region?	Bordeaux Champagne *Rheingau* Alsace Don't know
Which is the most appropriate designation for port wine?	Still wine *Fortified wine* Sparkling wine Lat Harvest wine Do not know
In 2017, which was the largest producer (in quantity) of wine at European level?	Spain Portugal *Italy* France Do not know

Selection of region of origin and wine

Portugal is typically associated with wine production and consumption. In 2019, it was the 2nd largest wine consuming country among European countries [45].

Historically, wine production in Portugal is structured in 13 demarcated mainland wine regions, where wine can be sold as a certified product (see map of Portugal's Wine Region in Silva et al. [46]). This certification represents a signal of perceived quality for the consumer, although there are differences as to how the wines connect to the winemaker and contribute to the local economy [47]. In 2018, 62% of still wine consumed in Portugal was red wine [48]. Comparing the market share (in volume and value) of still wines by the thirteen Portuguese wine regions, in 2018 (Figure 2), Alentejo and Douro regions were the most important contributors for total sales in value. However, the Douro region contributed significantly less for total sales in volume.

For each wine-producing region under evaluation (Dão, Douro, Alentejo), the wine was selected according to the following criteria: to have an average price in the middle range of the Portuguese off-trade channel (5€ - 12€), the same vintage (2017), and to possess a similar alcohol content. Furthermore, a specialist wine consultant firm was recruited to select a wine from each wine region that fulfilled these criteria. Table 2 shows the main characteristics of the three wines selected to taste.

Participants

One hundred and thirty-six red wine consumers living in different Portuguese wine regions of origin participated in this study. A consulting firm recruited the participants, based on the following criteria: (1) Portuguese native speakers; (2) to have a good general state of health (self-reported); (3) to have some experience in choosing wine; (4) regular still wine consumers; and (5) to have 35 or more years old (according to Bruwer et al. [49], and Wolf et al. [50], older consumers have more experience choosing and consuming red wine).

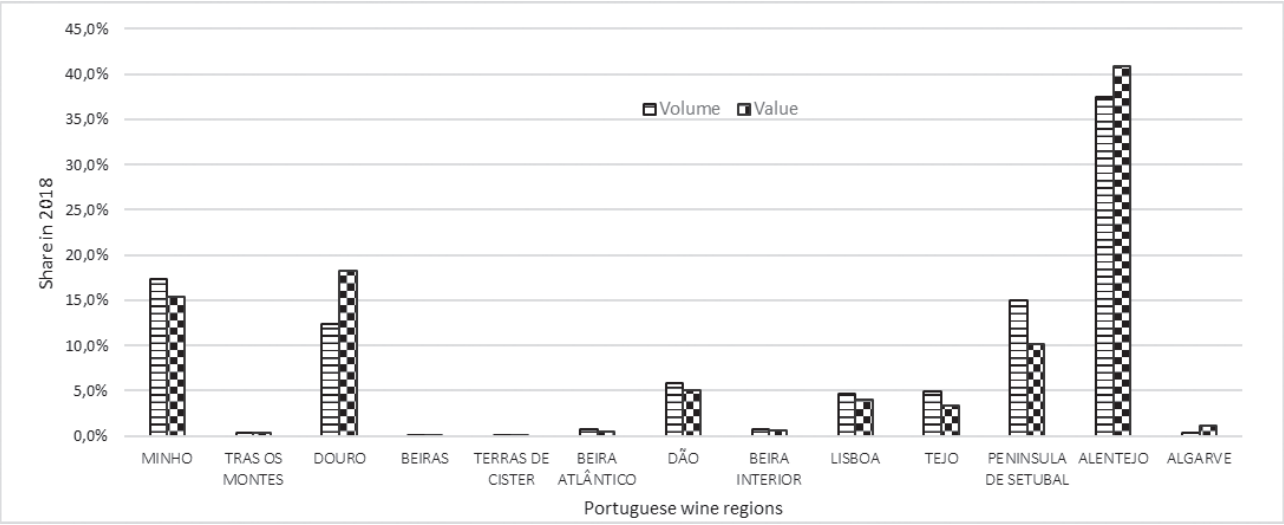

Figure 2. Market share (in volume and value) of still wines by thirteen Portuguese wine regions, 2018, Source: IVV [48].

Table 2. Main characteristics of the three wines selected to taste.

Region of origin	Douro	Dão	Alentejo
Grape variety	*Touriga Nacional*, *Tinta Roriz* and Touriga *Franca*	*Touriga Nacional, Tinta Roriz, Alfrocheiro and Jaen*	*Trincadeira* and *Aragonez*
Alcohol Content	13,5%	13%	14%
Year	2017	2017	2017
Type of bottle	Bordeaux	Burgundy	Bordeaux
Colour of bottle	Black	Black	Black
Geographical indication	PDO	PDO	PDO
Price (€/bottle) *	7 €	6 €	9 €

*Mean price off-trade; PDO: Protected Designation of Origin.

3.2 Data analysis

Participants' characterization

Participants' characteristics were analysed using univariate descriptive statistics for socio-demographics, wine consumption and purchasing habits, self-reported knowledge, subjective knowledge, opinion leadership, and opinion-seeking behaviour. For objective knowledge, a single score of individuals was determined depending on whether participants answered correctly or not the five multiple-choice items that make up the scale. To investigate the psychometric properties of these measures, a principal component factor analysis with a varimax rotation was performed [43,51]. To identify the wine knowledge types, median splits for objective and subjective knowledge measures were determined: participants with scores above the median on each measure were classified as "high" while the other participants were classified as "low" [51]. The resulting four consumer wine knowledge types were identified and labelled as show in Figure 3.

Hedonic evaluation

To explore the direct impact of the region of origin, we analyzed the difference between the evaluation of intrinsic cues (colour, aromatic intensity, acid taste, and structure) and the hedonic scores for each wine. To interpret how hedonic score was affected by region of origin information several indicators were calculated, according to Table A2 in the Appendix.

Furthermore, we investigate the impact of consumers' knowledge level on experienced and perceived quality. For this, a Kolmogorov-Smirnov test was performed to test the statistical significance of positive and negative differences between the blind test liking score (experienced quality) and the full information test liking score

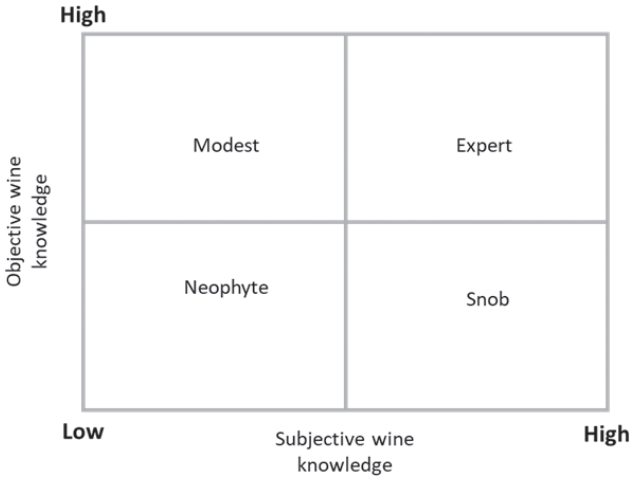

Figure 3. Wine knowledge types. Source: Adapted from Ellis and Caruana [51].

(perceived quality). Statistically significant differences were signalled at the confidence level of 95%.

4. RESULTS AND DISCUSSION

Sample description

Participants' profile is reported in Table 3. Concerning the socio-demographic characteristics, participants' mean age was 44,3 years (SD=8,63 years), 52% of participants were women, household average size (over 18 years old) was 2,27 individuals (SD=1,13), 87% stated to have a higher education level and 43% earn a monthly household income between 581€ and 1 500€. Regarding the purchasing and consumption behaviour, 49% of participants drink wine several times per week, 77 % stated to buy mainly wine from the Douro region, and 50% stated to spend 4,99€ per week on wine. The majority (74%) prefer to buy wine in the supermarket. Comparing participants' profiles between Scenario A and B, at a significance level of 5%, there are no significant statistical differences for all variables, except for monthly purchasing of wine. It is thus possible to compare Scenario effects between the two groups [52].

To classify participants into the four types of wine knowledge proposed by Ellis and Coruana [51] we first investigated the validity of the measures of the 20 items making up the three constructs in study (subjective knowledge, opinion leadership and opinion seeking) through a principal components factor analysis by applying a varimax rotation. Table 4 shows as each item is loaded separately and distinctively onto four factors. Two items for the opinion leadership measures and one item for the subjective knowledge were excluded to improve model robustness, increasing the explained variance to 68%.

Table 3. Participants' profile description.

	Relative Frequency		Total	p-value
	Scenario A (N= 71)	Scenario B (N=65)		
Gender				0,128
Women	57,7	44,6	51,5	
Men	42,3	55,4	48,5	
Education level				0,407
5-9 years	2,8	1,5	2,2	
10-12 years	12,7	9,2	11	
Higher Education	84,5	89,2	86,8	
Household monthly income				0,100*
< 580 €	0	3,1	1,5	
581 €- 1 500 €	42,3	44,6	43,4	
1501 € - 2 500 €	33,8	27,7	30,9	
2501 € - 3 500 €	18,3	16,9	17,6	
3501 € - 4 500 €	1,4	7,7	4,4	
> 4 501 €	4,2	0	2,2	
Wine consumption frequency				0,075*
Never	4,2	4,6	4,4	
Once	28,2	38,5	33,1	
Several times	47,9	49,2	48,5	
Every day	19,7	7,7	14	
Wine region of origin that most buys				0,696
Verdes	1,4	3,1	2,2	
Douro	78,9	75,4	77,2	
Dão	8,5	7,7	8,1	
Lisboa	2,8	1,5	2,2	
Alentejo	8,5	12,3	10,3	
Monthly purchasing of wine (bottle)				0,047**
1 or less	36,6	49,2	42,6	
2 to 3	33,8	35,4	34,6	
4 or more	29,6	15,4	22,8	
Weekly spending of wine				0,161
≤ 4,99 €	45,1	55,4	50	
5,00 € - 9,99 €	39,4	33,8	36,8	
10,00 € -14,99 €	5,6	6,2	5,9	
15,00 € -49,99 €	8,5	4,6	6,6	
≥ 50,00 €	1,4	0	0,7	
Place of purchase				0,097*
Hypermarket	71,8	75,4	73,5	
Wine Store	11,3	13,8	12,5	
Producer	16,9	10,8	14	

Notes: *** p<0,001; **p<0,05; *p<0,1.

Table 4. Results of principal components factor analysis followed by varimax rotation.

	Components			
	1	2	3	4
(1) I feel quite knowledgeable about wine	0,848			
(2) Among my friends, I am one of the 'experts' on wine	0,790			
(4) I know pretty much about wine	0,724			
(5) I do not feel very knowledgeable about wine (R)	0,720			
(7) When it comes to wine, I really do not know a lot (R)	0,714			
Cronbach's α	0,99			
(16) I do not need to talk to others before I buy a wine		0,820		
(17) I rarely ask other people what wine to buy		0,809		
(15) When I consider buying wine I ask other people for advice (R		0,753		
(18) I like to get others' opinions before I buy a wine (R		0,704		
(20) When choosing wine, other people's opinions are not important to me		0,659		
Cronbach's α		0,89		
(9) My opinion on wine seems not to count with other people			0,885	
(10) When they choose a wine, people do not turn to me for advice			0,760	
(11) Other people rarely come to me for advice about choosing wine			0,667	
(6) Compared to most other people, I know less about wine			0,560	
Cronbach's α			0,86	
(13) I often persuade other people to buy the wine that I like				0,874
(14) I often influence other people's opinions about wine				0,870
(12) People that I know pick wine based upon what I have told them				0,717
Cronbach's α				0,84

The findings indicate a cross loading for item six of Flynn and Goldsmith [43] proposed measure. In other words, the item related to the opinion leadership is placed on the subjective knowledge measure. This result can be explained by the relationship between the two measures, as subjective knowledge involves opinion seekers. Vigar-Ellis et al. [42] also found cross loading among factors and items with poor loading. The results show a division of the opinion leadership measure into two constructs, with a leading opinion relationship, the negative opinion leader and the positive opinion leader. However, the computation of Cronbach alpha supports the convergent and discriminant validity of the constructs (the Cronbach alpha score for all measures exceed 0,7, providing support for internal consistency, as stated by Nunnally [53].

Regarding the measurement of objective wine knowledge, each question was evaluated as either correct (1 mark) or incorrect (0 mark). The scores for the objective knowledge ranged from 0 to 5, with an average value of 2,60 (SD=1,06). Based on the marks, the sample was split into four segments using subjective and objective knowledge results of participants, according to Figure 3. This resulted in 93 of the participants being classified as "Neophytes" (low subjective-low objective), 25 as "Modest" (low subjective-high objective), 14 as "Snobs" (high subjective- low objective), and only 4 as "Experts" (high subjective-high objective).

Table 5 reports the results by consumers' knowledge type, regarding the importance of information on consumers' choice [11,36]. For all consumer segments, the most important wine cue is the region of origin. Environmental certification appears as indifferent for all knowledge types. Neophytes give more importance to front label design and medals/awards, while Experts ascribe more importance to information as grape variety, winemaker, expected quality price ratio, recommendation, previous experience and brand. Comparing the Modest with the Snobs, Snobs give more attention to the quality-price ratio, alcohol content, wine history, brand, and front label design. Moreover, the distribution of the importance of information across knowledge types is statistically different (p-value <0,05) for bottle shape, wine history, winemaker, brand, and medals/awards. In general, these results corroborate those in the literature for the four wine knowledge types [42,54].

Impact of origin region on Hedonic score

To assess the impact of the region of origin on the scores ascribed by participants to the features colour, aromatic intensity, acid taste, structure, and overall hedonic scores in two information conditions (blind tasting and full information) a between means unpaired test (Z- Wilcoxon test) was performed (Table 6). Results show that, in general, participants value more the wine attributes when they have previous knowledge about the region of origin (Scenario B) than in the blind information condition (Scenario A).

For the four intrinsic attributes under evaluation, statistically significant differences were found for colour and acid taste (Alentejo wine) as well as aromatic intensity (Douro wine). Thus, intrinsic attributes such as colour, acidity, and aromatic intensity were perceived dif-

Table 5. Mean importance score of information seek by consumers' knowledge type.

	Mean score Consumers knowledge type				Kruskal-Wallis test p-values
	Neophytes	Modest	Snobs	Experts	
Region of origin	6	6	6	6	0,406
Sensory profile	5	5	5	5	0,426
Food pairing	5	5	5	5	0,446
Environmental certification	4	4	4	4	0,051*
Grape variety	3	5	5	6	0,444
Front label design	6	3	4	3	0,132
Bottle form	5	4	4	3	0,024**
Wine history	4	4	5	5	0,000***
Winemaker	3	5	5	6	0,000***
Brand	4	5	6	6	0,005**
Medals/awards	6	5	5	4	0,038**
Expected quality-price ratio	5	5	6	6	0,703
Recommendation	5	5	5	6	0,445
Alcohol content	4	4	5	5	0,271
Qr code	3	4	4	4	0,051*
Previous experience	5	5	5	6	0,659

Importance level on a scale of one to seven with one equal to *No at all important* and seven equal to *Extremely important;*
*** p<0,001; **p<0,05; *p<0,1

ferently, depending on the region of origin information (Table 6).

Comparing the means of hedonic scores by Scenario and by region of origin, there is a valorization of all regions of origin (Table 6), i.e, the information on the region of origin increases the hedonic scores. In blind tasting (Scenario A), consumers assign the highest mean hedonic score to Douro wine. However, in the full information condition, the Dão wine achieved the highest mean hedonic score. Differences between information Scenarios are statistically significant for Alentejo and Dão wine at p value < 0,05. These results can be explained by the general idea among wine Portuguese consumers of an overvalued Alentejo wine region, as well as Dão wine region. According to IVV [48], in volume, the Alentejo wines were the most consumed in Portugal, representing 37,4 % of total sales, 73,1% through the retail channel. On the other hand, for Douro wine, the differences were not statistically significant between both scenarios (at a significance level of 5%). Consumers follow the same hedonic assessment with or without information about the region of origin. In 2018, Douro wine represented 12,4 % of total sales, in volume, mainly (68%) in restaurants [48]. The hypothesis that sensory perception of the wine is influenced by the knowledge of the region of origin was supported by the results, reinforced by the need of tasting in hedonic evaluation to avoid individuals' assumptions about the perceived quality of the products [55, 56]. Stefani et al. [18]and D'Hauteville et al. [3] found a similar behaviour when investigating the impact of region of origin on hedonic score. The hedonic score expressed in the full information scenario is higher than the hedonic score obtained under blind test condition. Furthermore, Masson et al. [12] and Vecchio et al. [57] demonstrate the influence of extrinsic cues (i.e. low-alcohol wien and process impacts) on the sensory perception. In same line, these authors show that the sensory perception of a wine is influenced by the knowledge of the extrinsic cue.

Assimilation and Contrast effects

To test the assimilation and contrast effects six indicators were computed: Expected quality – Experienced quality; Perceived quality – Experienced quality; Perceived quality – Expected quality; Assimilation effect (α); Moderating effect of information (MI); and Dissonance effect (DI). According to the results reported in Table 7, a statistically significant difference between expected quality and experienced quality was found for

Table 6. Mean values of hedonic scores with blind tasting (Scenario A) and with full information (Scenario B) for the three wines.

Attributes	Region of origin		
	Douro	Alentejo	Dão
Colour A	3,68	3,18	3,65
Colour B	3,57	3,54	3,74
Colour B-Colour A	-0,11	0,36**	0,09
Aromatic intensity A	3,21	3,18	3,35
Aromatic intensity B	3,49	3,43	3,48
Aromatic intensity B- Aromatic intensity A	0,28**	0,25	0,13
Acid taste A	3,18	3,54	3,28
Acid taste B	3,40	3,25	3,3
Acid taste B-Acid teste A	0,22	-0,29*	0,02
Structure A	3,27	3,18	3,38
Structure B	3,35	3,28	3,31
Structure B-Structure A	0,08	0,1	-0,07
Hedonic score A	6,55	5,96	6,18
Hedonic score B	6,82	6,89	7
Hedonic score B- Hedonic A	0,27*	0,93**	0,82**
Nº Obs. Scenario A	71	71	71
Nº Obs. . Scenario B	65	65	65

Attribute A = score attribute mean with blind tasting; Attribute B= score attribute mean with full information.
***Statistically significant at p-value<0,01; **Statistically significant at p-value<0,05;
*Statistically significant at p-value<0,1

the three regions of origin. In other words, the score of expected quality was slightly above the experienced quality in blind tasting, indicating the non-confirmation of expectations for each wine tested and the region of origin effect on consumers' preferences.

The mean of disagreement between the expected quality and experienced quality was higher for Alentejo wine, with a dissonance (DI) value of 24%. On the other hand, for Douro wine the DI value is only 7%, suggesting that the effect of region of origin is not homogeneous. These findings are in line with the results reported in Stefani et al. [18], D'Hauteville et al. [3] and Masson et al. [12].

The effect of assimilation or contrast is significant and positive for the three wines under study (Table 7). The region of origin information affects the overall wine evaluation increasing the mean of liking ratings. Especially, for Alentejo wine, the information about the region of origin leads to a 16% increase in experienced quality. Thus, the findings suggest that there is an assimilation effect for the three regions of origin under analysis.

The results reveal statistically significant differences between full information conditions and expectated evaluation (Table 7). For the three wines, the liking scores decreased in full information conditions, showing that the product did not meet the expectations. This effect is greatest for Alentejo wine, the least appreciated in sensorial terms. In other words, there is a positive partial assimilation or negative disconfirmation of expectations for the three regions of origin. These findings suggest that the wines are less tasty than the average participants' expectancy, probably because participants expected better, given some recognized regions of origin, as explained by Lange et al. [40].

Regarding the assimilation coefficients (α), the three wines reported a coefficient higher than 0,5, indicating the predominant effect of region of origin on the overall evaluation of the wine. Overall results confirm that perceived quality depends on the expectation of the region of origin, as reported by Kokthi and Kruja [6] and Vecchio et al. [57]. Furthermore, these results confirm the empirical evidence found in previous research that sensory cue by itself is not a discriminative of consumers' evaluation [18].

Assimilation-contrast theory helps to understand the differences that may exist in terms of the strength

Table 7. Computed indicators by region of origin.

Indicators	Region of origin		
	Douro	Alentejo	Dão
Expected quality – Experienced quality	0,45***	1,44***	1,22 ***
Perceived quality – Experienced quality	0,27*	0,93**	0,82***
Perceived quality – Expected quality	-0,18***	-0,51***	-0,40 **
Assimilation coefficients (α)	0,60 >0,5	0,65>0,5	0,67 >0,5
Moderating effect of information (%)	4	16	13
Dissonance effect (%)	7	24	20
Assimilation/Contrast effect	Partial Positive Assimilation	Partial Positive Assimilation	Partial Positive Assimilation

***Statistically significant at p-value<0,01; (z-Wilcoxon test).

of the region of origin on the wine [57]. Based on this theory, the results suggest that if the disparity between expected quality and perceived quality is sufficiently small to fall into the zone of acceptance, the consumers tend to partly assimilate the difference. Therefore, the hypotheses that the region of origin significantly affects experienced, expected, and perceived quality are supported. Also, these results confirm that the region of origin significantly affects differences between expected and experienced quality; and the differences between perceived quality and experienced quality.

In sum, these results highlight the effect of region of origin information on wine consumers' preferences. Previously, several authors have shown that the wine evaluation is influenced by both intrinsic cues (as taste) and extrinsic cues (as region of origin or brand), which affect the perceived quality of the wine [34,58–60]. On the other hand, Masson et al. [12] and Vecchio et al. [57] applied the assimilation-contrast theory to study the effect of other extrinsic cues, such as low-alchol and process impact, respectively, on wine perceived quality. The results of this study are in line with previous research findings, however, few studies have applied the assimilation-contrast theory to investigate the effect of region of origin on wine's perceived quality [3,18], as developed here.

Impact of wine consumers' knowledge type on experienced and perceived quality

To investigate the difference of experienced and perceived quality across consumers' wine knowledge type, a Kolmogorov-Smirnov test was performed (results for Experts are not reported as only one subject belongs to this category). Table 8 shows that only Neophytes present statistically significant differences between experienced and perceived quality. Comparing the hedonic score distribution for the three wines, statistically significant differences were found only for the Alentejo wine. The results indicate that this group ascribes higher hedonic scores for Alentejo wine in blind tasting (experienced quality). Following the distinctions discussed by Ellis & Caruana [51] for the different consumer knowledge types, Neophytes recognize that they know very little about wine, but like to consume wine. A basic product with low prices and intensively distributed will likely be the most sought by this segment of consumers. Thus, a feasible reason for the results obtained is the familiarity of the consumers to certain sensorial profile, responding more to brands than to the region of origin. In this context, the hypothesis that wine consumers' knowledge type has significant effects on experienced and perceived quality was partially verified. This result is in line with those reported in previous literature [3,12,57].

Table 8. Distributions of hedonic scores by consumer knowledge type between two informational Scenarios (blind tasting and complete information).

Consumer knowledge type[1]	Region of origin	Hypotheses[2]	Kolmogorov- Smirnov Z (p-values)
Neophytes	Douro	hs(EQ)<hs(PQ)	0,976
		hs(EQ)>hs(PQ)	0,644
	Alentejo	hs(EQ)<hs(PQ)	0,008**
		hs(EQ)>hs(PQ)	1,000
	Dão	hs(EQ)<hs(PQ)	0,990
		hs(EQ)>hs(PQ)	1,00
Modest	Douro	hs(EQ)<hs(PQ)	0,826
		hs(EQ)>hs(PQ)	0,877
	Alentejo	hs(EQ)<hs(PQ)	0,476
		hs(EQ)>hs(PQ)	1,000
	Dão	hs(EQ)<hs(PQ)	0,168
		hs(EQ)>hs(PQ)	1,000
Snobs	Douro	hs(EQ)<hs(PQ)	0,743
		hs(EQ)>hs(PQ)	0,953
	Alentejo	hs(EQ)<hs(PQ)	0,898
		hs(EQ)>hs(PQ)	0,953
	Dão	hs(EQ)<hs(PQ)	0,898
		hs(EQ)>hs(PQ)	0,497

**Statistically significant at p-value<0,05; *Statistically significant at p-value<0,1.
[1]The expert knowledge consumer group is composed of only one individual, thus the group is absent from the table.
[2]EQ=Experienced quality; PQ=Perceived quality.

A summary comparison table of our results and those from previous literature is presented in the appendix (Table A3).

5. CONCLUSION

The region of origin cues influence the consumer evaluation of food products as far as it can act as a quality cue to other features of the good and/or it can affect the liking of food through its symbolic or affective meaning. This is especially important for wine as it is an information-intensive product offering multidimensional decision challenges for consumers.

Understanding the strength of region of origin on perceived quality of wine, and how it varies across market segments is essential for the design of successful marketing strategies.

Considering three Portuguese wine regions of origin, the present study provides empirical evidence that

attest the impact of the region of origin on consumers' preferences, namely that it affects the expected, the experienced and the perceived quality of the wine. It also shows that consumers' knowledge provides a useful basis for segmenting the wine market, which reinforces the bet on the characterization of consumers by wine marketers. The Neophytes segment shows hedonic sensitivity to positively evaluate a known sensory profile. However, further research is required to test the responses of the segments to other marketing mix variables. Additionally, a predominant effect of region of origin on the overall evaluation of the three wines was found.

This paper supports important findings with respect to the relationships between expected quality of region of origin and its market strength. In the full information condition, participants decreased hedonic rating of all regions of origin, especially for Alentejo, which presented the highest percentage of dissonance. This suggests that the Alentejo region has a brand in the market that leads to higher consumer expectations. On the other hand, for other regions, Dão and Douro, investments should go to brand construction.

Moreover, the paper sheds light on the role of the region of origin in moderating the impact of experienced quality on consumers' preferences. In particular, it emerged that each region of origin is perceived differently according to its strength in the wine market. In light of this, intensive advertising and communication strategies can help to enhance the region of origin as a brand in the market thus improving the perceived quality of its wine.

The results reported in this study need to be considered in light of its limitations. Part of our results may depend on the choice of wines, although we controlled the selection criterion to obtain a representative sample. In this line, further research needs to be carried using authentic consumption situations, including other marketing mix variables and other wine regions.

Several practical implications derive from these findings. Wine producers should carefully transmit the information and the specific product features, both in terms of sensory profile and in terms of market reputation. Moreover, wineries could run information campaigns to communicate differences in sensory profile between regions of origin. In future research, it is crucial to investigate more deeply specific sensory attributes that influence wine consumer preferences, affect the perceived wine quality with a special focus on specific consumer segments.

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APPENDIX

According to Schifferstein [31] there are three ways to elicit sensory and non-sensory quality preferences depending on the information set available: blind test liking score (B – experienced quality: no information); expectation test liking score (E- expected quality: provision of non-sensory information) and full information test liking score (F-perceived quality: provision of non-sensory and sensory information). The difference between perceived quality and expected quality is designated as degree of disconfirmation; if expected quality is compared to experienced quality the degree of incongruence can be computed. Finally, comparing the perceived quality with experienced quality, the degree of response shift is computed. Schifferstein [31] proposes the analysis of ratio α, equal to the degree of response shift over the degree of incongruence, translating the assimilation effect. The assimilation-contrast theory can be interpreted as a mechanism by which the individuals try to adapt psychologically to their environment [61]. Table A1 summarises the different assimilation and contrast effects. Assimilation is absent (α equal to zero) when there is no discrepancy between expected quality and perceived quality. On the other hand, there is an assimilation effect (positive or negative) whenever that change of perceived quality is in the same direction of expected quality; while contrast effect (positive or negative) occurs when the change of perceived quality moves in the opposite direction of expected quality [6].

Table A1. Assimilation and Contrast effects.

Perception (Information conditions)	Assimilation			Contrast	
	Partial Positive	Partial Negative	Complete Assimilation	Positive	Negative
Expected quality – Experienced quality (E-B)	>0	<0	>0	>0	<0
Perceived quality – Experienced quality (F-B)	>0	<0	>0	<0	>0
Perceived quality – Experienced quality (F-E)	<0	>0	0	>0	<0

Notes: B -Blind test liking score; E -Expectation test liking score; F -Full information test liking score.

Table A2. Hedonic score differences tested.

Indicators	Application	Data analysis
Expected quality – Experienced quality	Expectation test liking score (**E**) - Blind test liking score (**B**)	– It is calculated to identify the effect of region of origin information on consumers preferences. – There are effects of region of origin on consumers preferences if E -B >0
Perceived quality – Experienced quality	Full information test liking score (**F**) - Blind test liking score (**B**)	– It is calculated to identify if there is assimilation or contrast effect – It shows to what extent product information (region of origin + sensory test) affects hedonic scores.
Perceived quality – Expected quality	Full information test liking score (**F**) - Expectation test liking score (**E**)	– It is calculated to identify if assimilation is partial or full; – There is complete assimilation if F-E=0.
Assimilation coefficients (α)	$\alpha = \frac{\text{Perceived quality – Experienced quality (F-B)}}{\text{Expected quality – Experienced quality (E-B)}}$, $0 \leq \alpha \geq 1$	– if α< 0,5, then sensory features are the most important in the product evaluation; – if α> 0,5 region of origin is preferable to sensory features.
Dissonance effect (DI)	$DI(\%) = \frac{\text{Expected quality – Experienced quality (E-B)}}{\text{Experienced quality (B)}} * 100$	– It measures the distance among expected quality and experienced quality as a percentage from the baseline outcome experienced quality
Moderating effect of information (MI)	$\alpha = \frac{\text{Perceived quality – Experienced quality (F-B)}}{\text{Experienced quality (B)}} * 100$	– It measures the average effect of information, as a percentage from the experienced quality on the perceived quality

Table A3. Assimilation-Contrast theory findings: comparison by wine evaluation' studies.

	Present paper	Stefani *et al.* [18]	D'Hauteville *et al.* [3]	Masson *et al.* [12]	Vecchio *et al.* [57]
Characteristics of study					
Extrinsic cues under evaluation	Region of origin	Region of origin	Region of origin	Low-alcohol wine	Process impacts
Main Results					
The sensory perception of a wine is influenced by the knowledge of the extrinsic cue (i.e., region of origin)	✓	✓	✓	✓	✓
The extrinsic cue under evaluation (i.e., region of origin) significantly affects the experienced quality	✓	✓	✓	✓	✓
The extrinsic cue under evaluation (i.e., region of origin) significantly affects the expected quality	✓	✓	✓	✓	✓
The extrinsic cue (i.e., region of origin) significantly affects the perceived quality	✓	✓	✓	✓	✓
The extrinsic cue (i.e., region of origin) significantly affects the differences between expected quality and experienced quality	✓	✓	✓	✓	✓
The extrinsic cue (i.e., region of origin) significantly affects differences between perceived quality and experienced quality	✓	✓	✓	✓	✓
The consumers' wine knowledge type significantly affects experienced and perceived quality	✓	n.a.	✓	✓	✓

n.a.: not application; ✓: Supported.

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Masters of Wine on Twitter: presence, activity, impact and community structure

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Abstract. Globalisation, the Internet and social media have changed the kind of actors with influence in the wine industry and the way these actors create signals to communicate credible information about experience and trust attributes. Among the most prestigious experts in the world of wine are the Masters of Wine (MW). Although initially devoted to international trade, they have spread their activities and their opinion is more and more appreciated by producers and consumers. The main objective of this article is to determine this community of experts' behaviour on Twitter. In order to do so, four factors (presence, activity, impact and community) have been considered. All Twitter profiles belonging to users awarded with the MW qualification were identified and analysed. In addition, a set of 35,653 tweets published by the MWs were retrieved and analysed through descriptive statistics. The results show MWs on Twitter as high attractors (number of followers), moderate publishers (original contents published), moderate influencers (number of likes and retweets), and low interactors (number of friends and mentions to other users). These findings reveal that the MW community is not using Twitter to gain or reinforce their reputation as an accredited expert in the wine industry, giving more influential space on Twitter to consumers and amateurs.

Keywords: wine, wine industry, wine experts, social media, Twitter, Informetrics.

1. INTRODUCTION

Wine has experience and trust attributes that ask for signals to avoid market failures. The role of critics, guides, prizes, awards and other third-party references has always been important to offer market actors credible information about the characteristics of wine [17, 32]. The globalisation of wine markets has increased the supply of wine and, consequently, the need of this kind of information for consumers.

The emergence of the Internet and the development of social networks changed the way people receive and interchange information [9], emerging thus new influence models where new actors can provide information and

influence market trends, therefore increasing the options to search and transmit signals of quality [32].

In particular, the potentiality of Twitter to generate influence has been widely proved [6]. Previous findings suggest that Twitter can create soft value for wine focused businesses [43]. However, more engagement from wine actors (marketers, brands, retailers, etc.) with those consumers talking about wine on Twitter is needed to create hard value.

Among the emerging actors who can play a role within the online conversation are the Masters of Wine (MW). The MW certification is the most prestigious in the world of wine for trade purposes. There are currently 384 MWs worldwide–out of the 452 that have obtained the certificate since its founding in 1953–from 30 different countries, although the most important group is that from Anglo-Saxon countries. All of them have a great reputation and hold important responsibilities in the different organisations that make up the global wine system. In general, most of them are opinion makers, although some of them have greater public presence, depending on their main activity. Their sound knowledge and prestige make of them potential wine critics and influencers.

The objective of this work is to identify and characterise the behaviour of the community of the Masters of Wine on Twitter, as well as to determine the impact achieved by these reputable wine experts through this platform. This understanding will allow further research in the field of 'wine and expert opinion' to be developed, identified by Storchmann [36] as one of the most important in wine economics.

There is a considerable amount of literature regarding the world of wine and the impact of gurus, experts and critics, both through publications and specialised magazines [2, 4, 13, 27], as well as blogs and social networks [8, 26]. The influence of certain professionals, such as sommeliers, who have a direct relationship with the final consumer and clients, has also been investigated [20, 34]. However, there are no studies – neither online nor offline – that analyse the role played by prestigious qualifications or diplomas, such as the MW, which enhance the reputation or brand of those who obtain them.

This is probably due to the difficulty of measuring the real influence – or capacity of influence – of such a large and heterogeneous group, where graduates carry out various professional activities (many make wine, others blend it, others buy it, others trade it, some teach it, and others write about it). This means that in some cases their influence is direct while in others it is indirect. In some cases, their influence is very intense, and in others it is practically non-existent. The approach of this article is therefore original, as it aims to estimate the behaviour of all the professionals with this qualification through participation as members of the social network Twitter, which serves as an indicator of their influence.

2. LITERATURE REVIEW

Social media's interactivity has empowered wine consumers to influence others [43], enhancing the role of crowdsourcing amateur opinions in areas traditionally relegated to experts [1]. Users can comment, review and share information online on the one hand, and search for this information as part of the consumption experience on the other hand [11]. Consequently, the online community has created a force within the industry [29], and has become one of the trust factors than can increase selling of products online [37], which is particularly effective among wine consumers, as word of mouth is such an important driver of wine sales [24].

The body of literature on wine and social media covers a wide variety of fields, mainly drinking alcohol (health), economics (sales and costs) and marketing (consumer behaviour and tourism) [25]. The latter concerns unveiling how wineries use social media for their business interests [32] and how marketers can use these tools to build a brand community [23].

Thach [38] coined the term Wine 2.0 and investigated to what extent wineries were adopting Web 2.0 components (mainly blogs and social media) as part of their marketing strategy and as potential accepted sources of information that might influence a purchasing decision, as well as increasing sales and consumption [40].

Facebook stands out as the most used social networking site regardless of the analysed country, followed by Twitter [37]. However, Instagram is increasing in some countries, such as Greece [18, 19]. Nonetheless, studies from the consumers' perspective are scarce. Literature confirms that consumers who claim to use social media more intensively when collecting information about wine show a greater propensity to buy wine online [25, 32, 35, 39].

The conversational and informational nature of Twitter makes this tool of special interest to track user interest on specific products [3, 5, 12], especially for marketing purposes [10, 21] and expert finding [42].

Wilson and Quinton [43] analyse a collection of tweets in English on the subject of wine in order to identify how wine was being discussed. An international

and diverse tweeting population with interest in the consumption of wine was discovered, where the interactive medium (Twitter) had empowered the consumer to influence others, irrespective of any existing relationship. Contrary to what happens with wine experts and critics in traditional specialised magazines, wine industry professionals do not control the ability of Twitter users to have peer influence because of their independent Twitter status.

Specifically, Wilson and Quinton [43] find wine bloggers as active and influential actors. According to Wright [44], 84% of wine bloggers use Twitter to promote their blogs. This community of bloggers can be divided into those who have no professional affiliation to the wine industry, entrepreneurial wine bloggers promoting their company, and other bloggers strongly connected to the wine industry and/or press, such as Robert Parker [16].

Marlowe et al. [26] analyse a sample of wine bloggers on Twitter in order to determine whether users with wine credentials attract more Twitter followers, as a proxy of becoming an influential voice on Twitter. To do this, the authors take into account the following nationally and globally-respected certifying bodies for wine credentialing: The Court of Master Sommeliers, Wine and Spirit Education Trust (WSET), Society of Wine Educators, Culinary Institute of America, International Sommelier Guild, Sommelier Society of America, and the International Wine Guild. The analysis concluded that wine bloggers with a certification had on average 75% more followers than those without certifications, supporting prior research showing that credentials have a major influence on others' behaviour [26].

Masters of Wine, irrespective of their specific connection with the wine industry, might establish a reputation and authority on Twitter, as wine expert users having a wine credential. However, this community has not been studied to date. Therefore, this contribution aims to fill this gap in the literature and provide a better understanding of this community, especially its online visibility and impact on Twitter, with the aim of providing wine market research practitioners a basis on which to better develop their work.

3. METHOD

Twitter is widely used as a data source for research since its inception [31, 45]. Taking apart conceptual and technical aspects, research based on Twitter data focuses on two elements: users and contents, shaped by a specific domain [41]. In this article, these elements are framed by the Masters of Wine (users), all those contents generated by this community on Twitter (messages), and the wine market (domain).

The behaviour in general – and influence degree in particular – of one user is delimited consequently by the contents generated and the impact of these contents on other users, considering the characteristics of the analysed domain. Notwithstanding, there is no consensus on what specifically denotes influence on Twitter.

Literature has led to the conclusion that each approach to determine 'influence' depends on the emphasis on different individual factors [3]. We can find factors related to connectivity (followers), content-oriented interactions (replies, mentions), click-oriented interactions (retweets, likes), and network-oriented measures (centrality metrics). Moreover, these measures are diverse. Some are based on simple metrics provided by the Twitter API, while others are based on complex mathematical models [33]. In addition, some approaches are based on the combination of several metrics to generate a final score, while other approaches try to reflect influence through each of the metrics measured separately [30].

For this exploratory study, four behaviour and influence factors have been considered:

1. *Presence*. This factor considers whether a MW has created a public Twitter profile. For each profile created, this factor includes all demographic user-level information incorporated into the profile.
2. *Activity*. This factor considers to what extent are MWs creating content on Twitter, and it includes productivity and types of content created.
3. *Impact*. This factor considers to what extent are MWs engaging with users, and it includes metrics related to connectivity and interactions, both content-oriented and click-oriented.
4. *Community*. This factor considers to what extent do MWs communicate with other MWs on Twitter, and it includes network-oriented interactions.

The approach followed by this work does not emphasise any of the factors considered, nor does it intend to generate an influence on the final score, but describe the overall behaviour of MWs on Twitter just as a preliminary stage to characterise their influence.

The first step consisted of gathering the population of professionals awarded with the MW distinction to date. To do this, the Institute of Masters of Wine's official website[1] was directly accessed on 8 March 2019. A total of 384 people were gathered, along with basic descriptive data: country of residence, gender, pro-

[1] https://www.mastersofwine.org/en/meet-the-masters/Browse-by-region/browse-by-country-of-residence.cfm

fession, personal website, and year in which she/he obtained the qualification.

Then, we proceeded to locate the MWs' personal profiles on Twitter. In order to do this, several searches by name/surname were carried out in the Twitter search box. In addition, the Institute of Masters of Wine official Twitter account[2] was analysed to check followers/following users and Twitter mentions. Finally, the MWs' personal websites were also consulted. At the end of the process, 186 Twitter accounts were identified.

The second step consisted of extracting data from each of the 186 Twitter accounts. This process was separated into two levels: profile-level data and publication-level data.

a) *Profile data*: information related to the overall Twitter account performance was gathered through the Twitter API as of 12 May 2019. The following metrics were captured for each profile: name, screen name, user ID, profile creation date, number of followers, followings and favourites, total number of tweets published, date of the first tweet, date of the last tweet, number of lists where the user is listed, language, bio text, location and personal URL.
   In addition, the Social Authority of each profile was obtained from Followerwonk[3], a professional suite oriented to analyse Twitter followers. This metric recursively measures the prestige of a Twitter account based on the prestige of the followers who follow said account. Social Authority metric scores from 0 (no authority) to 100 (maximum authority).
b) *Publication data*: all tweets published by all 186 Twitter accounts from October 2018 to April 2019 (seven months) were retrieved through the Twitter API. A total of 35,653 tweets were obtained. For each tweet, the following information fields were identified: tweet ID, tweet text, tweet author, publication date, number of favourites received, number of retweets received, language, type of tweet (original, reply, retweet) and embedded elements (media, URLs, hashtags and user mentions).

The third step consisted of quantifying the degree of interaction between MWs on Twitter through centrality measures. All mentions from each MW to any other MW were gathered, and a network was built with Gephi[4]. Finally, both node-level metrics (degree and centrality) and network-level metrics (density, diameter and average degree) were calculated to determine centrality measures [7]. Table 1 includes each of the metrics captured as well as their scope.

[2] https://twitter.com/mastersofwine
[3] https://followerwonk.com/social-authority
[4] https://gephi.org

Table 1. Summary of network metrics used: level and scope.

Metric	Level	Scope
InDegree	Node	The number of edges (mentions) directed into a node (user) in a directed graph. In this case, the number of mentions a MW receives from other MWs
OutDegree	Node	The number of edges (mentions) directed out of a node (user) in a directed graph. In this case, the number of mentions a MW provides to other MWs
Degree	Node	InDegree + OutDegree. In this case, this measure represents the total number of mentions where a MW is involved.
Eigenvector centrality	Node	A high eigenvector score means that a node (user) is connected to many nodes (users) who themselves have high scores and vice versa. This metric is also referred to as prestige score.
Density	Network	The number of connections the network has, divided by the total possible connections the network could have.
Diameter	Network	The shortest distance between the two most distant nodes (users) in the network. It denotes the number of steps, on average, it takes to get from one member of the network to another.
Average Degree	Network	The average number of edges (mentions) per node (users) in the network.

4. RESULTS

4.1 Presence

186 MWs out of the total 384 people awarded with such distinction (48.4%) have a Twitter profile, 106 women (57%) and 80 men (47%). Of these, eight accounts (5 males and 3 females) exhibited no data. Therefore, the final sample was composed by 178 Twitter profiles.

The percentage of MWs with a Twitter profile increases according to the decade in which the person was awarded the qualification. 73.4% of people awarded the qualification during the 2010' decade have a Twitter profile (Table 2).

Most accounts were created between 2009 and 2014 (91%). Eight users created the Twitter profile the same year they finished the study programme, while 77 already had a Twitter account when they obtained the qualification.

58.4% of users included the term 'MW' in their profile name whereas 25.8% included the term as part of their username (name of the account after the @ symbol), reflecting personal branding purposes.

As regards the language used, a predominance of English (predefined for 169 accounts) was found, fol-

Table 2. Number of Masters of Wine with a Twitter profile, broken down by decade of admission.

Decade	MW	Twitter	
		Yes	No
1950'	7	0	100%
1960'	12	0	100%
1970'	25	8%	92%
1980'	33	18.2%	82%
1990'	110	36.4%	64%
2000'	71	63.4%	37%
2010'	124	73.4%	27%
TOTAL	382	48.2%	51.8%

Source: Twitter. Note: data of completion date were unavailable for two Masters of wine.

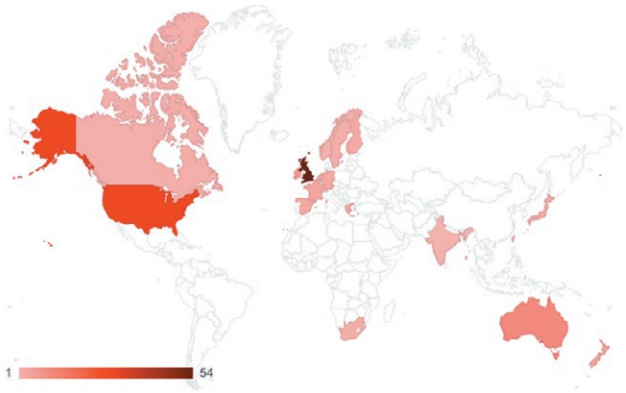

Figure 1. Masters of Wine according to the Twitter location field. Source: Twitter.

lowed by Spanish (three accounts) and then Norwegian, Dutch, Swedish, Japanese, French and German (one account each). This bias towards English is a consequence of the origins of the MWs: 206 (53.6%) come from the United Kingdom, 52 (13.5%) from the United States and 24% (6.25%) from Australia (Table 3). The number of MWs from New Zealand, Ireland, and Canada (26; 6.8%) is also significant.

No location data was found for 46 users (38 had the location field empty and six accounts included other information instead of a real/accurate location). Moreover, a location mismatch (different real origin and Twitter location) was detected for ten accounts. The geographies of MWs thus changes under the lens of Twitter (Figure 1).

Table 3. Ranking of countries according to the number of Masters of Wine.

Country	All MW	MW on Twitter	
	Real Location	Real location	Twitter location
United Kingdom	206	80	54
United States	52	34	29
Australia	24	13	11
France	17	6	4
New Zealand	13	9	5
Germany	8	4	3
Ireland	7	7	6
Canada	6	2	2
Spain	6	5	3
Norway	5	2	1
Switzerland	5	1	1

Source: The Institute of Masters of Wine and Twitter.

Users can include in their Twitter profiles a hyperlink to promote their related websites. 115 (61.8%) users included a link, mainly to private companies (46) and personal websites (40). Other less common websites were personal blogs (9), media (5), searchers (2), LinkedIn profiles (2), YouTube profiles (1) and non-profit organisations (1). Also noteworthy is that nine links were broken, reflecting carelessness on the part of these users.

4.2 Activity and impact

For the sake of clarity, activity (contents generated) and impact (content outcome) influence factors are included together in this section, which starts with metrics related to the users (profile-level data) and follows with metrics related to the tweets (publication-level data).

Profile-level data (users)

No general patterns were found regarding the activity of the MWs on Twitter (Table 4). Data is widely dispersed and several outliers (both high and low performers) exist. However, on average, profiles attract a great number of followers (4,946 followers), although their productivity (3,114 tweets on average) and impact (2,159 favourites on average) is less intense. In addition, MWs did not usually follow other users (912 followings on average) and are included in few users' lists (119 lists on average).

The distribution of followers per user is highly skewed (Figure 2; top left). 17 users attained less than 100 followers while 12 users attracted more than 10,000 followers each. Jancis Robinson is the MW with the most followers (257,031).

The number of followings is rather more homogeneous (Figure 2; top right) and exhibits lower values (only

Table 4. General activity and impact patterns of Masters of Wine on Twitter.

Statistic	Tweets	Tweets/ Day	Followers	Followers/ Day	Following	Favourites	Lists
Max	60,856	14.9	257,031	70.3	12,702	89,109	3,757
	Paul Tudor	Paul Tudor	Jancis Robinson	Jancis Robinson	Sarah Abbott	Paul Tudor	Jancis Robinson
1st Quartile	242.3	0.1	589.0	0.2	157.0	26.8	23.0
Median	987.5	0.3	1,476.0	0.5	359.5	223.0	45.0
3rd Quartile	3,019.8	1.0	3,658.3	1.3	990.3	1,377.8	108.5
Mean	3,113.6	1.0	4,945.7	1.5	911.5	2,159.3	118.8
Standard deviation	6,816.5	2.0	20,303.7	5.6	1,646.1	9,057.4	324.2

Source: Elaborated from Twitter data. Note 1: data includes all activity generated by each Twitter account since its creation. Note 2: lists refer to the number of times that a user has created a list in which the user is included.

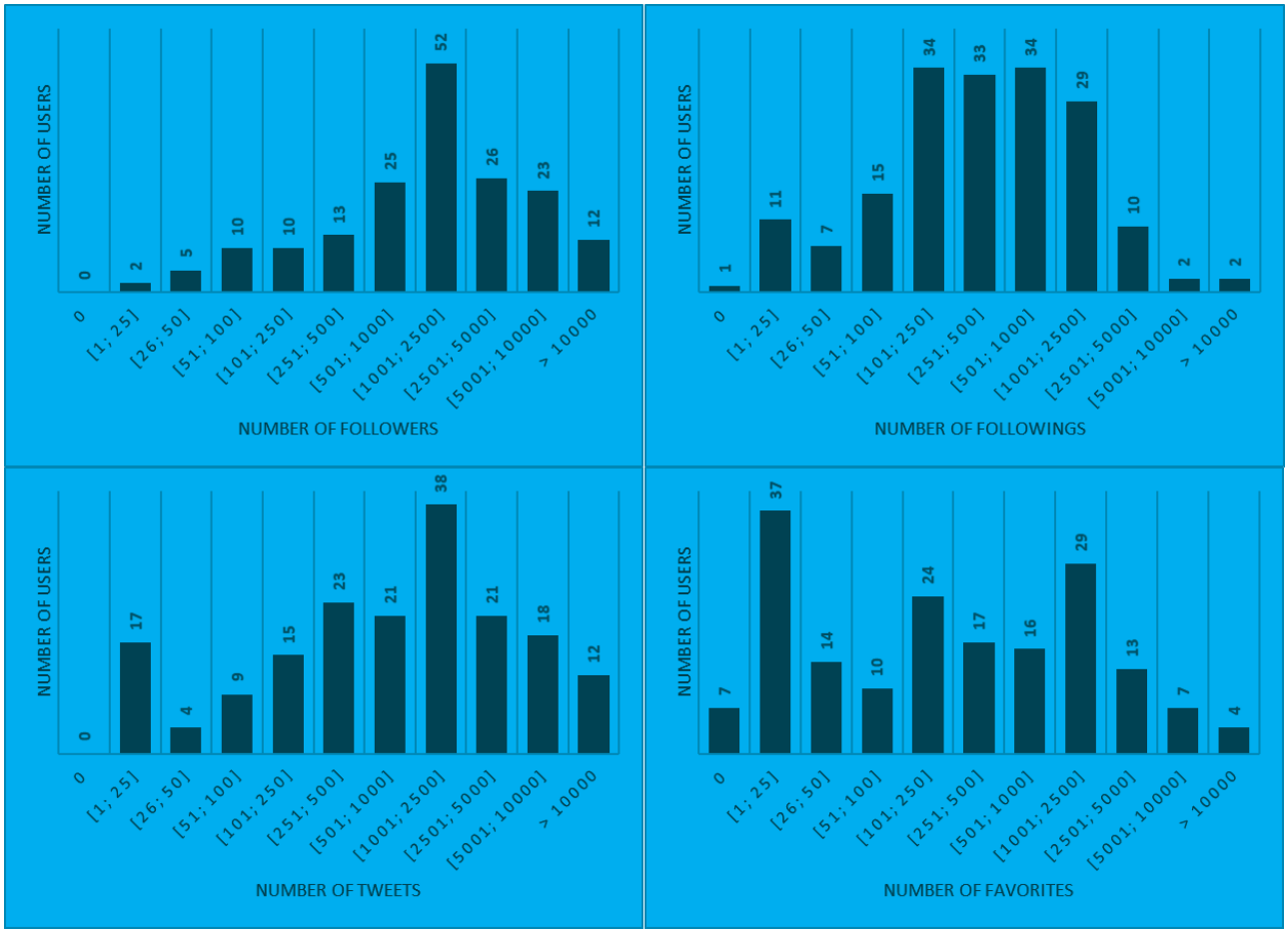

Figure 2. General behaviour of Masters of Wine on Twitter: distribution of followers (top left), followings (top right), tweets (bottom left) and favourites (bottom right). Source: Twitter.

12 MWs follow more than 2,500 users). It is noteworthy to mention that 30 MWs have published less than 100 tweets (Figure 2; bottom left), and 68 (36.6%) received less than 100 favourites (Figure 2; bottom right).

The number of followers achieved is not important in itself if we do not evaluate the quality of these followers. Thousands of inactive followers do not provide impact while hundreds of active and influential followers

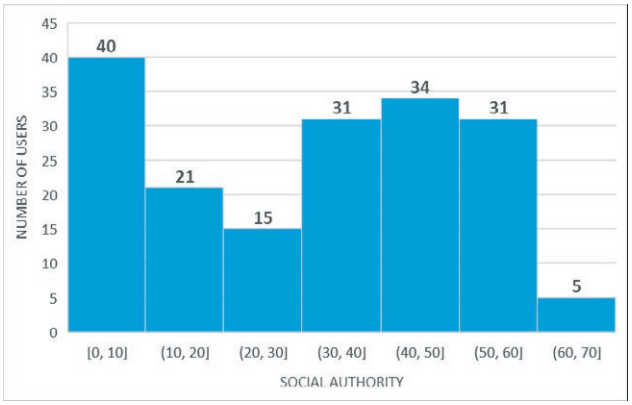

Figure 3. Social authority of Masters of Wine. Source: Followerwonk.

Figure 4. Publication activity: (top) Time elapsed since the creation of the Twitter account and the publication of the first tweet; (bottom) Time elapsed since the publication of the last tweet and the date of gathering data (12 May 2019). Source: Twitter. Note 1: each category is cumulative. That is, users tweeting the first day also tweeted within the first week, month, and so on. Likewise, users who tweeted last week also tweeted last month, year, and so on. Note 2: The time since last week was not available for one user.

may provide reputation. The Social Authority indicator precisely measures this facet.

The average Social Authority for all MWs is 31.1 (32.0 in the case of female users and 30.1 for male users). Only five users surpassed the value of 60. Tim Atkin stands out as the MW with the highest Social Authority (67). On the contrary, 40 users did not exceed the value of 10 (Figure 3).

Time elapsed since the creation of the Twitter account may distort the analysis, insomuch as one user may have more time to publish more Tweets and to obtain a better reputation. In order to check whether this parameter influences the remaining variables, a correlation test (Spearman) was performed (Table 5).

Age (the number of days since the creation of each Twitter profile) does not correlate strongly with any of the variables. As we can observe, the Social Authority achieves a strong correlation either with the number of favourites (Rs= 0.83; p-value < 0.0001) and tweets published (Rs= 0.75; p-value < 0.0001), while the raw number of followers is slightly less important (Rs= 0.65; p-value < 0.0001).

The low influence of the time elapsed since the creation of the Twitter account may be due to the greater or lesser activity of the user when the account was set up. For example, 71 MWs waited more than a year to post their first tweet (Figure 4; top) while only 70 published their first tweet during the first month. Similarly, 32 MWs did not publish a tweet over the last year as of when the time data was retrieved (Figure 4; bottom).

Table 5. Correlation matrix for user-level Twitter metrics.

Variables	Social Authority	Age (days)	Tweets	Followers	Following	Favourites	Lists
Social Authority	1						
Age (days)	0.04	1					
Tweets	**0.75	**0.23	1				
Followers	**0.65	**0.28	**0.82	1			
Following	**0.55	**0.26	**0.70	**0.67	1		
Favourites	**0.83	0.03	**0.70	**0.61	**0.61	1	
Lists	**0.55	**0.39	**0.78	**0.93	**0.66	**0.50	1

** Values are different from 0 with a significance level $\alpha < 0.01$
Source: elaborated from Twitter data.

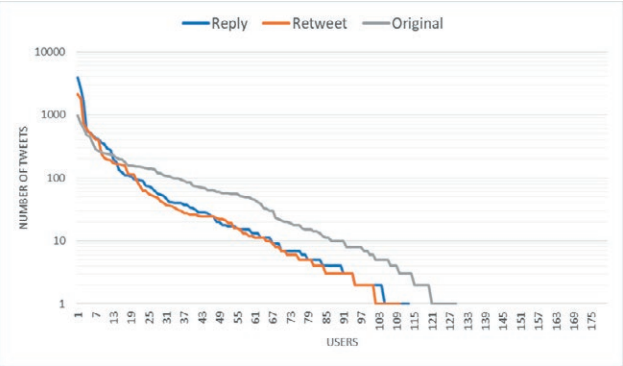

Figure 5. Distribution of publications (original tweets, replies and retweets). Source: elaborated from Twitter data.

Publication-level data (Tweets)

From October 2018 to April 2019, MWs published a total of 35,844 tweets, of which 14,517 (41%) were replies, 10,817 (30%) original tweets and 10,510 (29%) retweets. The distribution of publications is skewed (Figure 5) and distinguishes two different pattern behaviours. A wide set of users who publish a moderate-to-low amount of tweets, especially original tweets on the one hand, and a small group of users (approximately 15) who publish a great number of original tweets, retweets and replies on the other hand.

The publication profile of each user can be determined upon the percentage of each type of publications: original tweets (creator), replies (commentator) and retweets (disseminator). This way, we can find users that all their tweets are original (strictly creators), users that only retweet other tweets (strictly disseminators), or any other combination.

Following this reasoning, authors designed a scale from 0 (any tweet published falls under one specific tweet type) to 5 (all tweets published fall under one specific tweet type) for each of the three publication types to characterise the publication pattern of each user. The threshold for each value of the scale is detailed below:

- Value 0: No tweets published on the corresponding typology.
- Value 1: from 1% to 25% of all tweets published fall under the corresponding typology.
- Value 2: from 26% to 50% of all tweets published fall under the corresponding typology.
- Value 3: from 51 to 75% of all tweets published fall under the corresponding typology.
- Value 4: from 76% to 99% of all tweets published fall under the corresponding typology.
- Value 5: all tweets published fall under the corresponding typology.

A total of 36 different publication patterns were identified, being those that did not publish any kind of content (strictly readers or ignorers) the category with the highest number of users (41 MWs; 23%). 24 MWs were extremophile users (those with a 5 value in one dimension), 16 only published original tweets (strictly creators), 5 only published retweets (strictly disseminator) and 3 only published replies (strictly commentator). Other common profile patterns are characterised by combining a great percentage of original tweets and a low percentage of replies or retweets (Table 6).

The number of likes received by each tweet published in the period shows a skewed distribution (Figure 6), with few tweets attracting a significant number of likes and a long tail of tweets without any impact. The

Table 6. Publication profiles according to the type of tweet published.

Class Type			Number of MW	Profile
Original	Reply	Retweet		
0	0	0	41	Strictly reader or ignorer.
5	0	0	16	Strictly creator
3	1	1	13	Moderate creator; very light commentator and disseminator
4	1	1	11	Heavy creator; very light commentator and disseminator
2	2	1	10	Light creator and commentator; very light disseminator
3	1	2	10	Moderate creator; very light disseminator; light commentator
1	3	1	6	Very light commentator; moderate creator; very light disseminator
2	3	1	6	Light commentator; moderate creator; very light disseminator
0	0	5	5	Strictly disseminator
1	1	3	5	Very light creator; very light commentator; moderate disseminator
2	1	1	5	Light creator; very light commentator and disseminator.

Source: elaborated from Twitter data.

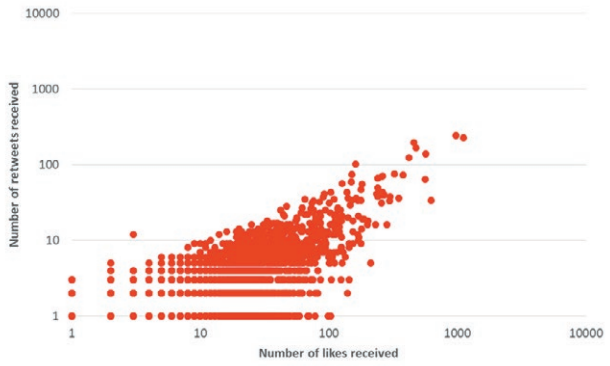

Figure 6. Scatterplot of the number of likes and retweets received by original tweets and replies. Source: elaborated from Twitter data.

original tweet with the highest number of likes received is posted by Jancin Robinson (1,113 likes). However, 25,112 (99.1%) tweets (both original tweets and replies) receive less than 100 likes each, and only seven tweets receive more than 100 retweets each.

If we take the whole corpus of tweets published by MWs in the period (25,334 original tweets and replies), we can observe a great wealth of information in the embedded elements (Table 7): 6,602 hyperlinks, 11,819 hashtags, 39,206 users mentioned and 4,434 media (either photos or videos).

Mentions to other users constitute the most frequently used element (59.0% of all tweets), followed by hyperlinks (25.4%), hashtags (19.8%) and media (17.5%). However, this activity is highly skewed. For example, 82 users did not mention any user. Among the elements embedded in tweets, hashtags stand out as they can express interest in specific topics or terms. 4,169 different hashtags were located out of the 11,819 total hashtags extracted from the tweets (Table 8). The term #wine is the most frequently used hashtag (634 times), by 46 different MWs from 10 different locations, followed by #burgundy (used 138 times by 13 users). In addition, among the most used hashtags, some of them achieve higher impact (#Winelife obtains an average of 14.3 likes per tweet), whilst others remain less popular (#cellartalk only 2.0 likes per tweet, being use almost the same number of times than #Winelife).

The impact of tweets shows a dependence on the type of embedded element. The engagement rate (ER) (number of likes and retweets divided by the number of tweets) informs about the relative impact of tweets per user. On average, the ER of tweets including at least one media (10.9) is higher than the ER of tweets including at least one hashtag (7.6), hyperlink (5.0) or user mention (4.0).

Finally, the dissemination activity carried out by MWs on Twitter through retweets is also noteworthy. A total of 10,510 retweets have been identified in the period. 49.6% of retweets included at least one hyperlink, 42.0% included at least one user mention, 41.9% included media, and 34.0% included at least one hashtag.

The inclusion of embedded elements increases the engagement of tweets published by Masters of Wine. The average number of likes for those tweets with at least one embedded element is 5.3 whereas this same value for tweets without embedded elements is 2.2. Likewise, the average number of retweets received by tweets with at least one embedded element is 0.75 whereas this same value for tweets without embedded elements is 0.19.

4.3 Community

14,953 tweets (59.0% of all original tweets and replies analysed) contained a total of 39,206 user mentions. Of these, 2,990 (7.6%) are mentions from one MW to another MW (Figure 7). Otherwise, 67 MWs did not mention any other MW, and 20 did not receive any mention from another MW in the period analysed.

Given the number of Twitter profiles analysed (178), the generated network exhibits a low average Degree (16.6) and a low density (0.093). That is, the community of Masters of Wine is not intensively connected with each other through direct Twitter mentions. Consequently, the number of steps it takes on average to get from one user to another is high (network diameter is equal to 5).

Only few nodes (those located at the centre of the network) are highly connected to others, showing a higher centrality (prestige score). Natasha Hughes stands out as the MW who receives a greater number of mentions from other MWs (52), while Jancis Robinson is the MW who mentions other MWs the most (118 users). These two users also appear as the most influential MWs in the username-to-username mention network built. In absolute terms, Gorman McAdams (945 mentions) and Tim Atkin (1,932 mentions) are the MWs who have receive and provide the greatest number of mentions, respectively (Table 9). As regards the eigenvector centrality, Natasha Hughes stands out as the most influential user in the network.

A lack of reciprocity in the 'mentioning/mentioned' network is also identified, reflecting different profile usage and information interests. Few MWs are widely mentioned by others, but they rarely mention others. For example, John Downes was mentioned by 42 users and Eugene Mlynczyk by 39 MWs, but they did not mention any other MW.

Table 7. Impact of tweets (original tweets and replies) according to the embedded elements: links, hashtags, user mentions and media.

Media Embedded	Metric	Sum	Mean	Median	SD	Max
Total	Tweets	25334	140.7	17.0	473.5	4845
Links	Tweets	6446 25.4%	35.8	4.0	76.8	564 Jancis Robinson
	Links	6602	36.7	4.0	79.6	618 Jancis Robinson
	Likes	42287	234.9	10.5	1155.0	10836 Tim Atkin
	Retweets	8051	44.7	1.0	245.7	2737 Tim Atkin
	Engagement rate	NA	5.0	2.7	5.5	29.5 Derek Smedley
Hashtags	Tweets	5007 19.8%	27.8	3.0	63.5	549 Christy Canterbury
	Hashtags	11819	71.2	5.0	207.4	1755 Jeannie Cho Lee
	Likes	40626	225.7	12.0	956.0	11591 Tim Atkin
	Retweets	5952	33.1	1.0	117.4	1157 Tim Atkin
	Engagement rate	NA	7.6	4.1	9.4	63.0 Amy Christine
@	Tweets	14953 59.0%	83.1	10.0	242.8	2401 Tim Atkin
	User mentions	39206	217.8	19.0	677.0	6700 Tim Atkin
	Likes	57586	319.9	19.0	1119.8	12800 Tim Atkin
	Retweets	8032	44.6	3.0	173.7	2042 Tim Atkin
	Engagement rate	NA	4.0	3.0	3.2	16.0 David Hesketh
Media	Tweets	4434 17.5%	24.6	1.0	53.5	311 Greg Sherwood
	Likes	51263	284.8	3.0	1085.7	11632 Tim Atkin
	Retweets	7622	42.3	0.0	155.4	1276 Tim Atkin
	Engagement rate	NA	10.9	7.5	11.2	65.9 Jancis Robinson

Source: elaborated from Twitter data.

Other MWs can be distinguished by mentioning other colleagues, but they rarely receive mentions from other MWs. For example, Tim Atkin mentioned 114 MWs but he only received mentions from 21 MWs. Jancis Robinson mentioned 118 MWs but she only received mentions from 27.

It is also noteworthy to comment that some MWs (specifically 121) also mention other MWs without a Twitter account, through their real name. This way, 107 MWs not present on Twitter have been mentioned at least once, accumulating a total of 603 mentions. Julia Harding (49 mentions) is the most mentioned MW without a Twitter profile by other MWs (Table 10).

5. DISCUSSION AND CONCLUSIONS

Since not all tweets published by MWs have been analysed, results should be taken cautiously as seasonal effects or changes in publication patterns might happen.

Table 8. Most frequently hashtags used by Masters of Wine.

Hashtag	Times used	Avg. likes	Avg. retweets	Number of users	Users (%)	Number of countries	Countries
#Wine	634	10.4	1.9	46	25.8	10	Australia, Canada, Greece, Hong Kong, India, Ireland, New Zealand, Sweden, UK, US
#Burgundy	138	12.6	2.1	13	7.3	5	Hong Kong, India, Ireland, UK, US
#masterofwine	120	12.2	2.5	12	6.7	6	Australia, Canada, Hong Kong, India, UK, US
#Cellartalk	120	2.0	0.4	2	1.1	2	Australia, New Zealand
#Winelife	119	14.3	2.9	4	2.2	4	Hong Kong, India, UK, US
#Winetasting	114	12.2	2.4	11	6.2	6	Australia, Hong Kong, India, Ireland, UK, US
#malbecargentino	111	6.1	1.7	1	0.6	1	US
#malbecworldday	107	6.6	2.0	1	0.6	1	US
#Mwtour	103	5.7	0.5	13	7.3	6	India, Netherlands, New Zealand, South Africa, UK, US
#mastersofwine	95	6.6	0.8	17	9.6	9	France, Hong Kong, India, Ireland, Netherlands, South Africa, Spain, UK, US

Source: elaborated from Twitter data. Note: no local language equivalents aggregated.

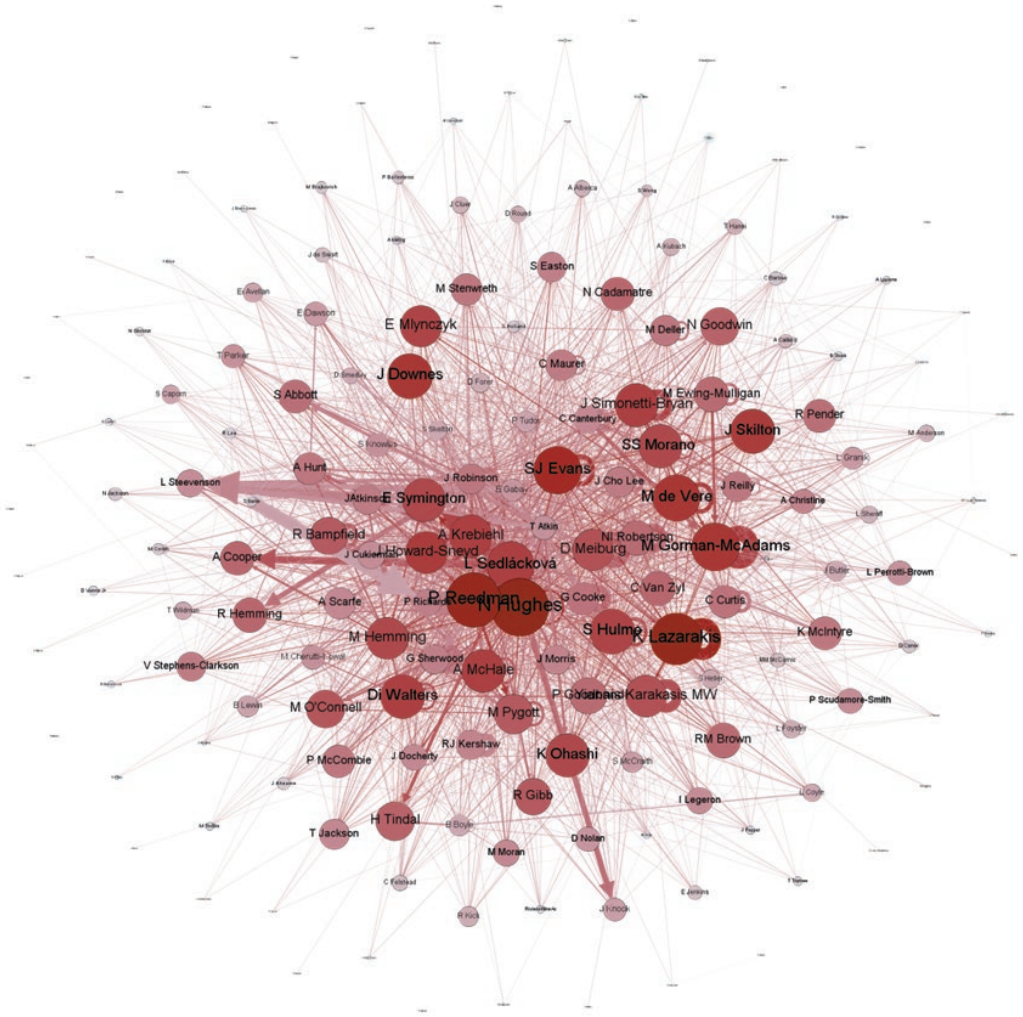

Figure 7. User mentions network for Masters of Wine. Source: Elaborated from Twitter data and generated with Gephi.

Table 9. Most influential Masters of Wine in the username-to-username mention network through node-level metrics (InDegree, OutDegree, Eigenvector centrality).

InDegree			OutDegree			Eigenvector	
MW	Users	Mentions	MW	Users	Mentions	MW	Users
N Hughes	52	492	J Robinson	118	1846	N Hughes	1.0
P Reedman	50	442	T Atkin	114	1932	P Reedman	0.94
SJ Evans	45	345	N Hughes	88	659	K Lazarakis	0.90
M Gorman-McAdams	42	945	A Krebiehl	86	585	M Gorman-McAdams	0.83
J Downes	42	109	E Gabay	80	892	SJ Evans	0.82

Table 10. Masters of Wine without a Twitter profile most mentioned on Twitter by other Masters of Wine.

Most mentioned	Mentions
Julia Harding	49
Caroline Gilby	25
Olivier Humbrecht	24
Michael Broadbent	23
Liz Thach	23
Patrick Schmitt	21
Jean-Michel Valette	19
Mark Andrew	14
Steve Smith	13
David Gleave	12

Notwithstanding, the set of 35,653 tweets published over seven months of activity is considered representative enough to estimate the recent activity of MWs.

Another aspect to take into account is the level of Twitter adoption. The current total number of active users amounts to 330 million [14], showing a decrease with respect to 2018 (336 million users). Given the bias of MW origin towards the US and the UK, the penetration of Twitter in these countries is critical. In 2019, the US had 48.5 million users (14.7% of the total population), being the country with the highest number of active Twitter users in the World. The UK had 13.7 million users (20.2% of the total population), being the 4th country in the ranking [15].

The percentage of wine drinkers in these countries should also influence the results obtained. As a proxy – and considering the last data available from the International Organisation of Vine and Wine (which corresponds to 2018) – the consumption of wine was 12.4 litres per capita (15 years of age or older) in United States (39th in the world), and 22.6 litres per capita (15 years of age or older) in the United Kingdom (23rd in the world)[5].

[5] https://www.oiv.int/en/statistiques/recherche

Besides Twitter demographics, Wilson and Quinton [43] detected an elevated occurrence of some specific wine type mentions (brands, red/white, places, champagne/sparling). Our study corroborates the use of these terms through hashtags, specifically of locations (#hongkong, #napavalley, #london, #chile, #edinburgh, #argentina, #baden, #italy, #california, etc.), brands and varietals (#burbundy, #malbecargentino, #bordeaux, #champagne, #garnachagrenache, #pinotnoir, #cabernetsauvignon, #chardonnay, etc.), denominations of origin (#bordeaux, #rioja, etc.), and terms related with leisure time (#tasting, #travel, #delicious, #familytime, #holiday, etc.).

The results evidence a low presence of MWs on Twitter (48.4% of all individuals awarded), although higher for recent awardees. They predominantly speak in English, include hyperlinks to promote their related websites and come from Anglo-Saxon countries (UK, US and Australia). The fact that a significant number of MWs includes the term 'MW' in their Twitter username denotes a potential interest in using the profile for self-promotion, giving the MW qualification an influential status.

Master of Wine's Twitter profiles attract a significant number of followers on average. However, their social activity (following other users) is further limited (only 43 MWs follow more than 1,000 users), which also indicates an interest primarily oriented towards promotion rather than conversation. The long average time elapsed since the creation of the accounts to the first published tweet might reveal on average there is a weak interest in the strategic use of Twitter.

The publication activity is varied in the period and no single activity pattern is detected, being the passive user the most frequent kind. Otherwise, the most productive users are likely to publish more replies and retweets.

Given the number of followers that MWs have on average, impact (measured according to the number of likes and retweets received) is low. Even though the engagement rate of tweets increases by adding sup-

plementary embedded elements, including hyperlinks, hashtags and media is less common, while mentioning other users is more frequent.

A Social Authority below 25 (out of 100) can be considered low. While values over 90 points are reserved for famous people (e.g., the singer Justin Bieber, entrepreneur Elon Musk, or US President Donald Trump[6] have a social authority of 100), values from 50 to 75 points can be considered significant for specific market domains. For example, in the case of the wine market, the well-known wine critic Robert Parker exhibits a Social Authority of 40 as of November 2020. This value was 54 in March 2018 [16], which shows the volatility of prestige, as followers can vary over time.

37% of the MWs obtain a Social Authority score lower than 25. Therefore, impact (measured according to the followers' Social Authority) is on average low. Despite the total number of followers attracted being elevated, the authority of these followers is limited, except for a few users.

Further research on followers' linkage to the industry might reveal whether MWs relate to influential people in the wine industry on Twitter.

Despite MWs frequently mentioning other users, they rarely mention other MWs, as the low-density user-to-user network demonstrates. Moreover, a lack of reciprocity in user mentions is identified, where a few MWs mention many awardees in their tweets, but the vast majority of these do not mention other MWs.

The general findings of this work show MWs on Twitter as high attractors (as regards the number of followers they attain), moderate publishers (as regards the quantity of original content published), moderate influencers (as regards the reactions to their published content), low connectors (as regards the users they follow) and low interactors (as regards the number of mentions to other MWs).

Given the reputation and influence of MWs in the wine industry, especially in English-speaking countries, these findings reveal that this actor (community of people awarded with the MW accreditation) is not using Twitter to gain or reinforce this reputation or influence. This research also shows that this community is very heterogeneous on this social network and that some of their components are very active. In any case, and given the uneven geographical distribution of MWs, these results would be especially significant in countries where the MW qualification is more integrated in the wine business culture (United Kingdom, United States and Australia).

If we consider the earlier findings by Wilson and Quinton [43], who detected a low engagement of wine marketers, brands and retailers on Twitter, we can reinforce the hypothesis that the influence space provided by Twitter to the wine sector is being occupied by consumers and amateurs, who can easily connect and engage with other consumers. This may cause a loss of representativeness on the part of professional wine experts involved in the communication of wine trust attributes signals. These results are of importance both for the industry and the markets, where expert opinion is very important, but their influence is due to a combination of expertise and communication strategy. In any case, future research analysing other wine-focused Twitter groups is advisable for a better understanding of the results obtained.

Given the rising importance of online sales channels in the wine sector, increased by the COVID-19 crisis [22], the effective use of social media in general and Twitter in particular by the professional actors of this industry should be considered as a strategic issue of central importance.

This research does not attempt to strictly identify influencers (as this term refers to the extent to which peers exert influence on the attitudes, thoughts and actions of an individual), which is one step beyond the description of publication patterns. Similarly, the dynamics of the 'sense of community' force of MWs on Twitter is outside the scope of this study, as it needs four characteristics (belonging, influencing, supporting and sharing) to be completely established [28]. A deeper analysis on MW followers as well as a content analysis of published tweets is consequently advisable for future works focusing on the characterisation of the MW online community.

Finally, future research should also delve into the use of other social platforms (e.g., Instagram and Facebook) by all professional actors in the wine sector, as well as to ascertain the reasons for using (or not using) these social networking tools.

6. ACKNOWLEDGEMENTS

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Social Mobility and the Social Representation of Sparkling Wine in Brazil and France

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Abstract. Wine is a social object, established in the Old World and later migrated to the New World. Champagne is an internationally important and famous French sparkling wine, significantly present worldwide. Brazil, a New-World wine producer, has a recent but expanding history of sparkling wine production and consumption. As to its social aspect, this product has different representations and roles in both these countries. Therefore, this study aims to understand how culture and social status influence the organization of social representations associated with sparkling wines in Brazil and France. Thus, we used the Social Representation approach, a theory of knowledge and communication. For content collection, we carried out a verbal association task. Two hundred and thirteen Brazilians and one hundred ninety-eight French participants provided the first four words which came to mind after hearing four inducted words. The verbal associations were categorized using semantic contextualization. Then, we performed a Correspondence Factor Analysis. The results supported our hypothesis that culture, social status, and social origins all influence social representations associated with sparkling wine, revealing this kind of wine to be a product of social distinction and affluence.

Keywords: social origins, social representation, wine culture, social norms, wine consumption.

1. INTRODUCTION

Consumption is a symbolic act, as social behavior is influenced by symbolism around a given product, as well as its social role [1]. Buying a product is not an isolated action. It is rooted in social and cultural values and ideologies. As a cultural product, wine [2, 3, 4, 5, 6] – with collective values and symbolism – projects different representations [5] because of its ancestry. Wine has more than 8,000 years of history [7], and was evidenced in Mesopotamia, a region which developed a rich urban civilization [8], as far back

as 3000 BCE. Wine culture was established in the Old World, represented by European countries, and was later migrated to the New World [9]. Represented by colonized countries, such as Brazil, New-World wine is undergoing an expansion in production [10] and consumption [11, 12], mainly in regard to sparkling wine, which has seen a significant increase in recent years [13, 12]. In Brazil, the conventional sparkling wine market grew around 160% from 2005 to 2017, and Moscatel sparkling wine grew around 400% [13]. France is still the main sparkling wine market in the world [14]. Over the last years, consumption there has remained stagnant, however, with low variation to local products and an increase of around 60% in imported sparkling wines [15].

Despite said stagnation, France is still the world's most important sparkling wine producer. The history of sparkling wine predates 77 CE, but its era of prestige began and continues with Champagne [16] in France. Therefore, Champagne has been followed and imitated all over the world. In the USA, for example, locally produced sparkling wines have used the name "Champagne" to convey a better reputation for themselves [17]. In Brazil, local sparkling wine was initially called "Brazilian Champagne" [18]. Inspired by the Champagne region, replacement products have also emerged in France, such as the Crémants [19] and other sparkling wines. In Brazil, the same representations associated to Champagne are applied to these variants mentioned above. Champagne shares the same representation with conventional and Moscatel sparkling wine and Cider, and, in France, Crémants and other sparkling wines [20]. Despite the physical differences, these products share a social meaning and convey different, historically constructed representations in society.

1.1 Social mobility and sparkling wine consumption

Social mobility concerns status changes, upward or downward in social standing, on a population over time [21]. It is a general aspect of the industrialization process [22]. Europe overwent an upward process during the 1980's and 1990's , but it is currently experiencing a downward process [23]. Nowadays, developing countries are going through an upward process [24], among them Brazil. Such changes in social standing affect consumers' habitus asymmetrically [25]. According to the author, downward mobility provides no incentive to change their habitus as a devalued position. Contrarily, upward mobility works as an incentive to adjust the habitus, creating a blended habitus. In short, a blend of the position of origin and destination, facilitated by a slow and steady upward movement [25].

Despite sharing the same economic access as others in their social class, consumers develop different perceptions, depending on their social origins [26]. Social origins are tied to the one's family's social class and education. Such perceptions are also expressed in behavior. In the high class, people tend to maintain their status throughout their lives, so they try to replicate their family's behavior [27]. However, social origin is not the only influence. In alcohol consumption, one's behavior and perceptions are influenced by their social class and age, particularly during their adolescence and early adulthood [28]. In other cases, such as with music, preferences are related to the origin of the individual's capital and their environment [29]. We also have bandwagon effects. In this case, consumers replicate other people's behavior as luxuries that all should have access to [30]. Privileged classes want to maintain their status and habits, and individuals seek to replicate their position throughout their lives [27]. However, this replication of behavior, the traditional cultural reproduction, might be different because of the education received by one's parents [31]. Upon reaching a new class and amassing wealth, consumers are driven to demanding iconic European products, such as wines, which provide a physical characterization of their economic growth [9].

As a product, wine represents cultural and social distinction [2]. Drinking wine improves social relations [32] and has an elitist dimension, such as the maintenance of one's social status, as well as its differentiation and self-promotion [33]. For example, a woman in upward social mobility consumes more wine than women in her group of origin because wine is generally associated with affluence [34]. This is a possible effect of the social value of wine [35] and the different representations associated with it [36], as well as the cultural contexts which influence the way people think about wine [6].

The main context in wine culture is the difference between Old and New-World wine and traditional and non-traditional wine countries. The Old World retains a historical relation to wine, while the New World's association to it is much more recent, and mostly in former European colonies . Traditional wine nations, though they might belong to the New World, form a closer and more familiar bond with wine than non-traditional wine countries. For example, France bears much closer ties to Argentina, a traditional wine producing country, than to Switzerland, whose bond is nearer to Brazil, a non-traditional wine country [38]. The Old World, composed of European countries, is the traditional producer and consumer. The New World is made up of former European colonies, such as Latin America, Africa, Oceania, and

the USA [9], the new consuming and producing countries. Represented mainly by emergent markets, such as China, India, and Brazil, New-World wines have a social influence on wine consumption [37].

In those countries, consumers develop different relations with wine and its different types. Usually, older consumers prefer still wine, while young adults prefer sparkling wine [39] because of their different representations. Sparkling wine has different characteristics concerning types, countries, and segments [40, 41], besides the different consumption contexts [13]. In the New World, sparkling wine is more associated with enjoyment and self-image, while in the Old World, it is more associated with tradition and the product itself [42].

Champagne is the main product of this category. Champagne is an icon, a luxury, and a festive beverage which has shaped modern consumption ideologies [43]. Nevertheless, over the last years, the most important consumption growth has been tied to other sparkling wines. In France, the Crémant had an increase in sales of around 50% from 2005 to 2013 [44]. Brazilian consumers have increased the consumption of local sparkling wines, unlike the increase of consumption of imported wines, mainly from countries in the New World.

1.2 The Theory of Social Representations

Social representation (SR) is a theory of common sense in knowledge and communication. It reflects socially constructed knowledge, maintained and shared, aiming to build a reality [45] and beliefs shared by individuals in the same social and historically determined group [46]. SRs may influence individual behavior in collectivity [47] because they aim to understand how people think, communicate, and behave [48]. From them, one can understand how individuals and groups build a stable and predictable world, from an unfamiliar object to a familiar one [49]. Two processes allow this social construction: objectification and anchoring. The former reduces uncertainty, making an abstract object concrete. The latter incorporates the new object in a familiar category based on preexisting knowledge [50, 51, 52].

An SR's activity and construction are the same for all individuals, but objects and their content may vary across cultures [6]. People think and interact according to their own culture, and depending on their group of origin and level of knowledge [53]. An SR might also explain and influence collective behavior [54, 55]. It is a lens we use to see the world and understand the dynamics of social interactions and practices [56]. It was made to persist and is not constantly changing [57]. According to Abric [58, 59, 60], SRs are structured around a central core and a peripheral system. The central core is rigid and may be activated differently to signify particular objects or practices according to the social context in which they occur [59]. Elements composing the peripheral system are more dynamic, accessible, and adaptable to a concrete reality. They also affect behavior [61, 62, 63] and allow us to understand products and objects from a social and cultural perspective [64], because an SR — as a collectively shared representation — classifies individuals as belonging to a specific group [65].

1.3 Summary and hypothesis

The present study aims to understand how culture, social origins, and social class influence the social representations of sparkling wine. Some studies aim at understanding the social aspect of sparkling wine consumption [13; 20, 42], and others focus on sparkling wine preferences [66, 67, 39, 68, 42], its intrinsic and/or extrinsic attributes [69, 70, 71, 41], and the sparkling wine market [72, 73, 74]. No studies have explored social representations of sparkling wine or made a comparison between the Old World and traditional wine countries against the New World and non-traditional wine countries, such as France and Brazil, or even that sparkling wine is a distinct category of wine, and an important product in the wine sector.

As to social representations, some studies have been developed about wine. It has been observed that still wine and sparkling wine are traditional and cultural products in France, one of the most important wine producing countries in the world. Contrarily, when compared to France, Brazil's history of wine production and consumption is recent, but has enjoyed significant growth in recent years. Sparkling wine was the most important reason for this growth, mainly due to internal sales, as this product has become linked to partying, luxury, celebrations, and a symbol of social affluence.

Previous studies have already approached social representations of wine in general. Those studies applied different approaches. Consumer proximity to wine improves their knowledge about the product, and, thus, there is an influence on how the object is represented in the consumer's mind [75]. Similarly, social representations allow highlighting how social groups understand the ill-defined concepts of wine [53]. Wine is seen as a traditionally French beverage [36], a cultural object of sociability and heritage [76] in which representations are influenced by culture and expertise level [6]. France is considered a traditional wine producing country, while

Brazil a non-traditional wine producing country [38]. Wine has an "ideal" context of consumption [32, 77] and may have an "ideal" label and bottle [78]; furthermore, it is an object of polemical representations and part of intergroup conflict, connected to social identity [5], represented as a product of social standing and affluence [20, 33].

Social representations are a worldview used by individuals or groups to understand the dynamics of social interactions and to clarify determinants of social practices [56]. Additionally, we have seen that social representations are constructed knowledge, socially and historically maintained, and they influence social behavior. Similarly, social origins, such as the education received by one's parents', also affect behavior and cultural practices. Due to these different social representations of wine, class, social origins, and cultural influence, our hypotheses were the following:

H1 – Social status and social origins will influence the way individuals represent sparkling wine, but they will be more important for Brazilian consumers due to their social mobility and the recent rise of the sparkling wine culture.

H2.a – Because the French are closer to and have historical contact with sparkling wine culture – being from a traditional country – social representations shared by them will be more related to wine culture and wine knowledge.

H2.b – Brazilians have a recent history with sparkling wine culture – being from a non-traditional country – and will thus share more trivial representations, showing ignorance about the product.

H3 – Sparkling wine will have shared representations with still wine as well as representations distinguishing the two.

H4 – Consumers will confuse sparkling wine with more familiar sparkling beverages.

2. METHOD

2.1 Participants

Participants were recruited using the online snowball sampling method via online social networks. This method consists of participants inviting others to share the questionnaire link. The link was shared on Facebook and WhatsApp groups in Brazil and France, and we invited participants to share the link in turn. Two hundred and fifteen Brazilians (151 females and 64 males) and one hundred ninety-eight French men and women (142 females and 56 males) of legal drinking age (see table 1) answered the questionnaire. Wine and sparkling wine habits were assessed on a 5-point Likert scale, where 0 = non-consumer (never), 1 = very occasional (exceptional parties and events), 2 = occasional (occasionally, other occasions besides parties), 3 = regular (regularly throughout the year), 4 = frequent (several times per month) [see 6]. Most participants were regular wine consumers (Brazil M = 3.31, SD = 1.01; France M = 3.37, SD = .92) and occasional to regular sparkling wine consumers (Brazil: M = 2.74, SD = 1.00; France: M = 2.58, SD = .78). Social origins were measured by their parents' educational level [see 27, 31]. Socio-demographic questions were also asked, such as age, gender, occupation, income range, and educational level.

Table 1. Participants age distribution across culture, socio-professional category, and social origin.

Age	Total	Brazil	France	SPC+	SPC-	SO+	SO-
18-20	4	1	3	0	4	1	3
20-29	166	94	72	80	86	80	86
30-39	99	68	31	56	43	36	63
40-49	54	20	34	31	23	12	42
50 and over	90	32	58	49	41	16	74

2.2 Procedure

We collected the content using a word association task, followed by two steps referring to hierarchical evocation and semantic contextualization [see 65, 60, 79, 80, 81]. Information such as social origins, consumption habits, and sociodemographic data were also requested. Participants wrote (04) words or phrases that came to mind [82] when we asked them about the four different inducing words. The inducing words in Brazil were: "vinho espumante" (sparkling wine), "espumante moscatel" (Moscatel sparkling wine), "sidra" (cider), and Champagne; in France: "vin mousseux," "vin pétillant," "vin crémant" – terms used to designate sparkling wine in French, and Champagne. These words were taken in referenced blogs and official content from wine associations, explaining the difference between those products, as well as how the product was misunderstood by the consumer [see 20]. To verify the context and the real meaning of the expressions and words, participants wrote a sentence expressing the meaning of the word and expressions through semantic contextualization [80,81]. The questionnaire was pretested with some Brazilian and French participants to verify their understanding of the terms and the organization in Portuguese and French.

2.3 Data analysis

The words collected were categorized according to their meaning and similarity. This technique is based on intuitive-content analyses and aims to exhaust the meanings produced on a word association task [83]. The categorization was done by groups of meanings, based on semantic contextualization, that is, "Champagne," when related to the wine from Champagne, and "non-Champagne," when the participants affirm the difference from Champagne [see 81]. Participants' data was dichotomized by culture (Brazil and France), socio-professional category (SPC + and SPC-), and Social Origins (SO+ and SO-). Socio-professional category and social origins were dichotomized using the average of participants. Their social status was measured by socio-professional category [see 84, 85, 86]. Social origins were measured by their parents' education level, following traditional cultural emulation [31]. Education levels were split by 2 years or less, and more than 2 years of a Bachelor's degree or equivalent (university education). Finally, we performed the Correspondence Factor Analysis (CFA) from a contingency table [see 87], and the results are illustrated with a CFA Graph.

2.4 Correspondence Factor Analysis (CFA)

CFA is a technique for processing different types of data matrixes, in which we can analyze interdependence between dimensions [88]. In this study, we look for the interdependence between representations associated by participants in the verbal association task (categories) and country of origin, socio-professional category, and social origins as independent variables. This technique allows us to simultaneously analyze independent variables and the verbal production of participants [83, 6], and also highlights the correspondence between the variable modalities and their associated words [6]. Through this method, CFA allows us to highlight social anchoring and helps us identify how the considered object is regarded, according to which positions it occupies in the social field [60]. It was developed to identify the most significant factorial axes [87]. This factorial analysis highlights the differences between association frequencies related to independent variables and their correspondence [80]. The graphical representation of results shows how social representations are organized [88, 83].

3. RESULTS

Correspondence Factor Analysis (CFA) was used to study the correspondence between our observations and modalities (Figure 1). We used Deschamps' approach [83], applied in recent studies, to define contributions by factors (CF) [see 87, 79, 6].

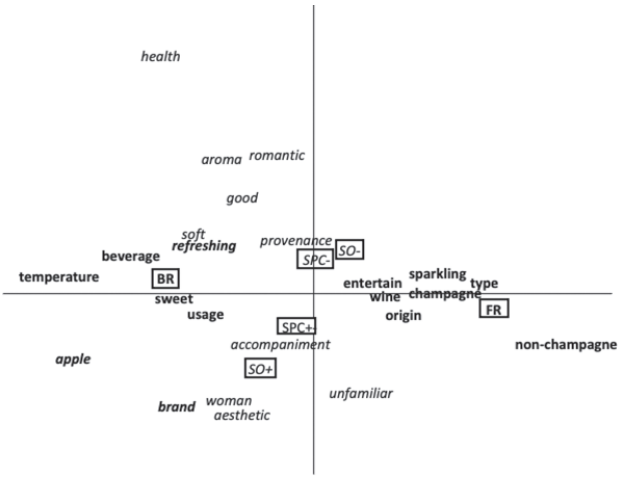

Figure 1. Graphical representation of the results from correspondence factor analysis (factors 1 and 2).
Note: It is important to read the figure following these instructions: Abbreviations in capital letters which are inside frames represent the terms of independent variables.
BR – Brazilians; FR: French; SO-: Low social origin; SPC-: Low socio-professional category; SO+: High social origin; SPC+: High socio-professional category.
"TERM" means that the term of independent variables accounts for the construction of Factor 1.
"TERM" means that the term of independent variables accounts for the construction of Factor 2.
"Item" means that the item accounts for the construction of Factor 1.
"Item" means that the item accounts for the construction of Factor 2.
"Item" means that the item accounts for the construction of Factors 1 and 2.
Items not considered as important are not showed on the graph, except to SPC+.

Factor 1 receives contributions related to the variable "culture": Brazil = .44, France = .49, a contribution of 93% of inertia. Factor 2 is related to social status and social origins. High social origins = .44, low social origins = .23, and low socio-professional category = .13, a contribution of 80% of inertia. The high socio-professional category was excluded because it did not contribute significantly to any factor = .12. Figure 1 shows the organization of factors.

The main opposition, related to culture, is observed in factor 1. For Brazilians, the term "beverage" refers to many different sparkling beverages, such as Cider, Moscatel sparkling wine, and conventional sparkling wine, which have the same usage, such as toasting, cork popping, bubbles, special glasses, "a Champagne flute," the ideal temperature for consumption, and as a light drink. "Apple" refers to Cider, derisively presented by

some participants as a "poor man's Champagne." The terms: "brand", "usage", "aesthetic", and "romantic" refer to visual and social status due to the prestige associated with product consumption. Brazilian participants shared representations of a visual and refreshing beverage, such as with the terms "refreshing", "beverage" and "temperature". They are also associated with an easy to drink beverage, soft and sweet, with specific consumption practices.

For the French, "type" and "origin" refer to different products from different regions, such as the different regions where Crémant, in France, or other sparkling wines are produced, such as Prosecco, in Italy, and Cava, in Spain. "Champagne" and "non-champagne" refer to the importance of a good differentiation between the Champagne AOP and substitute sparkling wine. The word "entertain" refers to amusing moments in which sparkling wine is consumed, such as parties and happy hours.

Factor 2 opposes high and low social status, socio-professional category, and social origin. However, there is more consensus in France than in Brazil, which can be explained by the fact that wine is a cultural product in France [6]. There, sparkling wine is seen as "Champagne" and "non-Champagne" - substitute products [20]. Low social status represents sparkling wine as more visual and general characteristics, "refreshing", "good", "soft", "provenance", "aroma", and "health". "Provenance" refers to the raw material used to produce sparkling wine, such as must and grape, and methods in which low status participants affirm they know how sparkling wine is produced. They give more superficial and general information about the product and not details of organoleptic properties, as a traditional wine consumer would [see 38].

Those from high social origins associate sparkling wine with the protection of social standing and distinction, showing their knowledge about the product, the difference between substitutes, or lack of knowledge about them. In France, "non-champagne", "unfamiliar", and "accompaniment" show that substitute products are not Champagne. In Brazil, substitutes are not conventional sparkling wine. "Unfamiliar" refers to the lack of knowledge about substitute products. The brand is related to how consumers differentiate products and social standing, mainly in Brazil.

The results show evidence of sparkling wine as a product of social standing and distinction. The object has different social meanings depending on the country in question. In France, "Champagne" and "non-Champagne", in Brazil, the different sparkling beverages and sparkling wine. In France, the representation is more related to the different wine types than to the sparkling characteristic; in Brazil, it is related to consumption, rules, and general beverages, not just wine.

4. DISCUSSION

This study aimed to understand how culture and social status influence the organization of social representations associated with sparkling wine in Brazil and France. According to our H1 hypothesis, results show that sparkling wine is seen as a product of social standing and distinction, but in different ways, depending on the country. One can observe that there is a convergence of associations from low social status, origins, and socio-professional category. High social status, social origin, and socio-professional category, which do not contribute significantly to the factor, do in fact converge. Among the French and Brazilians, in line with our theoretical elements, we can see the influence of culture. Indeed, results highlight a cultural difference between traditional and non-traditional wine countries [38].

Moreover, the process and construction of social representations are universal, but the subject differs across cultures [6] and depends on its country of origin [53]. Brazilians have a recent wine history [18, 89], but sparkling wine culture is on the rise. Differently, wine is part of the French identity and culture [90, 5, 6, 38]. Therefore, France is the origin of modern sparkling wine culture [91, 92, 8].

The results show social representation divergences in Brazil and convergences in France, probably due to their tradition of sparkling wine production and consumption. The results support H2.a, and H2.b hypotheses, in which one's culture and proximity to wine culture influence social representations associated with sparkling wine. Results confirm prior research about the differences between traditional and non-traditional countries [38]. In Brazil, sparkling wine is more often related to a general, soft, sweet, refreshing, easy-to-drink beverage, and with different brands. In France, it is related to Champagne and substitute products – non-Champagne — from different origins, regions, and countries, and different types: representations linked to knowledge and ignorance regarding the product. This aspect highlights social standing and dominance related to wine consumption [33] and the proximity to wine culture. There are also differences concerning social status, more divergent in Brazil and convergent in France. That evidence likewise contributes to validating our H1 hypothesis.

Wine, in general, is a cultural and social product [2]. Other authors have also showed the different rep-

resentations associated with it [77, 75, 5, 6, 78, 53, 36, 93]. In our study, according to our H3 hypothesis, the most important difference between still wine and sparkling wine is the presence of bubbles, foam, aesthetics, and entertainment. However, in Brazil, sparkling wine is represented as a general or common beverage with bubbles. In France, it is represented as wine with bubbles, consumed for entertainment, according to intrinsic and extrinsic quality characteristics [see 94], such as origin and type. In both countries, bubbles are an important element. They emphasize sparkling wine as a distinct category in the wine field, with bubbles, prestige, fun, and a product to be flaunted.

In France, we can observe the association between Champagne and non-champagne and, in Brazil, sparkling wine as a general sparkling beverage, including Cider. It is observed that there is a misunderstanding about the definition of sparkling wine. This result validates our H4 hypotheses about social anchoring, in which individuals familiarize novelty and reduce its strangeness [95]. Both countries anchor in familiar products to understand "new" products. Substitute products, Crémant, Cava, and Prosecco, are compared to Champagne; Champagne, technically a sparkling wine, holds a better reputation [16] and is represented in a different category. In Brazil, substitute beverages, such as Cider, a fermented beverage made from apples, are compared to conventional sparkling wine, sharing representation of sparkling wine, in some cases called "a poor man's Champagne." That is an anchoring process in which individuals give sense to a non-familiar object from preexisting knowledge [50, 51, 52]. The process is related to social representation origins and reinforces social position and sociability [33, 96]. Brazilians in higher social positions have more knowledge about sparkling wine, and the French, about Champagne.

Otherwise, results show the symbolic aspect of sparkling wine consumption related to social factors, such as social standing, position, and mobility. Sparkling wine is a product of social affluence and with a strong visual appeal. However, social representations of sparkling wine, its consumption, and social distinction must be studied further. Thus, our study shows the future directions of social standing and sparkling wine consumption. The rise of sparkling wine consumption in Brazil and France could be explained by social distinction and mobility, mainly in Brazil, where social representations differ depending social origins, suggesting the use of sparkling wine as a product of social standing. Brazil has increased economic and social development in recent years, showing upward social mobility [97]. In upward mobility, individuals try to adapt to a new social class, in an attempt to become a part of it and to be accepted by it [24]. Then, future research could study the correlation of the social representations of sparkling wine and social domination orientation (SDO), and conspicuous consumption, social representations of sparkling wine supporting a social hierarchy. SDO is the society that tends to have a social structure based on social hierarchies and dominance of hegemonic groups at the top [98]. Conspicuous consumption is "a deliberate engagement in the symbolic and visible purchase, possession and usage of products and services imbued with scarce economic and cultural capital with the motivation to communicate a distinctive self-image to others" [99, p. 217].

5. CONCLUSIONS

Considering consumption as a symbolic act which bears a social role [1], sparkling wine consumption must be seen as a social and cultural phenomenon. Our research highlights the origins of sparkling wine representation and the anchoring process with Champagne and French practices, as well as the context of its consumption. As proposed by Rodrigues et al. [38], less-known regions must improve wine education as a marketing strategy to increase wine awareness, as it could be an important alternative for the wine market.

Despite its organoleptic characteristics, sparkling wine is an object of representation, and its consumption is a social phenomenon with cultural meaning. The object is used to communicate social class and the need for social affiliation. We highlighted the differences between traditional and Old-World wine, and non-traditional and New-World wine representations. These differences show the influence of Old-World wines and opportunities for wine marketers to build product brands according to consumers' beliefs and culture, and the openness to new sparkling wine types, mainly in emerging countries, where upward social mobility is occurring and where there is a non-tradition of sparkling wine consumption.

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Premium price for natural preservatives in wine: a discrete choice experiment

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Abstract. The South African wine industry has recently launched the world's first 'no sulphite added' wine made from indigenous Rooibos & Honeybush toasted wood chips. This wood chip contains antioxidant properties known to protect wine from oxidation. On the other hand, SO_2 as a preservative, is often perceived by wine consumers as causing headaches and migraines. Differentiated wines based on their SO_2 content may be a profitable marketing avenue for the struggling industry. We interviewed more than 600 wine consumers to investigate their perceptions of wine preservatives and preference for several wine attributes. Specifically, we use discrete choice experiments to elicit willingness to pay for the innovative alternative based on Rooibos & Honeybush wood chips. In addition to wine preservatives, we also examine consumers' preferences for organic wine attributes and wine quality measured by a 100-point quality score and cost. Based on the results from the mixed logit model, we find that consumers are willing to pay an additional €3.53 (R56.48) per bottle of wine with natural Rooibos & Honeybush wood chips, while they are ready to pay €1.22 (R19.52) more for organic wine and €0.10 (R1.60) for each point on the quality score. Consumer preferences are not statistically different between red and white wine but differ considerably across consumers. In particular, those who believe SO_2 in wine causes headaches are willing to pay at least three times more for replacing sulphur-based preservatives with a natural one. Marketing implications are offered for the wine industry.

Keywords: wine preservatives, willingness to pay, discrete choice experiment.

INTRODUCTION

South Africa's wines have been progressively internationally competitive, with a viable and positive trend since 1994. The wine industry is the eighth in overall volume production globally and contributes approximately 4% to the world's wine. It exports half of its produce, and its local wine per capita consumption is estimated at 7.73 litres [1]. The wine industry generates R54.96 billion annually, contributing 1.2% to South Africa's GDP in 2019; R7.17 billion in taxes to the South African government; and income for

farmers worth R6.16 billion [1]. The wine industry plays an important role in South Africa's labour market providing over 300,000 jobs. More importantly, the industry is linked to the rest of the economy through producers' purchase of goods such as fertilizers, herbicides and pesticides, and services related to insurance, finance, research & development and advisory. Despite the benefits rendered, however, the wine industry is under serious threat.

In recent decades, the input cost of production has increased significantly in the South African wine industry. From 2006 to 2017, a steady upward trend in input production costs raised concerns about the welfare and sustainability of the industry. The increase and changes in production input costs have negatively affected the primary producers to the extent that over a thousand grape farmers have shut down operations [2] of a total of 3,145 remaining grape farmers, 13% are producing at sustainable income levels, 44% are operating at the break-even point, and the rest are making losses. Furthermore, the area under vine cultivation has reduced drastically from 102,146 hectares in 2006 to 95,775 hectares in 2016 [2].

In response to the potential impact of uncertain events, farmers implement various risk management strategies with respect to their production plans, the available finance, physical and human capital, and the degree of aversion to risk. These risk management strategies may include (among others) crop diversification, crop insurance, effective coordination, technology and innovation. For example, innovation is widely accepted to be a driving force for agricultural development. Progressively, scientists and extension agents recognize the key role of innovative farmers and acknowledge their experiments and innovations for agricultural development [3–5] and for farming systems resilience [6,7].

It has been shown that firms' capacity to innovate, and new product development in particular, has a significant potential to improve firm performance and increase market share [8–11]. However, product innovation cannot fully achieve this goal without effective market orientation [12–14]. This may require engaging various parties in understanding customers' current and future needs and the key factors for developing and designing a new or improved product that meets those needs [15]. In line with a product innovation strategy supported by market orientation, the wine industry may explore the potential of a natural preservative for wine as an alternative, with a view to developing a new product that will increase industrial specialisation and consequently improve the competitiveness of South African wines in global wine competition

Since time immemorial, sulphur dioxide (SO_2) has been used by winemakers to preserve wine [16]. Because of its antioxidant and antibacterial properties, SO_2 plays an important role in not only preventing oxidation, but also maintaining freshness [17]. It is important to note that trace amounts of (endogenous) SO_2, about 10–40 ppm, i.e., 10–40 mg per litter, are naturally formed by wine yeast during fermentation [18], but winemakers add extra SO_2 throughout production [19] to prevent spoilage and enhance aging potential [17]. Thus, while too much sulphur can ruin a bouquet, wine can spoil quickly when sulphur is missing.

Although some studies believes the health effects of SO_2 are overstated [20], there is overwhelming evidence that SO_2 may induce adverse reactions in wine drinkers suffering from sulphite sensitivity [21–24]. A wider share of the consumer population perceives that drinking even moderate amounts of wine, particularly red varieties, triggers minor health effects, including respiratory and gastrointestinal symptoms, headaches and migraines [16,25,26]. It is estimated that about 1% of wine consumers are sulphite-sensitive [27].

While medical science has not reached a consensus on whether SO_2 does in fact cause the reported minor health effects, public health authorities have made it mandatory for wine makers to restrict the use of sulphur in wines and display its quantity on wine bottles. This was made possible by the formation of specific legislation to control sulphite levels in final products [28]. The role of this legislation was to regulate and monitor the upper limits of sulphite and to help to standardize oenological methods in lowering sulphite concentrations in wines [29–31]. For instance, in South Africa – our study site – the Liquor Product Act 60 of 1989 requires that dry white wine produced after January 1995 may not contain more than 160 mg/l sulphur. Off-dry and sweeter wines may contain up to 200 mg/l, while sulphur content is allowed to be up to 300 mg/l for late harvests. The limit for dry red wine is 150 mg/l. Organic wines still contain sulphur, albeit at very low levels; however, if the level of sulphur is below 10 mg/l, the product may be labelled "no sulphur added". The shelf life of these wines is necessarily limited[1].

[1] In the European Union, Regulation 1333/2008 amended by Commission Regulation 59/2014, sets a limit for total SO_2 at 150 mg/l in red wines and 200 mg/l in white wines, and because some individuals are sensitive to SO_2, it is mandatory to include 'contains sulphites' on the label if total SO_2 is over 10 mg/l (i.e., SO_2 content of not more than 10 mg/kg or 10 mg/l is not considered to be present). EC Regulation 203/2012 sets the limit for organic wines at 100 mg/l for red wines and at 150 mg/l for white and rose wines. Organic and natural winemakers restrict its usage even further. For instance, The Charter of The Authentic – Natural Winemakers' Association in the Czech Republic

Even though replacement of SO_2 is uncommon, there is a small number of wine-makers who produce wine with lower SO_2. As noted earlier, organic wines usually contain trace amounts of sulphur. In some countries, such as the US, all organic wines are SO_2-free, excluding SO_2 naturally formed by wine yeast [32]. This is, however, not the case in South Africa, where wines can be classified as organic regardless of whether they contain SO_2 or not. Given that the absence of added SO_2 in wines can be viewed as a quality differentiation factor, and that 'no sulphite added' wines may appeal to health-conscious consumers, this study is warranted. Since the emergence of these health effects, winemakers around the world are encouraged to find alternative healthy ways to preserve wine.

Natural preservatives like yeast and other natural components of grapes and wine are used as an alternative to sulphur-based preservatives. Other alternatives to conventional wine-making include carbon dioxide additive, chemical preservation, fermentation, filtration, firming, oxidative wine making, pasteurisation, reductive winemaking, stabilisation, sterile bottling, and temperature management, hydrostatic pressure, pulsed electric fields, ultrasound radiation and ultraviolet radiation [33]. Bentonite – a pure natural absorbent swelling clay – has been used for ages to support sedimentation of yeast sludge and to bind thermosensitive proteins that prevent wine turbidity. Other nature-based substances such as plant proteins, collagens and gelatine are commonly used for wine clearing. The ongoing search for unique and innovative wine products has sparked interest in the global wine market; finding alternatives to SO_2 is one such goal.

Breaking into this niche, in 2013 South Africa produced the first wine made from natural preservatives (Rooibos & Honeybush). Rooibos (Aspalathus linearis) and Honeybush (Cyclopia) plants are indigenous to the Western and Eastern Cape provinces of South Africa [34,35] and have been harvested and processed mainly to produce herbal teas [36]. Research concerning the antioxidant capacity has been conducted by the Department of Oenology at the University of Stellenbosch in collaboration with two wineries (Audacia and KWV) to utilise this indigenous wood for wine preservation [19], [36–38]. Drawing attention to consumer behaviour in the marketplace has highlighted a trend of consumers choosing healthy food products. Most consumers, particularly in recent times, are attentive to artificial additives and prefer to purchase organic foods [39]. Given that 'no sulphite added' wines seem attractive to health-conscious consumers, it is interesting to explore this potential niche market in depth to gauge consumers' perceptions of the importance of these wines. Determining whether consumers choose such wines is important as it would reveal whether wine players (in the South African wine context) can exploit this source of avenue in an effort to save the struggling industry. Indeed, key evidence that would inform wine players is how valuable 'no sulphite added' wine is to consumers, and what share of consumers would consider such a trait as important in their buying decisions.

Several peer-reviewed papers address consumers' willingness to pay (WTP) for wine without added SO_2 [21–24]. While there is agreement about the negative effects of SO_2 on health, and even that consumers are ready to pay more money to avoid added SO_2 in wine, no study examines consumers' preferences for SO_2 alternatives. We conduct a novel study by estimating the premium price that wine consumers are willing to pay for SO_2 alternative.

To fill the research gap, our study uses a primary survey and discrete choice experiment (DCE)[2] to analyse preferences for three qualitative non-monetary attributes of wine: natural preservatives, organic production, and quality measured by a 100-point score, and the fourth attribute is price. Specifically, we aim to answer the following four research questions: (1) Are consumers ready to pay for wines made with natural preservatives (Rooibos & Honeybush), organic production, and with a higher quality score?; (2) Do preferences for wine colour and hence marginal willingness to pay for the three qualitative wine attributes differ for red and white wine?; (3) Since a sulphur-based preservative is perceived to trigger headaches, are consumers who believe that SO_2 in wine causes headaches willing to pay more for the wine attributes, particularly for Rooibos & Honeybush preservatives?; and, lastly, (4) Do preferences vary among various consumer characteristics such as gender, race, and the frequency of wine drinking? We use the stated preference approach to understand consumers' perceptions and, in particular, how consumers would value a wine that was produced using Rooibos & Honeybush as a preservative for both conventional and organic production.

We find that wine consumers in South Africa are willing to pay a price premium of €3.53 per bottle of

requires limits of SO_2 at 90 ml/l for red and orange wines and 100 ml/l for white and rose wines, see http://vinarstvivykoukal.cz/wp-content/uploads/2016/07/Stavek-Charta-autentistu-A2.pdf.

[2] Although the DCE has some limitations such as hypothetical bias (see Lusk and Schroeder, 2004), it allows researchers to control for exogenous factors that may otherwise weaken the results and also ensures that the effects of each attribute on preferences are identified (Kroes and Sheldon, 1988).

wine if Rooibos & Honeybush rather than SO_2 is used as a wine preservative, and this premium does not differ between red and white wine. Of 611 wine consumers interviewed, about 68% believe that consuming a moderate volume of wine causes headaches, and the same consumers are willing to pay three times more for the natural preservatives (€5.67) than those who do not think SO_2 in wine causes headaches (€1.82). The price premium for organic wine is smaller, about €1.22, and it does not differ much between the two segments. Wine quality (measured by a 100-point Quality Score) matters as well, but respondents are willing to pay only about €0.10 and €0.15 for the two segments. There is large heterogeneity in consumers' preferences.

The remainder of the paper is organised as follows. Section 2 reviews the literature. Section 3 describes the methodology and the data used for the analysis. Section 4 summarizes the empirical results, and Section 5 concludes.

2. LITERATURE REVIEW

There is no valuation study that examines consumers' preferences for an alternative to sulphur-based preservatives in wines . However, several studies analyse preferences for wines with 'no sulphites'added – two elicited stated preferences, one aimed at revealed preferences. Using a conjoint choice approach, Costanigro et al. [22] analyse the willingness to pay for non-sulphated wines in the US. Analysing the best-worst choices by ordered logit, they find that US consumers are, on average, willing to pay $1.23 (€1.11) per bottle of wine to avoid added SO_2. They also find that 34% of respondents experienced headaches after drinking wine, and these consumers are ready to pay more for wine with no sulphur, $1.23 (€1.11). Similarly to the study by Costanigro et al. [22], D'Amico et al. [23] also use a direct survey to analyse the purchase interest of Italian wine consumers for organic wine with no added sulphur. Estimating the ordered logit, they find that the majority of Italians (54.5%) were not willing to pay a premium for no added sulphur, and only 10% would pay a small premium. Environmental consciousness and 'wine curiosity' led consumers to pay a higher price for organic wines with no added sulphur. On the other hand, naturalness and designation of origin increased the probability of paying a premium price for wine with no added sulphur. The study also discovered that insufficient information is a barrier to accepting a higher price for organic wines and wines with no added sulphur. This study also highlights the need to educate consumers on health effects in order to obtain a positive evaluation of the health-related attributes of wine. Instead of stated preferences, Grogan [24] aims at revealed preferences to examine the value of added sulphur in French organic wines using an organic wine dataset from 546 wineries. Estimating the hedonic pricing model, they find that the addition of the SO_2 preservative reduced the price of red organic wine by 23% for wines that were intended to be drunk immediately after purchase; however, this effect becomes positive for wines that were intended to be cellared for at least one to three years. Adding SO_2 had neutral to positive effects for most white wines.

A more recent study by Amato et al. [21] analyses consumers' willingness to pay for wine bearing a SO_2-free label in Italy and Spain using experimental auctions. They employed a Tobit model for the analysis. Results in both countries show that consumers who associated the headaches with drinking wines with SO_2 are also willing to exchange the habitually consumed bottle of wine with a 'no-added sulphite' wine and they would even be willing to pay something extra for such wine.

In addition to research that directly examines the effect of added SO_2 on wine price and consumer decisions, other studies examine consumers' preferences and willingness to pay for wines perceived to be healthier. For example, a study by Barreiro-Hurlé et al. [40] reveals a positive valuation for resveratrol-enriched wine, a health-promoting ingredient. Organic wines are also often perceived as being health-promoting [40,41], and health-conscious consumers are particularly receptive to marketing campaigns promoting natural (and organic) wines [17].

Another stream of literature focuses on organic wines [42,43]. These studies highlight the effect of environmental concerns, and, as Olsen et al. [44] argue, the price premium for organic wine may be viewed as the financial "self-sacrifice" made in order to protect the environment. It is important to note, though, that 'organic' is a multifaceted attribute encompassing numerous consumer values, and consumers may even have difficulty explaining why they value organic wine over other varieties [40].

Several studies aim at various intrinsic (such as sensory characteristics) and extrinsic wine attributes (such as price, grape origin, vintage, or brand). Gil and Sánchez [45] vary wine price, age, and origin and find that, in the absence of other quality cues, the origin is the most important wine attribute. Robertson et al. [46] examine the subjective knowledge about wine associated with the relative importance of four extrinsic product attributes. They find knowledge of wine age, brand, and the region of wine origin to be increasingly impor-

tant, whilst the price of wine was the dominant attribute regardless of the level of product knowledge.

Similarly, Mueller et al. [47] use informed sensory hedonic tests to understand the interplay of wine sensory characteristics and extrinsic attributes such as packaging, price and brand awareness. With enrichment of choice experiments by the sensory tests, they were able to simulate consumers' purchase, which allowed them to examine preferences for new wines and predict their market uptake. Lockshin et al. [48] and Mtimet and Albisu [49] examine how market involvement influences the valuation of wine attributes such as brand, region of production, quality medals, and aging.

To sum up, despite relatively large literature on consumers' preferences for wine attributes, including organic quality and the non-use of SO_2 as a wine preservative, literature that would elicit consumers' preferences for a natural preservative is non-existent. This study therefore fills the gap by investigating consumer preferences for Rooibos & Honeybush (a natural preservative) and evaluates specifically whether or not, and to what extent, consumers are willing to pay for wines that are preserved by it.

3. METHODS AND DATA

3.1 Sampling and implementation strategy

Historically, black South Africans were prohibited from purchasing and consuming clear liquors, making the white consumer group the largest group of wine drinkers [50]. However, after the change of regime (post-apartheid) and with the growing number of black middle class, whites are no longer the majority wine consumers. Nevertheless, there are no background statistics on wine consumer segments. For this reason, we used multistage sampling to select areas and places to conduct the interviews. In the first stage, Cape Town city was purposely chosen from the Western Cape province[3] because it has the largest number of people and wine consumers [51]. About 95% of South African wine is produced in this province. The second stage involved randomly selecting clusters of shopping malls across the city. These malls encompass retail businesses that sell wine, i.e., restaurants, liquor-stores, supermarkets and bars. The third and final stage involved randomly selecting wine customers who went shopping in the pre-selected shops to form the sample. Eligibility criteria included any person above age 18 (this is the legal alcohol drinking age in South Africa) and who had consumed at least a bottle of wine (750 ml) in the last 6 months. Participants were approached by enumerators and asked if they could voluntarily take part in a wine survey for academic purposes. Five enumerators were recruited from postgraduate students enrolled at the School of Economics at the University of Cape Town, who were trained prior to pre-testing of the instrument. No incentive was offered to the survey participants. The interview was conducted in English and the enumerators used a pen-and-paper mode of interviewing.

A survey instrument was comprehensively pre-tested in two waves of testing with 44 and 52 wine consumers in the Western Cape province of South Africa during 10-14 June 2019, and 24-28 June 2019, respectively. Based on respondents' feedback, the survey instrument was modified to improve its readability and comprehension. The questionnaire consisted of four sections. The first section contained a brief explanation of the purpose of study without mentioning details of the study so as to minimise a potential framing bias. Questions regarding the wine acquisition practice were asked. The second section dealt with consumer information and knowledge about SO_2 content in wine, perceived health effects, cultivar production types and quality score of wine. The discrete choice experiment was presented in the third section. In the event respondents chose no change (status quo), respondents were asked to provide their main reason in order to identify protest responses. The final section collected socio-economic and other relevant information about the respondents. To facilitate understanding and render the survey more pleasant to respondents, visual information was included (see, Figure 1).

The main survey was conducted between July 8–22, 2019, and a total of 611 participants completed the survey. The demographic characteristics of the sample are reported in Table 1. While the sample may not be representative of the South African population, the recruiting strategy was highly successful in targeting respondents in areas where the majority of wine consumers reside. Almost everyone purchased at least a bottle of wine in a typical month. The majority of respondents (78%) are aged 21-50 years. There are 42% males and 51% females, while 7% choose not to provide information about their gender.

The majority of the respondents reside in Africa (80%), some in Europe (10%), while 4% and 3% came from Northern America and Asia, respectively, and the rest (3%) from other parts of the world. Regarding race,

[3] Western Cape is a province of South Africa located on the south-west coast of the country and has 6.6 million inhabitants, of which two-thirds live in the metropolitan area of Cape Town, which is also a provincial capital and tourist destination. The total population of South Africa is about 58 million.

our sample included 33% Caucasian, 31% African, 23% coloured (mixed race), and the minority being Indian and Asian (5% each). In addition, over 66% held a university degree. Median net annual household income is between R200,000 and R350,000 (€12,500–€21,875), coinciding with the average annual household income for South Africa at R270,000 [51]. However, one third of the respondents preferred not to provide information about their income.

To understand how respondents perceive SO_2 in wine, we asked them several questions. First, we asked "Do you have allergies to sulphur-contained foods and beverages such as wine?", followed by the question "Do you know, or have you heard of, someone who suffers from sulphite allergies in wine?". The final and the key question was "Do you believe that drinking even moderate amounts of wine give you a headache?". About 25% of respondents reported being allergic to SO_2 in foods and beverages; 61% claimed to know someone who suffers from SO_2 effects. About 68% believed that drinking even a moderate volume of some type of wine may result in a headache. We name this group as 'headache', while the remaining respondents constitute the 'no-headache' group.

About 15% of the respondents drink wine almost daily, 19% drink wine several times a week, 27% and 22% drink wine at least once a week or a fortnight, and only 5% drink wine rarely. When analysing observed preference, we name 'heavy drinkers' as those who drink wine almost daily or several times a week, and 'light drinkers' as those who drink wine once a month or less often (61% of our sample). 'Heavy' wine drinkers' and 'light' wine drinkers constitute approximately 34%, and 17%, of the sample size, respectively.

When making their choice, our survey participants had in their mind a wine with a price of about 195 Rand (std=116) for a (750 ml) bottle, with a minimum at 35 Rand and a maximum at 900 Rand. In euro equivalents, our respondents, on average, typically buy a bottle of wine for €11.5 (std=6.85), with €2.07 and €53 for the cheapest and the most expensive wine, respectively. This price also set the cost of the status-quo wine to which a price premium is added for the alternative wines.

Table 1. Socio-demographic characteristics of the sample (n = 611).

Variable	Percent
Gender	
Males	42%
Females	51%
Age	
18-20	4%
21-30	32%
31-40	24%
41-50	22%
51-60	15%
61-70	3%
Education	
High (secondary) school	12%
Some technical certificate/diploma	19%
Bachelor's degree	22%
Honours degree	18%
Professional/Master degree	16%
Doctorate degree	11%
Income	
R50,000 and less (€3,125 and less)	12%
R50,000 to R100,000 (€3,125 - €6,250)	5%
R100,000 to R150,000 (€6,250 - €9,375)	5%
R150,000 to R200,000 (€9,375 - €12,500)	5%
R200,000 to R350,000 (€12,500 - €21,875)	7%
R350,000 to R500,000 (€21,875 – €31,250)	9%
R500,000 to R750,000 (€31,250 – €46,875)	8%
R750,000 to R1,000,000 (€46,875 - €62,500)	5%
R1,000,000 to R2,000,000 (€62,500 - €125,000)	5%
R2,000,000 and more (€125,000 and more)	4%
I prefer not to answer	33%
Wine Consumption	
Almost daily	15%
Several times a week	19%
Once a week	27%
Once a fortnight	22%
Once a month	12%
Very rarely	5%
Headache	68%

3.2 Experimental design

Designing a DCE involves the selection and combination of the attributes and their levels to construct the alternatives included in hypothetical choice situations presented to respondents [52]. Respondents are then asked to think about the situation in which they would be making their choices. Identification of the attributes in our experiment was facilitated by the literature review addressing particularly recent studies [21–24]. In line with the state-of-the-art recommendations for stated preference studies [53,54], the design of our study was also based on findings from qualitative pre-testing that we conducted in focus groups with wine consumers from the Cape Town area. The qualitative pre-testing confirmed the suitability of the survey design and ensured the relevance and understanding of the attributes.

For our study, the alternatives were described using a pre-defined set of attributes with levels that were

Table 2. Attributes and levels of the discrete choice experiment.

Attribute	No. of levels	Levels
Preservatives	2	SO_2-based, Rooibos & Honeybush
Type of viticulture production	2	Conventional, Organic
Wine quality score	6	60, 75, 82, 88, 92, 100
Price (increase compared to what you usually buy)	5	Rands: 0, 30,45,60,75 (EUR equivalent: 0, 1.77, 2.66, 3.54, 4.43)

experimentally varied around the level expected by the respondents. We used four attributes: *Wine preservative* (SO_2-based vs. Rooibos & Honeybush), *Type of viticulture production* (conventional vs. organic), *Wine quality score,* and Price (see, Table 2).

There are two types of wine *preservatives* in our choice experiment: Rooibos & Honeybush and SO_2 -based preservative. *Type of viticulture production* may either be organic (wine produced using organically grown grapes) or conventional (wine produced using grapes grown with added chemicals, i.e., fertiliser, pesticide). The two viticulture types were included to allow a direct comparison of the valuation of conventional wines preserved with SO_2 versus conventional wines preserved with *Rooibos & Honeybush,* and again organic wines preserved with SO_2 versus organic wines preserved with *Rooibos & Honeybush*. This distinction allows the assessment of the influence of *Rooibos & Honeybush* in both viticulture production types.

Wine *quality score* is defined according to the Wine Spectator [55] scores, whose expert ratings are recognised globally. Specifically, these scores are defined accordingly as 95–100, classic: a great wine; 90–94, outstanding: a wine of superior character and style; 85–89, very good: a wine with special qualities; 80–84, good: a solid, well-made wine; 75–79, mediocre: a drinkable wine that may have minor flaws; and not recommended wine graded by 50–74 points. Quality levels also represent our proxy for a wide range of attributes, i.e., brand name, taste, origin, which would otherwise make evaluation bulky had we included them in the experiment. We use the point-values of the quality score to avoid uncertainty, as described in Table 2.

Lastly, *price* was defined as the extra cost (premium) respondents are asked to pay in addition to the price they usually pay for a 750ml bottle of wine. While the decision to pay a premium price for using *Rooibos & Honeybush* and other attributes in wine is essentially driven by the cost and benefits derived from its consumption, the individual choice is difficult to anticipate because of such reasons as information deficit and perceived or experienced health effects. The wine price was shown as an increment of what a consumer typically pays for a bottle of wine, and the premium included nominal Rand values: 30, 45, 60, and 75, and Euro equivalents are also shown on the cards in brackets.[4] In relative terms, the offered bids represented 15% to 38% of the average price of the status-quo wine. Since the bids were offered in absolute values, wine price premiums ranged between 3.3% and 214%, with the mean at 37%.

The choice task included three alternatives, with one referred to as wine that is typically purchased (i.e., the status quo). The status quo option described a typical wine sold on the South African market (in the Western Cape province); that is, a 750ml bottle of conventional wine with SO_2-based preservatives, graded by a 75-point quality score, whilst the price in the status quo was respondent-specific. Specifically, before the valuation part, we asked each respondent to state "*What is the average price for which you typically buy a bottle of wine most often?*". We found that respondents typically paid approximately €11.5 for a bottle of wine (std.= €6.85), with a minimum at €2.1 and a maximum at €53. An example of a choice card as presented to our respondents is shown in Figure 1. We then asked "Which of the three alternatives do you prefer?", and we repeated this valuation question four times for each different choice situation.

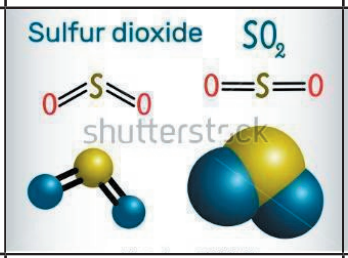
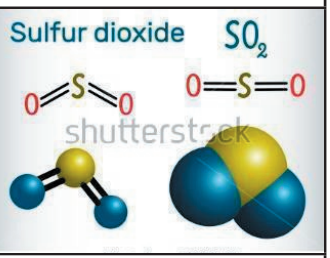
Since preference for red wine and white wine may differ, we elicited consumers' preferences for red and white wines in two separate choice tasks. The order in which consumers' preferences for red or white wine were elicited was assigned to each respondent at random.[5]

Using NGENE software, we generate a Bayesian-efficient design. The Bayesian approach for optimal experimental design has become more prominent in the literature [53,56–63] due to its ability to optimise design criteria that are functions of the posterior distribution and can easily be tailored to the experiments' objectives. Further, the framework provides a formal approach

[4] We used the exchange rate 0.059 Euro per Rand, based on the South Africa Reserve Bank prevailing rate at the time. www.resbank.co.za

[5] Our experiment contained another split-sample treatment in which we expressed price either in Rand or as a percentage change from the status quo level. In this paper, we use only responses with the price in Rand.

Figure 1. Example of a choice situation.

	Red Wine A	Red Wine B	Wine you usually buy
Preservatives	Rooibos & Honeybush 		
Viticulture production	Conventional 	Organic 	Conventional 
Wine quality Score	100 (great top wine)	60 (not recommended)	75 (a drinkable wine that may have minor flaws)
Additional cost per bottle	R45 (€2.8) more	R60 (€3.75) more	as you usually pay
Which option do you prefer?	☐	☐	☐

for incorporating parameter uncertainties and prior information into the design process via prior distributions, and provides a unified approach for joining these quantities with the model and design criterion [64]. Our design contains twelve unique choice combinations grouped into three, giving us four choice cards per each respondent. In total, we obtain 2,444 responses (from 611 respondents) for both choice tasks, one for white wine and another for the red wine experiment.

2.1 Econometric framework

The discrete choice experiments (DCE) technique has grown in popularity since its introduction by Batsell and Lodish [65] and Louviere and Hensher [66]. The use of the technique has been extended to many disciplines such as transportation, agriculture and environment, telecommunications, marketing and human health [21,40,48,67–75]. Applications also include conservation of wine varieties or valuation of wild crop conservation [76,77]. While DCE has limitations on hypothetical bias [78], it allows the study of products that are not yet available on the market [79] or policies that are not yet implemented [80,81]. Experimental designs not only allow researchers to control for exogenous factors that may otherwise weaken the results, but also ensure that the effects of each attribute on preferences are identified [82].

The choice model relies on the random utility theory [83], which assumes that individual n chooses the alternative j in choice situation t with regard to the highest utility:

$$U_{njt}=X_{njt}\,\alpha_n+\beta_n\cdot(Y_n\text{-}PRICE_{njt})+\varepsilon_{njt} \quad (1)$$

where X represents a vector of alternative specific attributes (PRESERVATIVES, VITICULTURE PRODUCTION, QUALITY SCORE), Y is income, PRICE is the price of wine, the vector of coefficients α and coefficient β are estimated and is a stochastic component identically and independently distributed with a constant variance k_n^2 $(\pi^2/6)$, with k_n^2, being an individual-specific

scale parameter. Instead of separately estimating the parameters for each respondent, we follow a common practice and assume that the parameters follow specific distributions, which leads to the mixed logit model [84].

Note that the coefficients are indexed by individuals' n, allowing for (unobserved) preference heterogeneity. In fact, as a consequence of taste and people's concerns, consumers may respond differently to different wine attributes, leading in turn to heterogeneity with respect to individuals' expected net benefit and hence WTP for 'no sulphite added' wine. We accommodate such heterogeneity by employing econometric models that accommodate both the observable and unobservable component of individual utility from offered alternatives.

Mixed logit with all factors random, freely and fully correlated is estimated using maximum simulated likelihood technique [84] in STATA 16. An individual will choose alternative j if $U_{njt} > U_{nkt}$, *for all* $k \neq j$, and the probability that alternative j is chosen from a set of C alternatives is given by:

$$P(j|C) = \frac{exp\,(X_{njt}\alpha_n + \beta_n \cdot (Y_n - PRICE_{njt}))}{\sum_{k=1}^{C} exp\,(X_{nkt}\alpha_n + \beta_n \cdot (Y_n - PRICE_{nkt}))} \qquad (2)$$

The usual procedure is to estimate the distribution of the utility coefficients (i.e., the model in preference-space) and then to estimate the willingness-to-pay as a ratio of two utility parameter estimates, as $-\frac{\widehat{\alpha}}{\widehat{\beta}}$.

In our alternative specification, we are interested to know whether preference for specific consumer segments differ. For this purpose, we fit the random utility model, additive in parameters, as follows:

$$U_{njt}=X_{njt}\,\alpha_{1n}+S\times X_{njt}\,\alpha_2+(\beta_{1n}+\beta_2\cdot S)\cdot(Y_n\text{-}PRICE_{njt})+\varepsilon_{njt} \qquad (3)$$

where S is a vector of dummies to describe specific segments such as: people who believe that drinking even moderate amount of wine causes headache ('headache', see Table 4), race (African, Caucasian) and gender (female); see Table 5 and for frequency of wine consumption (heavy drinker, light drinker); see Table 6 to control for observed preference heterogeneity. We assume the coefficient for the interaction terms to be fixed, which allows us to measure the difference in preference for the respective consumer segment and given attribute from the random mean.[6] Assuming the indirect utility function is additive in its attributes, the final WTP estimate for segments S in the specification is given as $-(\frac{\widehat{\alpha 1}+\widehat{\alpha 1}\cdot S}{\widehat{\beta 1}+\widehat{\beta 2}\cdot S})$.

We also assume this specification to explore preference heterogeneity in wine colour, pooling the data from the two sub-samples. Since we do not find preference for the attributes to differ between red and white wines, see Table A1, we estimate all mixed logit models with pooled data. WTP are estimated by the delta method, using the *nlcom* STATA command.[7]

3. ESTIMATION RESULTS

Table 3 presents the results for the mixed logit model estimated in the preference space with all factors random and freely correlated. We pool the data, without distinguishing wine colour. All coefficients are statistically significant at any convenient level and have expected signs, conforming to a priori expectations. It implies that respondents are willing to pay a premium for each of the three wine attributes, and the likelihood of purchasing a bottle of wine is decreasing with the increase in price. We also discover large unobserved preference heterogeneity for each of the four random attributes, indicated by the large and strong statistically significant standard deviations of the means.

WTP estimates are presented in Table 4, column (1). For *Rooibos & Honeybush* natural-based preservatives, respondents are willing to pay €3.53 per bottle, while the marginal price for organic winemaking is €1.22, a finding consistent with the idea that organic and SO_2 added' wines are differentiated attributes, though *Rooibos & Honeybush* evokes a richer and more complex set of values. These findings are consistent with a study by Costanigro et al. [22] who found 34%of resppomdents were affected by sulphite in wine. Based on a rank ordered logit estimation of best-worst choices, headache syndrome sufferers are willing to pay a ceteris paribus premium of $1.23 per bottle to avoid added sulfites. However, results show that headache sufferers are willing to pay more for wines without added sulphites than for organic wines. WTP for each point of the Quality Score is at €0.09 per 750ml bottle of wine. Comparing the average price of wine that respondents had in mind when stating values, i.e., 200 Rand or €11.85, the premium comprises 30% of the wine price for a Rooibos & Honeybush-based preserv-

[6] We note that the main (random) effect in these MXL models represent the utility of consumers in the baseline group, while fixed coefficients for all interactions between the wine attribute and consumer characteristics measures the differences in the utility of given segments from the utility of the baseline group.

[7] STATA command *nlcom* applies the delta method to compute the variance, standard error, Wald test statistic, etc., of the transformations. It is designed for functions of the parameters and takes nonlinear transformations of the estimated parameter vector from some fitted model.

Table 3. Parameter estimates, MXL, pooled.

	Means (s.e)	Standard deviations (s.e)
rooibos	2.5031*** (0.2420)	3.3848*** (0.3090)
organic	0.8659*** (0.1842)	1.7663*** (0.2740)
quality	0.0663*** (0.0091)	1.0969*** (0.0115)
price	-0.7087*** (0.0783)	1.9161*** (0.0838)
likelihood	-1833.6175	
LR Chi²	1130.57	
No. obs.	7,332	
r(respondents)	611	
k(parameters)	14	

Notes: *, **, and *** indicate the significance of the WTP mean estimates at 10%, 5%, and 1%. Standard errors are provided in parentheses. All random parameters are fully correlated, with 1000 draws for simulations.

Table 4. Willingness to pay estimates per bottle of wine, means in EUR (see parameter estimates for the headache segment in Appendix A2).

	Pooled data (1)	Headache (2)	No 'Headache' (3)
rooibos	3.5317*** (0.3683)	5.6704*** (0.9253)	1.8190*** (0.2979)
organic	1.2217*** (0.2650)	1.5306*** (0.4893)	0.9301*** (0.2547)
quality *(per QS point)*	0.0937*** (0.0126)	0.1506*** (0.0275)	0.0449*** (0.0103)

Notes: *, **, and *** indicate the significance of the WTP mean estimates at 10%, 5%, and 1%. Standard errors are provided in parentheses. Wald statistics for the quality test of the WTP means for headache vs. no headache segment is 15.79 (p = 0.0001) for rooibos; 1.28 p=0.2572) for organic; and 13.92 (p=0.0002) for quality.

ative, and 10% for organic wine, about 0.8% per each point in the Quality Score.

When comparing the difference between wine colour, we find no difference in preferences for the quality attributes between red and white wine (see MXL estimates in Table 1A in Appendix). WTP estimates are reported in Table 1A, Panel B. Although quality and organic production seem to be valued slightly more for red wine, clearly, neither of the two WTP estimates is statistically different.[8]

When we control for differences in preferences for consumers who believe that SO_2 in wine causes headaches (see MXL estimate in Table A2 in the Appendix), we find willingness to pay for natural preservatives (*Rooibos & Honeybush*) as well as for wine quality is at least three-times larger than for consumers who do not believe so: €5.67 vs. €1.82 for rooibos, and €0.151 vs. €0.045 for the quality score in Table 4, whilst their WTP for organic wines does not statistically differ from the other: €1.53 vs. €0.93, with Wald=1.28 and p-value=.2572). See Table 4, column (2) for 'headache' consumers and column (3) for the reference group with 'no headache' consumers. We conclude that, at the margins, individuals who believe their health may be affected by SO_2 in wine are also more sensitive to wine additives and are ready to pay a higher premium for wines perceived to be healthier and of a higher quality.

We estimated several mixed models, following eq. (3), to explore observed preference heterogeneity with respect to gender, race, and wine consumption frequency[9]. Table 5 presents the WTP estimates based on MXL model with the interactions with gender (female) and race (being African, and Caucasian), with non-female, Asian and Coloured as the reference category. As a reminder, since we assume the additive specification of the MXL model, the fixed coefficients for the interaction terms measure the difference in the utility from the random mean (see MXL result in Table A3 in the Appendix).

We find that females value organic wines more than males, Africans value *Rooibos & Honeybush* preservatives less than Caucasians, while the preferences of Caucasians do not differ from other races (those included in the reference category). This is expected considering that, on average, Caucasians and Africans in South Africa are at opposite ends of wealth and income distribution, with *other race* placed in between. WTP estimates reported in Table 5 show that non-African males will pay approximately €4.8 for rooibos-based preservatives, while non-African females are willing to pay €3.8 to avoid SO_2 added to wine.

African males and females are willing to pay much less: €2.7 and €2.2, respectively. Interestingly, only females are willing to pay for organic attributes; about

[8] WTP for Rooibos & Honeybush preservatives is €3.71 for red and €3.43 for white wine (Wald statistics is 0.16, and p=0.6928); WTP for the organic attribute is €1.21 and €1.09, respectively (Wald=0.07, p=0.7949); and WTP for 1-point in the quality score is €0.093 for red and €0.088 for white wine (Wald=0.05, p=0.8316).

[9] Parameter estimates and tests are compiled in the Appendix. Controlling for other socio-economic variables (e.g., income, education, and other wine-measuring preferences) resulted in no significant differences in preferences and are not reported here. These results are available upon request.

Table 5. Willingness to pay estimates per bottle of wine, by gender and race, means in EUR.

	male + other race	male + Caucasian	male + African	female + other race	female +Caucasian	female +African
rooibos	4.7533***	4.8661***	2.677***	3.7979***	3.7561***	2.207***
	(0.9426)	(1.1957)	(0.5751)	(0.6707)	(0.7999)	(0.4353)
organic	0.3100	1.2791*	0.5492	1.2303**	2.1276***	1.2588**
	(0.5277)	(0.6759)	(0.4316)	(0.4534)	(0.6145)	(0.3624)
quality *(QS point)*	0.0945***	0.1532***	0.0638***	0.0794***	0.1240***	0.0560***
	(0.0247)	(0.0372)	(0.0187)	(0.0198)	(0.0265)	(0.0147)

Notes: *, **, and *** indicate the significance of the WTP mean estimates at 10%, 5%, and 1%. Standard errors are provided in parentheses.

€2.1 and €1.3 for Caucasians and Africans, respectively, while WTP for organic wines for males is not statistically distinguishable from zero, with the exception of male Caucasians, who are willing to pay a similar amount as African or other race females, but this estimate is only weakly significant. Males are, however, ready to pay more than females for wines with higher a Quality Score: €0.077 compared to €0.056 for Africans, and €0.095 compared to €0.079 for the other race), except for Caucasian males and females, who are actually willing to pay the same premium of €0.12.

Last, we analyse the differences in preferences for consumers who differ in their wine consumption frequency (see MXL results in Table A4 in the Appendix). We find that heavy drinkers would pay more for natural preservatives than light drinkers: €5.28 vs €3.21, organic attributes €1.96 vs €0.72, and quality score €0.14 vs €0.11. Heavy drinkers seem to care more about wine additives and are willing to pay a premium for natural preservatives, organic attributes and high quality score for wine. Light wine drinkers care less about organic attributes which are statistically not significant. See WTP estimates in Table 6.

Table 6. Willingness to pay estimates per bottle of wine for Heavy vs Light wine drinkers, means in Euro.

	Heavy drinkers	Light drinkers
natural	5.2811***	3.2056***
	(1.1534)	(0.7842)
organic	1.9583***	0.7247
	(0.6592)	(0.5167)
quality *(QS point)*	0.1420***	0.1055***
	(0.0333)	(0.0265)

Notes: 'Heavy drinker' is a consumer who drinks wine at least several times a week, and 'light drinkers' is a consumer who drinks wine once a month or less often. *, **, and *** indicate the significance of the WTP mean estimates at 10%, 5%, and 1%. Standard errors are provided in parentheses. Wald statistics for the quality test of the WTP means for heavy vs. light segment is 2.24 (p = 0.1345) for rooibos; 2.40 (p=0.1215) for organic; and 0.83 (p=0.3629) for quality.

4. DISCUSSION AND CONCLUSIONS

More than half of the sample of 611 wine respondents from South Africa believes that drinking even moderate amounts of some type of wine causes headaches. A discrete choice experiment was conducted to explore the preferences of consumers in the Cape Town area for natural preservatives, organic wine, and quality measured by a 100-point Quality Score, and price attributes. This study is novel in that it estimates the premium price for not having added SO_2 in wine by substituting the conventional wine preservative with *Rooibos & Honeybush* – a natural preservative. This is the first analysis of its kind. We find that consumers from the Cape Town area are willing to pay about €1.2 per bottle for organic winemaking. Only Caucasian males are willing to pay for the organic quality and, on average, they are willing to pay as much as non-Caucasian females (€1.3), while Caucasian females are willing to pay €2.1 per bottle of wine for organic winemaking. Wine quality matters as well: on average, consumers are ready to pay €0.10 per each point on the Quality Score.

With regard to the key attribute – *Rooibos & Honeybush* preservatives – consumers are willing to pay even more, on average €3.5, though males are willing to pay slightly more than females. Caucasian males will pay €4.8, which is almost double what African males will pay (€2.7). Caucasian females will pay €3.7 compared to African females who are ready to pay €2.2.

With regard to other studies, Amato et al. [21] find that Italian and Spanish wine drinkers will pay €1.19 and €1.57, respectively, to avoid added SO_2. Similarly, Costanigro et al. [22] found 34% of respondents were affected by s2ulphite in wine. Based on a rank ordered logit estimation of best-worst choices, headache syndrome sufferers are willing to pay a ceteris paribus pre-

mium of $1.23 per bottle to avoid added sulfites. However, results show US wine consumers are willing to pay approximately €1.19 more per bottle of wine. It is important to note that the previous studies relied on a hypothetical SO_2-free alternative and hence they did not use real preservatives as in our case (i.e., using natural the preservatives of *Rooibos & Honeybush*).

Since using SO_2 as a wine preservative is very likely associated with adverse health effects, we investigated whether those who believe in these effects are also ready to pay higher premiums for healthier wines. We find that these consumers are indeed willing to pay at least three times more for an SO_2-free natural preservative and quality scoring than those who do not believe so. They are also ready to pay for organic winemaking, but their premium is only two thirds higher. The importance of these differences is even more significant if we consider the high percent (68%) of respondents who believe SO_2 causes headaches in our sample.

We found no difference in preferences between the colour of wine (red or white); however, willingness to pay for the three wine attributes differ between red and white wines.

Heavy drinkers would pay more for natural preservatives in wine than light drinkers. This is a good message for winemakers since the high investment cost induced by introducing the new natural preservative may be recovered faster.

Our findings confirm that consumers' decisions to purchase a bottle of wine in South Africa are more influenced by natural preservatives and organic attributes rather than a higher quality score. Our findings present a significant contribution, at least in the South African context, to understanding preference and hence a niche for the natural preservative market. The share of respondents who believe SO_2 causes headaches is astonishingly large and their preference for wine with less adverse health effects is also strong. These consumers represent an apparent and potentially important market segment for the wine industry and wine producers interested in wine product differentiation. Although this study targets South African wine consumers, these findings are useful for other wine-producing countries and regions. Further research could investigate whether our findings for South African consumers also hold in other regions.

Based on our findings, we recommend that the wine industry should provide greater clarity regarding organic winemaking standards. In particular, it should clarify what constitutes organic wine, perhaps by emulating the US standard that regards organic wine as wine made without added sulphur. It is clear, though, that respondents are aware about natural preservatives and are in tune with the natural/organic movement for healthier living. As there is no strong scientific consensus on whether SO_2 in wine causes headaches, investigations in medical research seeking to establish the root cause of headaches promises significant rewards for the wine industry.

Before embarking on investment, wineries should consider the additional costs involved with *Rooibos & Honeybush* alternatives and compare them with the expected premium for 'no sulphite added' wines. Our empirical study provides the industry with the first evidence of consumers' acceptance of a novel natural wine preservative and, more specifically, how wine consumers may respond.

To fully understand consumer behaviour in relation to natural preservatives, more effort should be put into determining the factors that impact wine-consumer choice. Understanding these factors can provide a better targeted marketing strategy suitable for capturing consumer preference for natural preservatives in wine. Needless to say, the preferences of a wider sample should be investigated. In this sense, the relatively small sample size (≈600) and narrow geographic extent (the Cape Town metropolitan area) are the main limitations of our study. Nevertheless, our results are in line with previous literature on "no sulphite added" but are silent about sulphur alternatives as in our case study. Our study also supports the Wine Industry Strategic Exercise (WISE) 2025 Strategy, particularly on the theme of "Technological and innovation".[10] The discovery of natural preservatives in wine making has the potential to further boost the South African wine industry's competitiveness locally and abroad.

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APPENDIX

Table A1. Estimation results, MXL with colour interactions.

Panel A – Parameter estimates

	Mean (s.e)	SD (s.e)	Interactions with red wine
rooibos	2.7012***	3.3068***	-0.4001
	(0.3175)	(0.3101)	(0.3759)
organic	0.7933***	1.8402***	0.0201
	(0.2637)	(0.2834)	(0.3089)
quality	0.0641***	0.0907***	-0.0020
	(0.0120)	(0.0133)	(0.0142)
price (in euro)	-0.7276***	0.8832***	0.0564
	(0.1031)	(0.0857)	(0.1165)
Model characteristics			
Log likelihood	-1833.271		
LR Chi²	1127.78		
No. obs.	7,332		
r(respondents)	611		
k(parameters)	18		

Panel B – WTP estimates per bottle of wine, means in EUR

	Red wine	White wine
rooibos	3.4287***	3.7125***
	(0.5210)	(0.5154)
organic	1.2122***	1.0904***
	(0.3654)	(0.3581)
quality	0.0926***	0.0882***
	(0.0168)	(0.0161)

Notes: *, **, and *** indicate significance at 10%, 5%, and 1%, respectively. Standard errors are provided in parentheses. All random parameters are fully correlated, with 1000 draws for simulations. Wald statistics for the equality test of the WTP means for each attribute between red and white wine is 0.16 (p = 0.6928) for rooibos; 0.07 (p=0.7949) for organic; and 0.05 (p=0.8316) for quality, indicating that mean WTP values are not statistically different for red and white wines at any convenient level.

Table A2. Parameter estimates, MXL with headache interactions.

	Mean (s.e)	SD (s.e)	Interactions with headache
rooibos	2.1259***	3.3019***	0.5800
	(0.3616)	(0.2989)	(0.4033)
organic	1.0870***	1.8310***	-0.3566
	(0.3124)	(0.2673)	(0.3490)
quality	0.0525***	0.0895***	0.0193
	(0.0131)	(0.0118)	(0.0163)
price (in euro)	-1.1687***	0.8493***	0.6915
	(0.1256)	(0.0817)	(0.1345)
Model characteristics			
Log Likelihood	-1806.2427		
LR Chi²	1066.11		
No. obs.	7,332		
r(respondents)	611		
k(parameters)	18		

Notes: *, **, and *** indicate significance at 10%, 5%, and 1%. Standard errors are provided in parentheses. All random parameters are fully correlated, with 1000 draws for simulations.

Table A3. Parameter estimates, MXL with interactions on gender and race.

	Mean (s.e)	SD (s.e)	Interaction with female	Interaction with African	Interaction with Caucasian
rooibos	2.9056***	3.2454***	-0.0740	-0.7970*	-0.3700
	(0.3938)	(0.2993)	(0.3704)	(0.4552)	(0.4453)
organic	0.1894	1.8332***	0.7277**	0.2429	0.4770
	(0.3242)	(0.2701)	(0.3131)	(0.3766)	(0.3749)
quality	0.0577***	0.0913***	0.0014	-0.0075	0.0220
	(0.0152)	(0.0115)	(0.0144)	(0.0179)	(0.0173)
price	-0.6113***	0.9123***	-0.1342	-0.1761	0.0902
	(0.1220)	(0.0832)	(0.1193)	(0.1478)	(0.1428)
Model Characteristics					
Log likelihood	-1822.3397				
LR Chi²	1090.13				
No.obs	7,332				
r(respondents	611				
k(parameters)	26				

Notes: *, **, and *** indicate significance at 10%, 5%, and 1%, respectively. Standard errors are provided in parentheses. All parameters are fully correlated, with 1000 draws for simulations.

Table A4. Parameter estimates, MXL with frequency of wine drinking interactions.

	Random factors		Fixed interactions	
	Mean (s.e)	SD (s.e)	Interactions with heavy drinkers	Interactions with light drinkers
Rooibos	2.4721***	3.4320***	0.2285	-0.1926
	(0.3131)	(0.3101)	(0.4321)	(0.5180)
Organic	1.0082***	1.6719***	-0.0068	-0.4929
	(0.2443)	(0.2835)	(0.3439)	(0.4081)
Quality	0.0641***	0.0983***	0.0085	0.0109
	(0.0116)	(0.0117)	(0.0170)	(0.0204)
Price (in euro)	-0.8659***	0.9153***	0.3545**	0.1548
	(0.1055)	(0.0861)	(0.1389)	(0.1649)
Model characteristics				
Log likelihood	-1826.8435			
LR Chi2	1109.95			
No. obs.	7,332			
r(respondents)	611			
k(parameters)	22			

Notes: *, **, and *** indicate significance at 10%, 5%, and 1%, respectively. Standard errors are provided in parentheses. All random parameters are fully correlated, with 1000 draws for simulations.

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Regional determinants of Hungarian wine prices: The role of geographical indications, objective quality and individual reputation

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Abstract. Analysing the determinants of wine prices has always been a field of interest in the wine economics literature. By estimating hedonic price functions, however, most papers generally remain at the country level with regions generally neglected or treated as simple dummy variables. The aim of this paper is to analyse the determinants of wine prices at the regional level by using Latent Variable Path Modelling with Partial Least Squares and Principal Component Analysis on the example of Hungarian wines. This approach is able to capture the regional specialties of wine production and provides a better insight into price determination. Results suggest that intrinsic values play a major but ambiguous role in determining regional wine prices, especially in the case of sugar content. It also becomes apparent that specific Geographical Indications (GIs) play a crucial role in price determination, instead of GI use per se. Moreover, individual brands also have an important role, as Tier1 and Tier2 wineries tend to sell their wines at higher prices and in smaller batch sizes.

Keywords: wine regions, price determination, Hungary, quality, Partial Least Squares.

1. INTRODUCTION

A large amount of scientific literature has been dealing with the determinants of wine prices recently [1,2,3,4]. By mainly applying hedonic pricing models, the vast majority of these studies quantify the relationship between wine prices and, *inter alia*, origin, subjective and objective quality and labelling elements like variety, vintage or brands. Despite the large quantity of research into the topic, articles mainly focus on the country level and regions are often neglected or treated by simple dummy variables [5,6,7].

However, wine is a highly differentiated product and this differentiation starts at the regional level [5,8,9]. It largely depends on the regional characteristics of the kind of wine produced and such diversity is missed when wine prices are analysed at the country level. This article aims to analyse

the determinants of wine prices at the regional level by using Latent Variable Path Modelling with Partial Least Squares (LVPLS) and Principal Component Analysis (PCA), using the example of Hungarian wines. This approach is able to capture the regional specialties in wine production and provides a better insight into price determination. Our motivation to prefer this approach over the classical methods was based on some previous studies [10,11,12] using PLS and we followed the guidelines of Hair et al. [13].

The article is structured as follows. First, a literature review is given on the most important studies on the determinants of wine prices written between 1998 and 2018, and this is followed by a description of the methods and data used here. The third section shows our results together with a discussion, while the last part concludes.

2. GEOGRAPHICAL ORIGIN AS A DETERMINANT OF WINE PRICES

Origin has always been considered one of the most important determinants of wine prices. *In this regard, a significant part of the literature analyses the role of geographical indications (GIs) in the determination of wine prices.* Being indicators of special quality, GIs may permit higher prices, which may prove to be essential when competing with more efficient New World wine-producing countries. The main idea behind GIs is that differences in quality may be attributable to their origin. GIs as collective brands embody a collective reputation, which is the sum of the individual reputations of the group members [14].

The majority of the *theoretical literature* in this regard analyses the relationship between consumers' willingness to pay and regional reputation (GIs). Menapace and Moschini [15], for instance, developed a reputation model to investigate the use of trademarks and certification for GI food products and found the two concepts to be complementary in signalling superior quality to consumers. Anania and Nistico [16] analysed whether public regulation can substitute trust in quality food markets and found that even imperfect regulation is better than having no regulation in place. Moreover, Moschini et al. [17] investigated the relationship between geographical indications and the competitive provision of quality in agricultural markets and found a strong positive relationship as well as clear welfare gains. Zago and Pick [18] combined the two theories and suggested that the introduction of a regulation and the emergence of two differentiated competitive markets provides consumers and high quality producers better-off (and low-quality producers worse-off). It is also evident that GIs play a crucial role in international trade debates, labelled as a "war on terroir" by Josling [19].

As to the *empirical literature,* Ali and Nauges [20] analysed Bordeaux *en primeur* wine pricing on a sample of 1153 wines of 132 producers and showed that the pricing behaviour of producers depends to a large extent on their collective reputation associated with their wine regions. Angulo et al. [21] ended up in similar conclusions by analysing 200 Spanish red wines - they concluded that wine regions were one of the most important determinants of wine prices. Blair et al. [22] also reached similar conclusions when analysing 393 Bordeaux wines, while Di Vita et al. [23] also ended up in the same when analysing wine sales in Sicily. The argument above was also underpinned by Ling and Lockshin [24] for Australian wines, Noev [8] for Bulgarian wines and Roma et al. [7] for Sicilian wines. Moreover, the role of geographical indications was especially strong in price determination in case of *grand cru* wines as suggested by Carew and Florkowski [25] as well as Combris et al. [26]. Lecocq and Visser [27] by analysing three different samples of Bordeaux and Burgundy wines, also found that objective characteristics shown to the consumers on the label, including GIs, explained the major part of price differences, while sensory characteristics are less important. Van Ittersum et al. [9] analysed consumers' willingness to pay for protected regional products and found a significantly positive relationship between the two, based on the consumers' image consisting of a quality warranty and an economic support dimension. Similar conclusions were drawn by Panzone and Simoes [28], highlighting that labelling is not a factor attracting a price premium per se, but rather it is the interaction between the labels and the region of production that actually gives a premium.

Moreover, Landon and Smith [29] analysed the collective reputation of Bordeaux red wines and found that reputation of seven out of eleven wine regions had a significant positive effect on price, which can even reach $14 per bottle. Shane et al. [4] estimated this price difference to be £6-7 for UK consumers. Similarly, Thrane [30] was talking about a 30% difference for French and German wines, while Troncoso and Aguirre [6] calculated a 20% price difference for Chilean wines sold in the USA. This, according to Landon and Smith [29] strengthens the snob-effect where consumers prefer a bottle of wine to another based on regional origin and reputation and not on quality difference.

However, a number of articles found that the role of origin in price determination was rather country-spe-

cific. Defrancesco et al. [31], for instance, analysed the role of origin in the case of Argentinean Malbec, concluding that New and Old World consumers differ in their willingness to pay for Geographical Names (GNs) when buying premium Argentinean wines in specialised shops. Estrella Orrego et al. [32] added that consumers appreciate "New World" wines for different attributes than "Old World" ones, thereby valuing wine's characteristics differently. Schamel [33] analysed the value of producer brands versus GIs on US price data for 24 wine regions in 11 countries and added that "New World" wines had to catch up in terms of regional reputation, though leading brands could take much of the price differential.

Besides origin, a large part of the literature analyses the determinants of wine prices from different aspects including expert ratings, objective characteristics (chemical composition, weather, age) and wine label information (varietal, vintage). Although a full review of this literature would take us far away from the focus of this article, some relevant literature is discussed here to highlight the most important findings.

As to expert ratings, the majority of the studies found a significant and positive relationship between wine prices and expert ratings (scores), however, opinions differ on the strength of the relationship (see e.g. [1,6,8]). Regarding objective characteristics, most studies agree that chemical composition and weather affects the price of wines ambiguously, while age has a significantly positive effect on wine prices (see e.g. [7,24,30]). Finally, wine label information also has a generally positive impact on prices, according to most of the studies (see e.g. [2,24]).

It seems evident from the literature above that regions play a decisive role in determining wine prices. Although most studies are focusing on a country or a specific region in searching for the determinants of wine prices, the novelty of this paper is to analyse all wine region of a country at the same time to provide a full picture – this approach is, to our understanding, new in the literature. The paper also aims to provide a full coverage by aiming to capture and analyse the most important factors determining wine prices as evident from the literature above.

3. METHODS AND DATA USED

2.1 Theoretical background

In order to analyse the determinants of wine prices at the regional level, two methods are used (Path modelling and Principal Component Analysis). First, Partial Least Squares (PLS) is a relatively new methodology for estimating Latent Variable Path Models (called LVPLS). From a broader conceptual perspective, LVPLS is a statistical data analysis methodology for studying a set of blocks of observed variables which can be summarized by latent variables (Outer model) and the linear relationships between the latent variables (Inner model). Establishing the relationships requires some previous knowledge. LVPLS is also employed to handle Structural Equation Modelling problems (SEM) which was founded by Joreskog [34]. Before PLS become quite popular, SEM was the conventional technique for estimating Latent Variable Path Models. The main principles of the PLS technique for principal component analysis were described by Wold [35], and the first PLS analytical tool for blocks of variables was developed in 1975 [36]. The whole algorithm was published in the 80s [37,38]. Further developments to the approach relating to the methodology's application to SEM problems and Path models were described by Chin [39] and Tenenhaus et al. [40], respectively. However, these methodologies (PLS and SEM) differ a lot as concepts. There exists a wider range of applications that cannot be handled properly by a SEM framework but are nevertheless within the spectrum of the flexible LVPLS methodology. Structural Equation Models are causality networks of several Latent Variables (LVs) measured by several observed Manifest Variables (MVs) [41,42]. The SEM estimation procedure is based on classical covariances and a maximum likelihood (ML) estimation, but the PLS approach is a component-based (variance-based) procedure involving fewer assumptions. For example, within the SEM framework variables should obey the normal distribution assumption, and the number of the observations should be large enough (over 200). PLS allows working with small sample sizes and makes less strict assumptions about the distribution of the data [43]. PLS has the capacity to deal with very complex models involving a high number of LVs, MVs, and relationships [44,45]. In PLS, the relationship between an LV and its MVs can be modelled in either a formative or a reflective way, which is an advantage when the approach is compared to the SEM. In a formative way, a given LV is estimated by the linear regression of blocks of MVs that belong to the LV. This means that the LV is caused by the MVs. In the reflective way, the opposite is true so the MVs are caused by the LV. Another important difference is that PLS is rather an explanatory technique, but SEM is mainly used for testing theoretical models. The major disadvantage of PLS is that no global criterion is optimized which would allow us to evaluate the overall model. However, Amato et al. [46] propose a global criterion of goodness-of-fit (GoF).

In a formative model, MVs are modelled by multiple regressions, implying that multicollinearity might be a relevant problem in LVPLS modelling [47,48], therefore we fit a reflective model and also estimated the Variance Inflation Factor (VIF). Chin [39] suggests bootstrapping for model testing, an approach in which 500 samples are generated from the original data through the use of sampling. This means that Beta coefficients are estimated in each sample and the mean and standard error (SE) of the parameters are computed from the total number of samples. Another problem concerns the assumption of equal initial weights at the beginning of the estimation procedure, something which makes the results very arbitrary. The advantages of the PLS approach compared to the classical hedonic model should also be stressed out as this is the major point of the study. Hedonic models aim to describe the price of a good by a set of prediction variables using an ordinary least square regression (OLS) or weighted least squares (WLS) ([11]). The general pitfalls are the large number of prediction variables that might cause a problem in case of small datasets when OLS applied as well as in case of large datasets due to the problem of multicollinearity (correlated predictors). In order to solve this issue highly correlated variables could be omitted generating the loss of information and biases and important features of the model could be lost. Król [11] stated that especially in case of large amount of binary predictors and multicollinearity as in our case partial least squares regression might be a better alternative to OLS/WLS methods of hedonic models estimation. On the other hand, PLS approach makes it possible to use more dependent variables. The above mentioned reasons guided us to prefer PLS latent variable path modelling.

In order to estimate the causal relations between each wine region/sub-region and the wine composition, price and quantity a Latent Variable Path Analysis with Partial Least Squares (LVPLS) with a reflective method for index construction [49] was applied, using XLSTAT software. The sample contained 2309 valid observations, which is more than sufficient for this type of analysis. The composite reliability of the blocks was tested by the explained variance. For estimating the initial weights in the model, the Centroid Scheme was used. The PLS algorithm stopped when the change in the outer weights between two consecutive iterations was smaller than 0.0001 or the number of iterations reached 100. In our case the algorithm converged on average after 18 iterations. Bootstrap sampling was also applied for model testing and parameter estimation, in which 500 samples were generated from the original data as suggested by Chin [39]. This means that the mean and SE of the parameters were computed from the total number of samples and only those Beta coefficients were considered statistically significant that were at least twice their respective SE [50]. A normalized version of the Goodness-of-fit (GoF) as proposed by Esposito Vinzi et al. [51] was used to measure the overall model fit by obtaining bootstrap resampling. The GoF of 0.10, 0.25, and 0.36 can be considered an adequate, moderate and good global fit, respectively [13,48,52]. In the course of inner model quality assessment, R^2 measures were calculated. The R^2 values of 0.02;0.15;0.35 are considered as small, medium or large effects according to Hair et al. [48]. In order to assess the discriminant validity of the model, the Fornell and Larcker criterion [53] was applied. In the case of the outer model, we reported the Pearson correlation coefficients, which were denoted by "r". Regarding the inner model, we reported the regression Beta coefficients, denoting bootstrap-estimated SE values by "B".

2.2 Operationalization of constructs

Our sample of wines is selected from the Hungarian off-trade sector (main wine shops and supermarkets). Considering the extreme levels of sugar content and high prices, all wines from the Tokaj region were excluded as they would significantly distort the results. In case, when the same observations (wines with the same lot number) were sold at different prices, and only the cheapest was included in the model.

Our model design includes nine latent variables for five different dimensions of the study. Regional origin is represented by five variables, one for each wine region, while other latent variables are individual brand, composition and market situation.

The manifest variables of regional origins are geographical indications. Each GI of a wine in the sample is represented by a dummy variable whose value is 1 if the batch in question bears the geographical indication concerned, but is otherwise 0. Two additional dummy variables were generated: one for wines without a geographical indication, and another for wines with non-Hungarian-protected geographical indications (PGIs) that were imported in bulk by wineries operating in the Duna region and then released to the market under their own brands (i.e. both the brand and the name of the wine is in Hungarian). Certain geographical indications are segmented into two or three quality levels using additional terms to the name itself (e.g. Eger Superior or Villány Prémium). To handle this phenomenon, these geographical indications were treated as separate names. The source of data is the geographical indication on the label of the wine observed. The legal use of the GIs was

double-checked in all cases in the public database of the wine authority.

Individual brand reputation is measured by three dummy variables. Given the high number of producers, the grouping of individual brands according to their status served as an appropriate method. The wineries were classified in relation to two significant awards ('Wine Producer of the Year' and 'Winemaker of the Winemakers'). There are several reasons for this. On the one hand, both nominees and winners of these awards are selected by experts, so a high level of past performance can be assumed for these winemakers. On the other hand, both awards traditionally receive heavy media attention which focuses on the winemakers involved. Hence, the individual brands concerned have a credible and positive reputation with the consumer. Winners of one of these awards were categorised as Tier1 wineries, while nominees were classified as Tier2 wineries and the rest was ranked as Tier3. Information on this can be found on the websites of the relevant awards.

Intrinsic value of the wines is measured by five manifest variables. According to Hungarian wine law, wine products produced in Hungary may be marketed for public consumption or export only if they receive authorisation by the wine authority. This permission is issued following the assessment of 12 analytical parameters and, where appropriate, after sensory evaluation. The following analytical parameters were included as manifest variables:

- sugar-free extract content (g/l),
- residual sugar content (g/l),
- pH value,
- actual alcoholic strength (by volume),
- age (years)

2.3 Source of data

The source of the data is the Hungarian wine authority. The latent variable *colour and varietal* is measured by seven manifest variables, including the colour of wine and the varietal composition. The information on varieties is condensed into these variables by creating varietal groups as the wines included in the sample represent almost 150 different permutations of varietal composition.

The following groups were created:

- red wines made of Bordeaux (Cabernet Franc, Cabernet Sauvignon and Merlot) varietals,
- red wines of other varietals,
- rosés (of any variety),
- white wines of two Hungarian varieties (Cserszegi Fűszeres or Irsai Olivér),
- white wines of other aromatic (Muscat) variables,
- white wines of international varieties (e.g. Chardonnay),
- white wines of other varieties.

The Hungarian wine authority also provided data on colour and varieties.

The manifest variables of *market situation* are price and quantity. The price was observed in the Hungarian off-trade sector (main wine shops and supermarkets). If a wine was observed on multiple sites, the lowest price was included in the dataset. The scope of the study extended only to wines, other grapevine products (such as sparkling wines or semi-sparkling wines) were excluded. All prices were re-calculated for a unit of 0.75 l bottle. Quantity is the size of the batch expressed in litres and was provided by the wine authority.

Finally, when reporting our results, we are aware that a region *per se* cannot determine wine prices but that special characteristics of the regions do. We should keep this in mind when "regional effects" are analysed below.

4. RESULTS AND DISCUSSION

Before presenting our model results, descriptive statistics and measurement units are shown in Table 1.

Figure 1 provides a graphical representation of the parameter estimates in the model. Path modelling groups subregions into blocks according to the wine region they belong to and then examines the paths and links between these wine regions and links between regions and wine composition, colour and varietal and individual brands in terms of regression coefficients. The model is exploratory in nature and the algorithm is iterative, hence it is able to identify irrelevant connections. Ovals represent the LVs (blocks), and squares stand for the MVs. All the links (arrows) are significant at the 5% level, whereas the dotted lines represent non-significant links.

Based on the result of the bootstrap analysis, the regression coefficients between the LVs were proved valid. In order to verify that the SE of the regression coefficients will always be provided. Regarding the goodness of fit, the GOF of the inner model was 0.770, the GOF value of the outer model was 0.958 and the entire model has a GOF of 0.738, which shows an excellent fit. The two main regressions of the model are Wine composition (R^2=0.561) regressed by the wine regions and Colour and Varietal as well as Market Situation (Price, Quantity) (R^2=0.386) regressed by Wine composition. The proportion of variance explained in the two regressions is appropriate.

Table 1. Descriptive statistics.

Unit of measurement	Description						
	Price (HUF/ 0.75 litre)	Quantity (litre)	Actual alcohol (%vol)	Sugar (g/litre)	Sugar-free extract (g/litre)	pH	Age (years)
Min	195	250	7.14	0.00	15.60	2.88	1.00
Max	23980	507284	16.45	162.70	46.80	4.01	13.00
Mean	2072	20275	12.61	5.31	24.70	3.49	2.33
Standard deviation	1937	35803	1.13	13.09	4.45	0.15	1.66
Median	1540	7540	12.59	1.30	24.20	3.49	2.00
1st tier	3015	19703	12.99	2.08	25.37	3.51	2.67
2nd tier	2659	11049	12.96	3.41	25.03	3.50	2.57
3rd tier	1678	22982	12.42	6.63	24.44	3.48	2.18
White - other	1831	14831	12.45	5.02	22.23	3.39	2.02
White - International	1857	11232	12.70	5.40	22.07	3.39	1.83
Rose	1299	26043	12.24	3.98	20.82	3.40	1.15
Red - other	2287	20956	12.68	3.88	27.40	3.57	2.85
Red - Bordeaux	3108	16684	13.41	3.50	29.24	3.62	3.45
White - Cserszegi/Irsai	1115	21352	11.61	3.43	21.33	3.45	1.24
White - other Muscat	1496	26577	11.73	19.05	21.31	3.43	1.65

Source: own composition.

All manifest variables of intrinsic value are in a strong significant relation with Composition, and their effect is positive except for sugar content. That means that the more concentrated a bottle of wine is, the higher its price and the lower its quantity will be, while wines (outside of the Tokaj wine region) with higher sugar content are cheaper and produced in larger batches. This argument supports the findings of the majority of the literature [7,24]. Moreover, the analysis of Colour and Varietal composition shows that red wines significantly differ from white ones and rosés. The (positive) effects of the varietal composition is the highest for red wines of Bordeaux varieties. That means that red wines (especially of Bordeaux varieties) tend to be priced higher and sold in low quantities, while rosés are sold in large batches at significantly lower prices. This is very much in line with previous findings of the literature [1,2].

The effect of regional origins largely depends on the actual region. Felső-Magyarország and Pannon wine regions affect intrinsic value positively (B=0.175; SE=0.014; t=12.6; p<0.001 and B=0.184; SE=0.016; t=11.7; p<0.001, respectively), while the effect of Balaton and Duna regions is negative (B=-0.087; SE=0.015; t=-5.8; p<0.001 and B=-0.225; SE=0.014; t=-15.9; p<0.001, respectively). This means that wines from Felső-Magyarország and Pannon regions are sold at higher prices, in smaller batch sizes and have higher intrinsic value. On the contrary, wines from Balaton and Duna region wines have lower prices, higher quantity and lower intrinsic value (the composition contains less alcohol and more sugar). Felső-Pannon region is still significant but with a relatively smaller regression coefficient (B=0.044; SE=0.015; t=3.0; p<0.01). The regression coefficient of wine composition was B=0.621 (SE=0.016; t=38.1; p<0.001) with regards to price and quantity. This suggests that the more alcohol and sugar-free extract content increases the price of wines and the quantity is lower. These results confirm previous studies suggesting the GI-based results are highly region-specific [31,32].

Collective or individual brands may alter the effects of regional origin, again echoing findings of previous literature on the topic [7,8]. Higher tier individual brands (Tier1 and Tier2) always positively affect intrinsic value and compensate potential negative regional effects. The effect of using a Tier1 brand is double to that of a Tier2 brand.

Meanwhile, the role of GIs is versatile; however, all of them were significant. In regions, where the regional origin is positively related to intrinsic value (Felső-Magyarország and Pannon), only half of the GIs strengthen this effect. The different classes of Eger (Eger Classicus (r=0.124), Eger Superior (r=0.398), Eger Grand Superior (r=0.326) and Eger before 2010 (r=0.458)) have a positive effect. In the case of Eger, however, the role of regulations must be highlighted – if certain practices are forbidden (e.g. sweetening, subtracting alcohol), and

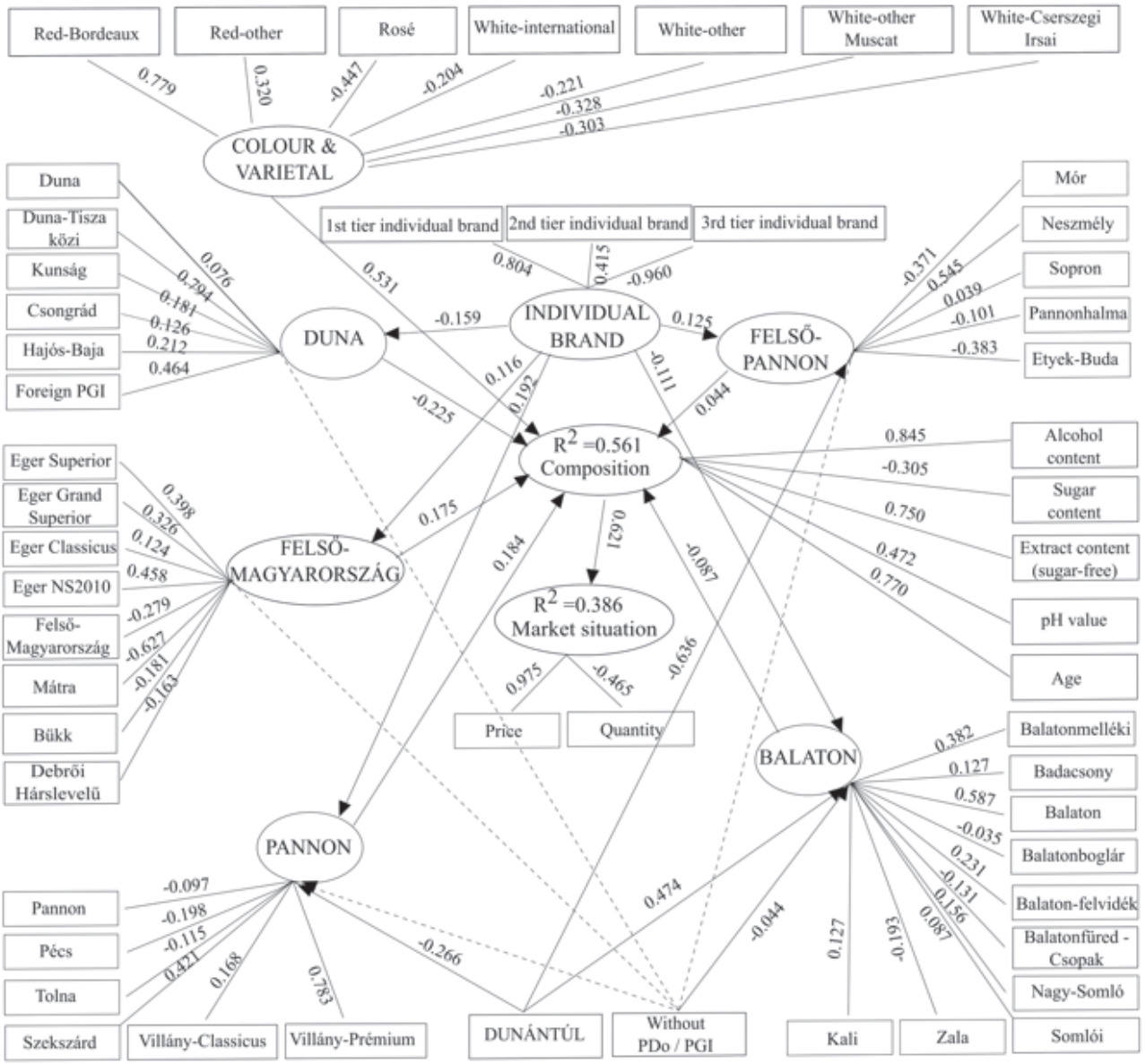

Figure 1. Path model and regression coefficient estimates from the bootstrapping. Source: own composition.

thresholds on grape quality level are stricter, production technology has an impact as well.

On the other hand, Mátra (r=-0.627), Bükk (r=-0.181), Debrői Hárslevelű (r=-0.163) and Felső-Magyarország (r=-0.279) have a negative effect. In Pannon region, it is only Szekszárd (r=0.421) and the two tiers of Villány (V.Classicus (r=0.168) and V.Prémium (r= 0.783), while Pannon (r=-0.097), Pécs (r=-0.198) and Tolna (r=-0.115) have a slightly negative effect. A higher negative effect can be found for Dunántúl (r=-0.266). Both in the case of Eger and Villány, the effect of top tier categories (E.Superior and E.Grand Superior, V.Prémium) significantly exceeds the effect of low tier categories (E.Classicus and V.Classicus). These results also strengthen the case-specific nature of GI price effects suggested by the literature [31,32].

There are two regions, where regional origin yields a negative effect: Balaton and Duna. Only 3 out of the 16 concerned GI has an impact that changes the negative coefficient of the regional origin into positive: Balatonboglár (r=-0.035), Balatonfüred-Csopak (r=-0.131) and Zala (r=-0.193). All other GIs keep the negative effect of regional origin on intrinsic values. The highest impact is of Duna-Tisza közi (r=0.794), imported PGIs (r=0.464),

Table 2. Pearson correlations between latent variables and standard deviations.

Latent variable	1	2	3	4	5	6	7	8	9
IB (1)	0.762	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CV (2)	0.081	**0.414**	<0.001	0.943	0.834	0.017	<0.001	<0.001	<0.001
Duna (3)	0.158	-0.099	**0.397**	0.943	0.834	0.017	<0.001	<0.001	<0.001
FM (4)	0.116	0.141	-0.035	**0.357**	0.238	0.967	0.895	<0.001	<0.001
FP (5)	0.125	0.043	-0.052	0.019	**0.408**	<0.001	0.082	<0.001	0.001
Balaton (6)	-0.110	-0.143	0.132	-0.048	-0.286	**0.284**	<0.001	<0.001	<0.001
Pannon (7)	0.192	0.375	-0.127	0.047	0.191	-0.277	**0.368**	<0.001	<0.001
WC (8)	0.204	0.661	*-0.281*	0.246	0.111	-0.188	*0.452*	**0.662**	<0.001
PC(9)	0.279	0.304	*-0.272*	0.213	0.074	-0.087	*0.390*	*0.621*	**0.764**

n.r = not relevant, cannot be calculated
Source: Own composition.
IB: Individual Brand; CV: Colour and Varietal; FM: Felső-Magyarország; FP: Felső-Pannon;
WC: Wine composition; PC: Price and quantity.

Table 3. Impact and contribution of the latent variables to Composition.

Description	Colour & Varietal	Pannon	Felső-Pannon	Balaton	Felső-Magyarország	Duna
Correlation	0.661	0.452	0.111	-0.188	0.246	-0.281
Beta coefficient	0.531	0.184	0.044	-0.087	0.175	-0.225
VIF*	1.196	1.284	1.109	1.196	1.030	1.058
Effect sizes (f^2)	0.537	0.060	0.004	0.014	0.068	0.109
Correlation x Beta coefficient	0.351	0.083	0.005	0.016	0.043	0.063
Contribution to R^2 (%)**	62.5	14.8	0.9	2.9	7.7	11.3
Cumulative %	62.5	77.3	78.1	81.0	88.7	100.0

(*): Variance Inflation Factor, should be lower than 3 according to Hair et al. [13].
(**): The sum of "correlation x Beta coefficient" was 0.561 and contribution to R^2 of a latent variable was calculated as a percentage of this value.

Balaton (r=0.587), Balatonmelléki (r=0.382). Also, Dunántúl (a PGI including the area of three wine regions: Felső-Pannon, Balaton and Pannon) has an overall negative effect on intrinsic values, regardless of their regional origin. Not using a GI affects only the Pannon regional origin, moderating its positive impact (r=-0.097). Regarding Felső-Pannon regional origin has a negative effect in case of Mór (r=-0.371) and Etyek-Buda (r=-0.383) while Neszmély (r=0.545) has a positive effect on intrinsic values. Individual brands may compensate for the negative effects (r=0.125). The "without GI" variable did not have a significant correlation with any of the above wine regions but Balaton (B=-0.044; SE=0.021; t=-2.128; p=0.033).

The explained deviation is presented in the main diagonal of the correlation matrix and shows how much a given LV explains from its MVs (Table 2). The figures under the main diagonal are the Pearson correlations between the LVs. The values above the main diagonal show the significance of the Pearson correlation coefficients. It is obvious that each LV (especially the outcome Price and quantity) explains a sufficient amount of deviation of its linked items and the model does not conflict the Fornell and Larcker criterion (correlations don't exceed standard deviations). However, in case of wine composition Colour and Varietal is also strongly correlated but not better then its MVs. Wine composition is the most correlated with Colour and Varietal, Price and Quantity and with Pannon/Duna regions.

Table 3 presents the contributions of the latent variables to Composition. Colour and Varietal explained around 62.5% of the variance in Composition, Pannon and Duna contributed to 14.8% and 11.3% of the variance. Regarding the effect sizes it can be stated that Colour and Varietal had a large predictive ability, while Felső-Magyarország, Duna and Pannon had only a small effect on Composition.Going more into detail, the dif-

Table 4. Regional determinants of wine prices by major wine regions.

Region	Alcohol content (%)	Sugar content (%)	Extract content (%)	pH value	Price (HUF)	Quantity (Litre)	Age (Years)
Duna	11.6	10.8	24.3	3.5	1037	39029	1.9
Felső-Magyarország	12.7	6.7	24.4	3.5	2007	21917	2.6
Felső-Pannon	12.7	2.7	22.6	3.4	2090	14451	2.0
Balaton	12.6	6.4	23.7	3.5	2066	15414	2.2
Pannon	13.1	2.1	26.4	3.5	2556	14297	2.6
ANOVA F-values*	94.3	25.9	47.2	25.4	30.2	37.3	19.1

*: All the F-values are significant at 0.01 level.
Source: Own composition.

ferent wine regions show various patterns with respect to intrinsic values, price and quantity and can be clustered into two groups (Table 4). In the first cluster, larger batches can be observed in the case of Duna and Felső-Magyarország at lower prices. Also, these wine regions have lower alcohol content and relatively higher sugar content. Felső-Pannon, Balaton, Pannon belong to the second cluster with lower batches and higher prices and relatively higher alcohol and lower sugar content. Pannon region is standing out with its high sugar-free extract content. F-values show significant differences among these wine regions and also highlights the most influential factors and we could determine an order. The major differences among the regions are due to actual alcohol content (F=94.3) which varies between 11.6 to 13.1 percent. The second most influential factor is sugar-free extract content followed by quantity (F=37.3) and price (F=30.2). The least significant factors are sugar content, pH value and Age but they also cause significant differences between the regions.

Studying the differences between the different GIs also reveal new patterns (Table 5). It is observable that wines without GIs (FN) are dominating the sample with extremely high quantity and relatively lower prices. The same holds for Duna-Tisza közi and Dunántúl. In the case of Eger wines, we can observe the lower quantities with the highest prices. Badacsony is standing out from the Balaton GIs, Kunság and Hajós-Baja from Duna GIs, Villány from the Pannon GIs and Neszmény and Etyek-Buda from the Felső-Pannon GIs regarding quantity and price. At GI level the most significant factors are also actual alcohol content, followed by quantity and price. The least influential factors are pH value and sugar content. ANOVA analysis found significant differences between GIs and region with respect to all parameters at 1% significant level. The major differences among the GIs are due to actual alcohol content (F=25.6) (this is the same at the regional level) which varies between 10.9 to 14.2 percent. The second most influential factor is quantity (F=16.7) followed by price (F=13.8). The three least significant factors are sugar content, age and pH value but they also cause significant differences between the regions.

In the second step, a PCA was performed (Figure 2). The purpose of the analysis was to graphically represent the patterns of the different wine GIs with respect to the different determinants of wine prices in a two-dimensional space (biplot graph) and study the connections between the rows (subregions) and columns (determinants) of the matrix. All the PCAs were performed by using the Varimax rotation so as to create more interpretable principal components. For all the calculations R 3.4.4 was used with psych package with principal and KMO function was used for calculating PCA and Kaiser-Meyer-Oldkin (KMO) tests of sampling adequacy. The total explained variance was 74% and KMO test provides 0.55 for measuring the sampling adequacy which is acceptable.

As evident from Figure 2, the first component separates explain 42% of the total variance and separates wine GIs with respect to price and actual alcohol on the right side and quantity and sugar content on the left side of the axis. Wines without GI or with GIs Duna-Tisza közi, Balatonmelléki, Balaton, Felső-Magyarország are lower priced and poor in alcohol but more sold in higher quantity and the sugar content is also higher. The opposite is true for Eger Superior, Grand Superior, Eger NS2010 and Szekszárd and Villány. The second dimension separates GIs with more relatively higher pH and sugar-free extract content like Duna, Szekszard, Eger NS2010 and Eger Superior from GIs (Somlói, Bükk, Mór, Neszmély, Pannonhalma, Pannon, Mátra) with relatively less extract content and smaller pH. The second component explained 32% of the total variance.

On the whole, we found that major differences among the GIs in terms of prices are due to actual alco-

Table 5. Regional determinants of wine prices by geographical indications.

Regions	Alcohol content (%)	Sugar content (%)	Extract content (%)	pH	Price (HUF)	Quantity (Litre)	Age (Years)
without PDO/PGI	11.1	18.8	25.2	3.5	1045.7	80501.6	2.1
Badacsony	12.5	8.2	23.5	3.4	2648.9	8056.6	2.8
Balaton	12.0	9.4	23.2	3.5	1544.0	29610.3	1.9
Balaton-felvidék	12.6	4.4	24.5	3.4	1670.6	4336.6	1.4
Balatonboglar	12.8	6.2	24.5	3.5	2016.4	20172.4	2.3
Balatonfüred-Csopak	12.7	3.3	22.7	3.5	2105.3	7153.4	1.9
Balatonmelléki	11.9	14.8	23.7	3.5	1019.6	42766.9	1.4
Bükk	12.6	1.2	20.5	3.3	2004.8	2507.7	1.7
Csongrád	11.7	6.9	24.5	3.6	1620.0	2832.2	1.8
Duna	12.5	6.2	26.5	3.6	1624.8	6036.7	2.4
Duna-Tisza közi	10.9	14.6	23.6	3.5	479.9	65311.9	2.2
Dunántúl	11.9	9.6	22.8	3.5	1306.9	50326.3	1.4
Eger Classicus	12.9	2.6	25.3	3.5	1745.6	32052.6	1.5
Eger Grand Superior	14.1	10.6	25.2	3.4	7874.3	2877.9	2.7
Eger Superior	14.2	4.7	28.5	3.6	4806.2	8990.5	3.4
EgerNS2010	13.6	4.1	27.8	3.5	4622.4	5989.3	4.3
Etyek-Buda	12.5	2.2	21.6	3.4	1762.2	22490.8	7.6
Felső-Magyarország	12.4	9.8	24.3	3.5	1735.9	24143.3	1.9
Hajos-Baja	12.4	5.1	26.0	3.5	1316.0	13519.3	2.0
Káli	13.1	22.3	24.9	3.4	3771.5	4785.3	2.3
Kunság	12.1	6.4	23.8	3.5	1392.2	9661.3	2.5
Mátra	12.2	8.0	22.3	3.4	1332.4	14725.1	2.1
Mór	12.7	4.0	20.9	3.4	1524.6	5273.0	1.9
Nagy-Somló	12.4	2.4	24.2	3.4	2466.9	6507.9	1.6
Neszmély	12.6	2.4	21.6	3.4	1749.4	23899.6	2.5
Pannon	12.3	2.2	22.1	3.4	1308.5	20068.9	1.9
Pannonhalma	13.0	2.4	21.4	3.4	2066.2	11159.1	1.1
Pécs	12.7	7.2	23.9	3.4	1837.9	5612.9	1.3
Somlói	13.6	2.2	19.7	3.2	1982.5	5349.0	2.1
Sopron	12.7	3.3	24.8	3.5	2706.4	4924.6	3.0
Szekszárd	13.1	1.8	26.9	3.6	2419.6	12084.9	2.3
Tolna	12.6	3.0	24.8	3.5	1585.4	12031.6	2.7
Villány	13.1	1.6	26.7	3.5	2894.9	17108.6	2.5
Zala	13.2	2.0	23.6	3.4	1679.7	6102.7	2.7
ANOVA F-values	25.6	8.3	13.3	9.7	13.8	16.7	13.9

*: All the F-values are significant at 0.01 level.
Source: Own composition.

hol content and quantity, while sugar content, age and pH value had less importance. These findings also hold important lessons for policy makers. It should be understood that a dual wine market exists in Hungary, with producers for the two distinct segments having very different goals and ambitions. On the one hand, premium quality wines should have a higher alcohol content, have a recognisable GI behind them, and be produced in lower quantities. On the other hand, homogenous wines should be produced in large quantities and be sold at an average price. Stakeholders in the sector should also bear in mind that it is not GI usage that matters on average but the specific GIs as we have shown above. From a consumers' point of view, economic theories also hold – high quality wines with low prices remain supermarket slogans.

Finally, we have to mention some limitations of this study. First of all, the results are highly case (i.e. GI)-specific. Regarding the PLS approach, interpretation of the model could be harder with negative weights and

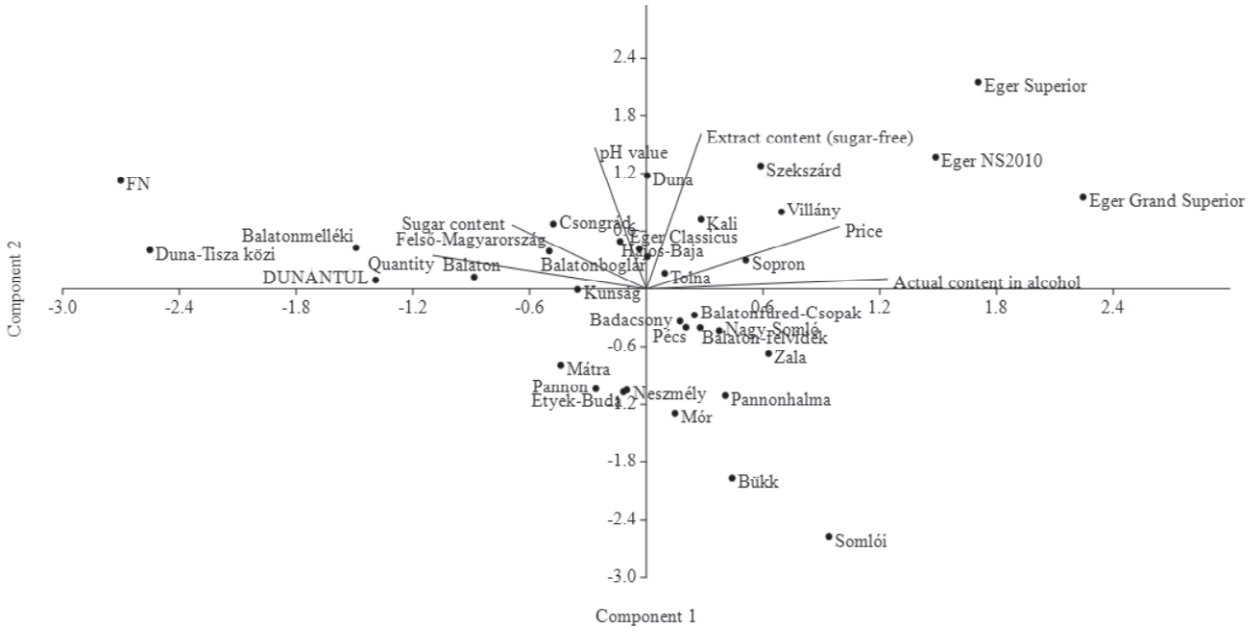

Figure 2. Relationship between subregions and determinants (biplot). Source: Own composition.

formative measurements with negative weights could critical. There is not a global index for model validation and GOF is not advisable to use for this purpose and its use is limited. Some variables might violate the Fornell and Larcker criterion (like in our case Color and Varietal was strongly correlated with Wine Composition) and multicollinearity could be an issue especially in case of formative modelling.

5. CONCLUSIONS

This paper aimed to analyse the regional determinants of wine prices in Hungary by using Partial Least Squares method. The results show adverse effects on price and quantity as cheaper wines tend to be sold in larger quantities, and the opposite also holds true.

First, it becomes apparent that intrinsic values play a major but ambiguous role in regional wine prices. The higher the concentration of a compound is, the higher the price will be – with the exception of sugar. This suggests that wines with a higher concentration of alcohol and sugar-free extract and with low sugar content are made in lower quantities and are sold at higher prices. The lower the batch size is, the easier it is to attain higher price levels. Alternatively, from the reverse perspective, we can assume that only more expensive wines are worth producing in smaller quantities (as average costs are higher in these cases).

At the other end of the market, larger batches are produced of wines with elevated sugar levels and sold at a lower price. Given the exclusion of Tokaj wines from the sample, higher sugar levels are typically a result of sweetening rather than the use of overripe grapes whose must does not ferment completely. In the case of these wines, sugar is not a sign of elevated quality level but rather a tool for creating a homogenous taste (and covering possible minor defects). Thus, the negative relationship of sugar content and price is entirely in line with theory, suggesting that homogenous wines shall be produced in large quantities and sold at an average price.

The regional dimension shows versatile effects as some regions strengthen the relationship of intrinsic values and market situation, while others weaken this effect. This is further complicated by different GIs. The results are in line with the findings of previous literature on this subject as it is not GI usage that matters, but the specific GI. The most notable GIs are Villány (V.Classicus and V.Prémium), Eger (mainly E.Superior and E.Grand Superior or older vintages) and Szekszárd. We must note that red wines are very common with these GIs (however, whites in Eger and rosés in Villány and Szekszárd also have a significant share).

Individual brands have an essential role. Tier1 and Tier2 wineries tend to sell their wines at higher prices and in smaller batch sizes. The relationship is twice as strong in the case of the Tier1 group. On the whole, our

results support empirical literature at the country level as evident from the literature review.

Our model also suggests that wines with a low concentration of alcohol and extracts and significant levels of sugar content (i.e. semi-sweet) are sold in the lower segment of the market, characterised by fierce competition. Here, batches must be larger for the sake of efficiency and the concentration of chemical compounds are low for lower costs. Meanwhile, the higher end of the market shows the signs of monopolistic competition with product differentiation, higher quality level, higher prices and smaller batches.

Results also suggest that wine market policies (such as horizontal rules on GI systems) shall make the differences in quality rules more transparent for consumers. A classification of GIs by easy-to-understand quality standards (based on simple indicators of grape and wine quality) may serve as a useful tool.

Moreover, the control of wine products shall be adjusted to their market situation. On the one hand, wines sold at larger quantities (and lower prices) should be controlled on the spot instead of the strict and time-consuming ex-ante control process before their release to the market. On the other hand, wines sold in low quantities and at higher prices (often using GIs or individual terms benefitting of a good reputation) should be controlled rigorously before entering to the market (including strict organoleptic tests).

Our paper can serve as a basis for future studies either by comparing our results to different regions or introducing other regional determinants (variables) to a selected region in order to give a more comprehensive picture on the topic.

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Millennial university students' valuation of traditional wine: Evidence from an experimental auction

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Abstract. This paper analyzes whether the perception of traditional wine brings value to millennials. Based on survey data and experimental auctions (165 participants), this study identifies the main factors affecting this consumer groups' willingness to pay for traditional wine through a Tobit model methodology. The results suggest that millennials are willing to pay a higher price depending on demographic factors such as monthly disposable income, on wine involvement variables such as consumption frequency, and on nourishing and health aspects and product availability at points of sale, both of which are wine purchase decision criteria. The investigation has significant marketing and policy implications.

Keywords: traditional wine, millennials, willingness to pay, purchase decision variables, experimental auction.

1. INTRODUCTION

Traditional food products have been described as those produced with assured authentic receipt, raw material, and production processes and that have been commercially available for over 50 years [1]. Traditional winemaking is often linked to a wine produced in limited quantities using autochthonous grape varieties with minimal chemical-physical and technological intervention methods and using techniques of processing and conservation consolidated by time, in opposition to more modern, standardized, commercially oriented and large-scale wine production [2,3].[1] Although often related

[1] Admittedly, to be consistent with prior literature, the labels "traditional", "typical" [4], and "terroir" [5] may overlap in some dimensions. "Typical" and "terroir", in particular, are commonly employed in the wine literature when examining the sensory typicality of a wine [4,6]. All these traits point to the distinctive characteristics of a wine, linked to the combination of natural and

to a remainder category and left out of the mainstream wine groups, the traditional wine concept is attracting increasing interest among consumers from the 'Old World' and is found in many of the leading wine-producing countries (e.g., France, Spain, Italy, and Portugal) with strong links to regional/local identity. In Burgundy, France, this concept is closely related to practices developed by *vignerons*, including small French artisan producers [7]. In the autonomous region of Galicia (Spain), Decree 174/2019 regulates the production and marketing of traditional wine. In the same line, traditional wine is officially regulated in the autonomous regions of Trento and of Bolzano (Italy) (Law n. 238/2016) and Portugal (article 3 of the Legislative Order 38/2008).

For consumers in general, the attribute 'traditional' is consistently associated with the concept of natural food products [9]. This claim is commonly linked to 'old-style family-farm food' production [10], which is capable of better preserving food naturalness [11] and authenticity [12]. However, recent studies focusing on the millennial generation have shown evidence that such consumers do not necessarily link traditional food products with natural food products [13]. This previous evidence raises questions about the importance these consumers place on the specific case of traditional wine and conditions for attracting wine interest.

Drawing on previous literature on millennials' attitudes and wine purchasing behaviors (e.g., [14-16]), the aim of this paper is to analyze whether the concept of traditional wine brings value to millennial university students. Consumers' purchase decisions rely on several factors that can potentially influence their choices. Specifically, this research examines the influence of individual factors (i.e., demographic characteristics, self-reported wine knowledge and consumption frequency, and wine purchase criteria) on the willingness to pay (WTP) for a wine. In line with this objective, this investigation combines a wine experimental auction along with the self-administration of a questionnaire. The experimental auction was designed to compare the WTP for a traditional wine with the WTP for three other wines (non-organic wine protected with a designation of origin (hereafter PDO), organic wine with PDO (hereafter, PDO+Organic), and organic wine without PDO (hereafter organic)). All four wines had the same basic characteristics, namely, color, region, vintage, and grape variety. The setting used was a convenience sample of 165 university students.

The findings suggest that millennial university students are willing to pay a higher price for traditional wine only under certain circumstances. In particular, we found that consumers' demographic characteristics, self-reported consumption frequency, and wine purchase criteria can act as driving factors influencing WTP for a traditional wine. This evidence highlights the importance of behavioral factors in wine choice behavior. Therefore, our investigation has major implications for wine business practitioners when targeting specific marketing audiences.

This paper is structured as follows. Section two reviews the literature and introduces the theoretical framework. Section three describes the research methods (experimental auction and self-administered questionnaire). The fourth and fifth sections introduce and discuss the empirical findings. Finally, the last section presents the main conclusions, limitations, and lines of future research.

2. BACKGROUND

2.1 Certifications, regulations and market trends in the wine industry

The wine sector is regulated by multiple legislations and quality schemes frequently associated with certifications of specific production processes and geographical origin. Certification bodies are organizations that ensure compliance and verify that the standards disclosed through mandatory or voluntary norms are met. In the last decades, the main regulations and certifications have been pushed to respond to the dynamics of the international wine industry market. In this regard, a trade-off arises between the forces that lead to the standardization of productions and those in favor of maintaining the traditions and preserving the ties with the territory and the reflection of its unique characteristics on a specific wine [17].

On the one hand, most wine producers have tried to adapt their wines to the dynamics of the international market by producing more commercial and industrial-based products [18], and by adopting technology-driven winemaking techniques (e.g., micro-oxygenation and mechanical filtration [19], or commercial yeast [20]). "In a world characterized by a significant evolution in wine consumption, PDOs have constituted a valid strategy of marketing and competitiveness for producers" ([21], pp. 140). Together with PDOs, organic certification is another main officially regulated production system that is playing a key role in the current scenario. Organic production is a reactive movement looking for ecological alternatives to conventional producing systems, generated by modern consumption patterns [22]. To

human factors in a certain territory [4-6]. Terroir and typical wines, in contrast to traditional wine, are frequently used to refer wines that also certificated with PDO or PGI [4,7,8].

certify their wines as organic, companies not just have to respect the ecological procedures of organic farming (e.g., avoid synthetic chemicals) but also regard the established rules on the use of certain products or practices during the oenological process [23]. The responses to attend to market demands and international dynamics moved the production of most wines away from the features of traditional wines [24].

On the other hand, relatively few wine producers, usually small-scale peasants from "Old World" wine regions, struggled to maintain the uniqueness and traditional way of producing wine in their area. The concept of 'traditional wines' is something that goes beyond PDO or organic certifications. These wines are known since the old days and, although they are subjected to specific regulations in some regions (e.g., Galicia-Spain), they are rarely attached to an official certification.

2.2 Traditional food products

Traditional food products were defined by Guerrero et al. [12], as 'a product frequently consumed or associated with specific celebrations and/or seasons, normally transmitted from one generation to another, made accurately in a specific way according to the gastronomic heritage, distinguished and known because of its sensory properties and associated with a certain local, region or country' (pp. 348). Traditional food products are normally associated with small-scale peasant production systems oriented towards artisanal and old-fashioned elaboration methods reflecting the soil, the environment, and the culture of one region [18,25] as opposed to industrialized manufacturing [11].

In the specific case of wine, this follows the same principles of the abovementioned products in relation to its production process, i.e., small-scale, made exclusively in the rural properties of the peasant farmers, ancestral know-how linked to common cultural roots, the environmental and social characteristics of a certain territory [26,27]. In addition, it is also characterized by the employment of minimal mechanical operations and limited chemical intervention during the winemaking process [2,3]. As a result of its production process, one of the most valued aspects of traditional wines is its ability to better express the terroir [5,6], being its commercialization carried out mainly in a cellar door concept, directly with the final consumer, at the head of the rural property where it was produced [28]. In contrast to PDO and organic products, traditional wine is not associated with an official certification scheme.

The previous literature on consumer behavior suggests that the acceptance of traditional food products could be more linked with middle-aged consumers than with younger generations [29]. Nevertheless, millennials' attitudes and purchasing behaviors in relation to traditional wine remains underexplored.

2.3 Millennial wine consumption habits

The concept 'millennials' applies to people who reached adulthood around the beginning of the 21st century. Accurate delimitation varies from one source to another, but the prevailing threshold encompasses those born between 1982 and 2000 [30]. The use of information and technology in almost every aspect of their lives is a distinctive feature of this consumer segment [31]. Their behavior might dictate present and future consumption tendencies [30]. Therefore, the understanding of millennial behavior has become an important issue not only for academics but also for managers.

The millennial generation shows specific features relevant for the analysis of food purchasing habits. These differences place this generation apart from others and establish the segment as one of the most attractive for food businesses across the globe [32]. Millennials have higher acceptance of natural product claims [33] and show a high knowledge level regarding the value and quality of products [31]. Moreover, they are highly aware of their eating habits [33] and their health implications [15], and have a stronger interest in sustainability aspects [34]. Millennials are more likely to come across an innovative food product on the market [35]. They have more interest in a greater diversity of flavors and/or textures and usually show interest in non-traditional foods [29]. Millennials tend to be early adopters of new food products [35]. This consumer group tends to use price as a quality indicator [36].

Regarding habits related to wine, frequent wine consumers appear to be declining among millennials [34]. This can be associated with the evidence that suggests that millennials are willing to pay less for a bottle of wine than older generations [31]. By contrast, the number of occasional consumers is increasing [16]. Millennials drink wine in more varied contexts than previous generations, with wine being one of the favorite drinks of millennials in social settings [14,31]. In addition to traditional places such as home and restaurants, consumption habits are shifting to other places such as bars and outdoor spaces [37,38]. Wine is primarily consumed in groups and takes its roots in the millennial generation's lifestyle [16].

Consumer's price behavior has been linked with price elasticity [36]. On the one hand, price is more inelastic for younger consumers than for older consumers, i.e.,

one may expect that millennials would be less responsive to price modifications than older consumers [39]. On the other hand, previous research suggests that the price elasticity of wine for the lower end of the market is higher than for the middle and upper ranges [40-42]. Therefore, the WTP for wine varies slightly depending on the age of the consumer and the wine price point. Surprisingly, limited evidence can be found in the literature about millennials' WTP for wines in different price brackets.

Previous studies of millennials confirm that wine labels have a relevant influence when choosing a bottle of wine [43], as they facilitate risk reduction in decision-making [34]. Furthermore, through the label, the sustainable attributes of the wine are communicated, which play a relevant role in the millennial wine purchase decision-making process [31,34]. Furthermore, wine business research suggests that the importance attached to price by this consumer group is directly correlated, among others, to their country of origin [37], the wine production system [34] or wine type [44].

3. METHODOLOGY

3.1 Sampling and data collection

Two different methods were conducted: a quantitative research survey and an experimental auction. The survey was distributed among millennial students from a public university in Spain. The first part of the questionnaire was answered before the experiment, and the second was answered during the experiment [45]. We followed the methodology of similar experimental studies (e.g., [34]) that used convenience sampling of potential respondents. The chosen sample for the present study is supported by Allen and Spialeks' [30] definition of millennials, comprising individuals born between 1982 and 2000. Along with statistical demographic data, among other information, participants were asked to indicate the importance of a number of established product characteristics when buying a wine. Additionally, an experimental auction was conducted to analyze the willingness to pay for wine (e.g., [46]). This procedure is developed in depth below in subsection 3.2.

To address the issue of common method bias and following Conway and Lance's [47] recommendations, some procedures were employed before collecting the data. Two pretests with three academics with experience in the wine field ensured anonymity and confidentiality of the respondents and presented all information and data to facilitate the completion of the survey [48].

All the information-gathering work was performed between November 2017 and March 2018. The sample for this study consisted of 165 respondents. The age of the respondents at the time of the survey ranged between 18 and 35 years[2] (see Table 1 for demographics). The use of university students is common in recent experimental auctions involving wine (e.g., [16,46]).

Table 1. Descriptive statistics of the participants in the sample (N = 165).

Variable name	Variable coding	Frequency	Percentage
Gender	Male	73	44.2
	Female	92	55.8
Age	18-21	82	49.7
	22-25	62	37.6
	26-35	21	12.7
Monthly disposable income (€)	=< 1000	31	18.8
	1001-2000	60	36.4
	2001-3000	38	23.0
	3001-4000	20	12.1
	>4000	10	6.1
	Not declared	6	3.6
Wine consumption frequency	Never	7	4.2
	Several times a year	51	30.9
	Less than once per month	18	10.9
	1–3 times per month	36	21.8
	Once a week	33	20.1
	More than a once a week	18	10.9
	Daily	2	1.2
Self-reported knowledge of wine products	Absolutely no knowledge	40	24.4
	Some knowledge	106	64.6
	Good knowledge	17	10.4
	Not declared	2	0.6
Consumption by wine type[a]	Red	102	61.8
	White	102	61.8
	Rosé	28	16.9
	Sweet	19	11.5
	Sparkling	29	17.5

[a] Participants could choose more than one option.

Descriptive statistics (Table 1) revealed that the majority of the individuals in the sample were aged between 18 and 21 years old (49.7%), mainly women (55.8%). The average monthly income ranged between

[2] The age 18 is the legal age for drinking and purchasing alcohol in Spain.

Table 2. Significant factors influencing wine purchase (N = 165).

Variable	Description	Source references	Mean	Std. Dev.
Brand	Wine brand or producer	[57]	3.267	1.079
Taste	Expected taste	[57]	4.242	0.748
Health	Nourishing and health aspects	[58]	3.327	0.040
LabelandBottle	Visual impact of the bottle / label	[59]	2.848	1.004
Price	Price of the product	[60]	3.897	0.932
Availability	Product availability at points of sale	[61]	3.445	1.078
Grape	Grape variety	[38]	3.152	1.142
PDO	Protected Designation of Origin	[21]	3.509	1.007
RegionalLocal	Local or regional product	[7]	3.600	1.049
Organic	Organic certification	[23]	3.109	1.117

1,001.00 and 2,000.00 euros (36.4%). Over 50% of the participants reported drinking wine more than 3 times a month. Furthermore, 64.6% of the individuals considered themselves as having some knowledge about wine. It also should be noted that red and white wine were the most frequent types of wine consumed by the participants.

Figure 1. Wine information used in the experimental auctions.

3.2 Task and procedure

Drawing on previous literature, we identified ten items influencing the wine purchase decision. Participants were required to indicate the importance of each item (see Table 2) when buying a wine. Their choices were measured by using a Likert scale, including intermediate points, where '1' denoted "not important at all" and '5' "extremely important", prompted by the question "Indicate the importance for you of each of the following characteristics when buying a wine". There is a common understanding that Likert scales are the most widely used unidimensional scaling method for attitude and opinion measures [49].[3]

The scale reliability was assessed using Cronbach's alpha. In an untabulated test, we obtained a score of 0.6, which according to previous studies [53,54], could be considered an acceptable value. In this regard, a lower Cronbach's alpha could be considered sufficient to indicate consistency for scales with a reduced number of items [55] or in the case of a new scale [56].

To assess participants' WTP for traditional wine, an experimental auction was conducted. The experimental auction included four wines (see Fig. 1)[4], two organic and two conventional:

(1) Wine 1 (PDO): with Protected Designation of Origin and non-organic (i.e. conventional);

(2) Wine 2 (organic): produced according to European Commission (EC) regulation no. 203/2012;

(3) Wine 3 (PDO+Organic): with a Protected Designation of Origin and produced according to European Commission (EC) regulation no. 203/2012;

and (4) Wine 4 (Traditional): not a certified wine.

Participants were divided into two groups[5], with participants submitting their set of bids according to the following scheme:

- **Group 1** - sees the label first ® then bids ® then tastes the four wines® and then bids again.
- **Group 2** - tastes first ® then bids ® then sees the label ® and then bids again.

In both groups, WTP was measured through the overall average WTP of the participant for each of the four wines considered.

The experiment consisted of a pen and paper auction that included the following steps [46]. First, with participants allocated randomly and separated from each other,

[3] Despite the number of possible items on a Likert scale, five and seven response categories are considered significantly more accurate than other category options [50]. Notwithstanding potential limitations, a 5-point Likert scale was found suitable for the present study proposal. This number of items has been used in recent similar wine studies [15,19,44]. It has been suggested that this number can reduce respondent's frustration [51],and is also related to an increased response rate [52].

[4] Wines were provided by three wineries. All the wines chosen were collected directly from the pallets stored in the wineries' warehouses.

[5] Group 1 and group 2 comprised eighty-five and eighty individuals, respectively.

Table 3. The wine production process as explained to the participants.

	Wine 1	Wine 2	Wine 3	Wine 4
	PDO	Organic	PDO+Organic	Traditional
Production System	Conventional	Organic	Organic	Conventional
Production process	This wine has been produced following PDO regulations (e.g., being officially approved by the DO)	This wine has been produced following European Union rules for organic production (e.g., the avoidance of any chemical interventions)	This wine has been produced following PDO regulations and European Union rules for organic production	This wine has been produced in small-scale, manufactured at the rural property of peasant farmers employing traditional practices; it has no certifications

they received an ID number. Then, participants were placed at a visually isolated table with four wine samples with numbered codes in a different random order specific to each subject. The sessions started by providing written and verbal instructions, as well as a thorough briefing about the production process (see Table 3) of each wine in the auction. The participants were subsequently informed that the four wines had the same general characteristics: wine region,[6] varietal grapes (Mencía) and type (young red). Following Vecchio's [16] experiment, no additional information on brand, sensory characteristics and, to avoid any influences on bid values, no reference price was given to respondents. In line with other studies with similar characteristics (e.g., [46]), the information on alcohol content was not provided to the participants. This is because once the auctioned wine samples have all the same alcohol content, this information has no influence on the results. Attendants were instructed to eat a piece of cracker and rinse their mouth with water to clear their palate between tastings.

The methodology employed is based on the sealed bid method (first-price). This methodology has been used in previous wine studies (e.g., [46]) and has been proven to be quite efficient for eliciting WTP, being one of the easiest for participants to understand; it can also increase equilibrium bids [64]. Subjects were asked to submit the maximum amount they were willing to pay for a 750-ml bottle for each of the four wine samples presented to them. The bid range was from a minimum bid of € 0.00 to a maximum of €10.00. Following Schmit et al. [46] and Vecchio [16], each participant received monetary compensation (€10.00) for completing the experiment. This monetary compensation covers the costs associated with their bids as well as the time individuals spent in the experimental auction [65]. Participants were informed that only one of the wines auctioned would be binding to the end of the experiment. The highest bidder should buy the wine bottle, so it was in their best interest to bid their maximum WTP for each of the wines. The experiment involved a total of nine sessions.

In group 1, the glasses were labeled with the information of each wine. Participants submitted their bids for each of the four wine samples. Later, they were allowed to assess the overall likeability and the attributes of bitterness, sweetness, and fruitiness (see Appendix1). This assessment was followed by a second set of bids [46]. In group 2, participants were invited to perform a blind tasting of each of the four wines. This sensory assessment was followed by a first set of bids. Afterwards, the conductors of the experiment uncovered the label for each wine. At that point, participants presented the second set of bids.

3.3 Data analysis

Tobit models, also commonly designated censored regression models, are widely used in academic research. Such models are also adapted to the study of consumers' response to food labels (e.g., [16,46]). Given the nature of the data, the Tobit model is recognized as one of the most appropriate methods to model the factors affecting bidding behavior [66].[7] In particular, the methods employed ensured that the data were left-censored at 0, since WTP cannot be negative. According to Tobin [66], the Tobit model, compared with other statistical techniques, ensures more consistent estimates. Furthermore, it facilitates the inclusion of additional information. Statistical analysis was performed using R 3.6.1 GUI 1.70 statistical package Rcmdr Version 2.6-0. The censReg,

[6] All the wines in the experiment were produced in Ribeiro wine region, (province of Ourense, Galicia), where red wines assume a relevant presence [62]. Ribeiro is one of the oldest Denominations of Origin (PDO) in Spain (1932). It is also one of the most outstanding in terms of sales and knowledge awareness among Spanish consumers [63].

[7] In this research the dependent variable is a continuous variable in a finite interval.

summarytools, and maxLik packages were used to compute censored regression analysis and other statistical analyses [67].

4. RESULTS

4.1 Average willingness to pay bids for each of the four wines

The main aim of this study is to analyze whether the concept of traditional wine brings value to millennial university students. For that purpose, we examined whether information revelation affected participants' WTP. Using data from group 1, this assessment adopted a one-way analysis of variance (ANOVA) along with the Tukey test [68]. The preliminary assessment confirmed the influence of information cues. The WTP reached an average of €2.13 for the traditional wine (Table 4). Additionally, the average bid for this wine was lower than for other wines.

Table 5 shows the results for group 2. After the blind test, the average bid for traditional wine was €3.67. Next, the information about the wines was presented to the participants. The following average bid for this wine decreased by €1.21. This represents a reduction of 32.97% compared to the average bid obtained in the blind tasting. By contrast, the average WTP bids for the remaining wines increased when information was disclosed after the sensory evaluation.

Table 4. Average willingness to pay (€)* bids displaying information first (group 1).

Wine	Information first
PDO	3.76
Organic	3.93
PDO+Organic	5.18
Traditional	2.13

Table 5. Average willingness to pay (€)* bids displaying sensory evaluation first (group 2).

Wine	Blind taste (A)	Information after blind taste (B)	Difference (B-A)
PDO	2.84	3.04	+0.20
Organic	2.64	2.75	+0.11
PDO+Organic	2.79	3.71	+0.92
Traditional	3.67	2.46	-1.21

*Significant at: $p < 0.01$ (one-way ANOVA).

Table 6. Average overall likeability.

	Information first (group 1)	Sensorial first (group 2)	Difference (group 2-group 1)
PDO	3.40	2.88	-0.52
Organic	2.91	2.66	-0.25
PDO+Organic	3.02	2.84	-0.18
Traditional	3.14	3.48	+0.34

Many experimental auction studies conducted on agricultural and processed food products have highlighted the importance of introducing sensory cues when evaluating consumers' WTP (e.g., [69]). Therefore, in line with those works, a complementary analysis was performed. The new analysis was designed to assess the participants' overall likeability towards intrinsic wine quality (5-point Likert scale where 1 denoted 'Don't like it at all' and 5 denoted 'Like it a lot'). The findings presented in Table 6 suggest that sensory responses to traditional wine are stronger when sensory evaluation precedes the disclosure of information.

4.2 Variables influencing the purchase of traditional wine

The participants' demographics, self-reported wine knowledge, consumption frequency, and purchase decision criteria were analyzed as variables potentially influencing the purchase of traditional wine. This analysis was performed with data from group 1 because the steps followed by this group were closer to a real market scenario, although we acknowledge the limitation that it does not consider the influence of the 'context' and the 'situation' of purchase. Table 7 provides a summary of the results. The relevant role of some sociodemographic variables is suggested here. A significant positive relationship was identified between monthly disposable income and the WTP for traditional wine, as expected (e.g., [70]). The frequency of wine consumption was also found to have a significant positive relationship, confirming previous findings associating frequency of consumption with a high acceptance of certain products (e.g., [57,71]). The findings also suggested a meaningful effect of the variables in the wine purchase decision. Here, the t-value confirmed the statistical significance of the variable health. The results also suggest that the availability of the product has a negative relationship with WTP.

To further explore the participants' behavior toward the traditional wine, we applied ordinary least squares (OLS) regression to understand the factors underlying

Table 7. Tobit regression results on bids for the traditional wine auctioned in group 1 (information disclosed first)[a].

Variable	PDO	Organic	PDO+ Organic	Traditional
Gender	-0.044	0.100	0.899	0.517
	(0.556)	(0.515)	(0.623)	(0.472)
Income	-0.187	-0.750	0.187	**2.001****
	(0.216)	(0.202)	(0.244)	(0.182)
Product knowledge	-1.432	-1.302	-0.904	-1.325
	(0.525)	(0.487)	(0.589)	(0.445)
Consume frequency	0.985	0.997	0.759	**1.826***
	(0.176)	(0.164)	(0.198)	(0.148)
Brand	0.014	0.185	0.040	-0.146
	(0.249)	(0.230)	(0.279)	(0.210)
Taste	-0.462	0.100	0.388	0.163
	(0.312)	(0.289)	(0.349)	(0.264)
Health	1.381	1.924*	1.792*	**2.207****
	(0.269)	(0.249)	(0.302)	(0.232)
LabelandBottle	-0.170	-0.628	-0.692	-0.419
	(0.240)	(0.222)	(0.269)	(0.205)
Price	-0.364	-2.249**	-1.349	-0.248
	(0.275)	(0.255)	(0.308)	(0.233)
Availability	-1.639	-0.663	-2.089**	**-1.950***
	(0.224)	(0.208)	(0.252)	(0.192)
Grape	0.774	1.749*	0.835	0.647
	(0.218)	(0.202)	(0.244)	(0.186)
PDO	-0.156	-0.160	0.051	-0.083
	(0.295)	(0.274)	(0.331)	(0.248)
RegionalLocal	0.060	-0.394	-0.445	-0.073
	(0.262)	(0.243)	(0.294)	(0.222)
Organic	-0.321	-0.671	0.510	-0.738
	(0.276)	(0.256)	(0.309)	(0.234)
Constant	2.584	2.768	2.005	0.599
	(2.436)	(2.258)	(2.731)	(2.042)
Log-likelihood	-163.254	-157.455	-172.260	-141.264
N	85	85	85	85

[a] Standard error is reported in parentheses.
Significance codes: '*', '**', and '***' denote significance at the 10%, 5%, and 1% levels, respectively.

the difference in prices assigned to these products. Interestingly, as shown in Table 8, income was statistically significant for Traditional-PDO and Traditional-Organic but not for Traditional-PDO+Organic. The variable price only impacted Traditional-EURO LEAF. In particular, the estimated coefficients for income show that participants with higher income tended to bid higher in the significant relationships.

Table 8. OLS regression results for the price difference in bids for the traditional wine auctioned in group 1 (information disclosed first)[a].

Variable	PDO	Organic	PDO+Organic
Gender	0.577	0.389	-0.618
Income	2.246**	2.797***	1.531
Product knowledge	0.472	0.187	-0.034
Consume frequency	0.585	0.647	0.650
Brand	-0.316	-0.487	-0.309
Taste	0.805	0.118	-0.255
Health	0.159	-0.325	-0.531
LabelandBottle	-0.050	0.437	0.603
Price	0.234	2.288**	1.426
Availability	0.156	-1.064	0.882
Grape	-0.235	-1.255	-0.375
PDO	0.293	0.271	0.151
RegionalLocal	-0.392	-0.126	0.254
Organic	-0.208	0.156	-1.132
Constant	-2.497	-2.410	-1.814
R^2	0.138	0.196	0.192
N	85	85	85

[a] Standard error is reported in parentheses.
Significance codes: '*', '**', and '***' denote significance at the 10%, 5%, and 1% levels, respectively.

5. DISCUSSION

Wine is one of the most differentiated products in the food market [72]. The aim of this paper is to analyze whether the perception of traditional wine adds value for millennial university students. New emerging consumer groups are increasingly concerned about differentiated food products [73]. Based on the combination of dynamics in food and beverage markets [74], consumers' preferences, and the need to differentiate themselves from their competition [70], managers have explored new production techniques and developed innovative products, and such changes have impacted traditional attributes and uniqueness [12,29]. Despite market dynamics and innovation changes, it appears that a substantial untapped market exists for traditional wines.

The Tobit model indicated that variables affecting WTP for traditional wine vary depending on monthly disposable income, frequency of wine consumption, health-related issues, and availability at sales points. Although 'traditional' is an attribute excluded from what millennial university students consider to be a 'natural product' [13], surprisingly, the results show that fulfilling certain conditions can contribute to increasing preferences towards such products with respect to wine.

The driving factors of wine purchase create a unique level playing field for traditional wines and a distinctive market niche far from large-scale, streamlined industrial wine production. First, the health-enhancing aspects of wine – a niche closely associated with organic products – are a driver of product differentiation and new marketing channels. The previous literature has acknowledged that the expected enhanced health benefits derived from wine consumption are also related to the WTP (for example, those employing organic production methods [43] that do not contain certain specific additives, such as sulfites [75]). Thus, these factors lead to the assumption that the health-enhancing aspects of traditional wines may be related to their less-processed nature and the avoidance of chemical interventions during the winemaking process [2,3], which lead consumers to be willing to pay more for such products.[8] Second, smaller availability at the point of sale may act as a promoter of family traditional small-scale production and as a driver of wine tourism development. Recent empirical investigations suggest that limited availability of a product may be seen as a barrier affecting consumers' purchase decisions [61]. In some cases, limited availability can also relate to a niche market [77].

Despite the limited evidence in the previous literature of millennials' WTP for wines in different price ranges, some conclusions can be mentioned in this regard from our findings. On the one hand, according to previous research, the price elasticity of traditional wine, often related to a remainder category, may have the equivalent behavior as basic priced wines, consistent with high price elasticity (e.g., [36,41,42]). However, on the other hand, a different scenario could be possible. The WTP for traditional wine is related to its smaller availability at the point of sale, which can lead to the assumption that traditional wine could follow the same assessment of premium wines, meaning that they are more inelastic. Additionally, the more frequently the individual consumes wine, the higher the WTP for traditional wine. In this regard, previous studies (e.g., [78]) suggest that participants with a higher frequency of wine consumption are less price sensitive, in both on- and off-premise wine sale outlets. Furthermore, considering the common features shared with more differentiated products, significant substitution effects may not be expected for traditional wine. Although the elasticity and substitutability of traditional wines in a millennial setting are very interesting discussion issues, caution must be applied to previous discussions as this is not our study focus. There is abundant room for further progress on these issues. Studies specifically oriented and drawing on specific theories (e.g., auction theory [79]) could extend our knowledge about elasticity and substitutability at different price ranges in a millennial context.

Finally, positive externalities can arise from the fact that traditional wine purchases are often related to a 'cellar door' experience, which is habitually linked to the oldest consumer segment [70] and *per se* represents an authentic experience of place. Such an experience creates a close relationship with the seller, facilitating consumer loyalty and contributing to increased sales in the long term and preventing consumers' perception of traditional wines as a low-quality wine class. This is confirmed by Famularo et al.'s [80] assumptions that a greater understanding of a wine's region results from consumers' knowledge and involvement with wine products, which together contribute to their decision-making process.

6. CONCLUSIONS

In view of the above considerations, there seems to be an alternative path for small traditional wine producers. Such wine producers are completely different from more technology-oriented producers. These two realities could, and should, coexist in the market landscape for mutual benefit. Nevertheless, traditional products, when compared to other niche market products, suffer from a lack of decoded information and clear labeling. The presence on the label of a protected designation of origin reference [43,57] or organic certification [43] has proven to be a quality indicator. Thus, our findings confirm previous studies (e.g., [8,59]) on the use of information cues as an important focus for assisting consumers in decision-making related to the quality of the product. Such information is required given the impossibility of tasting the wine before purchase. Therefore, wine producers should provide detailed and valuable cues to market traditional wine. Furthermore, the sustainable aspects of traditional wine, namely, aspects related to the practices employed for its production, the promotion of the cultural and artisanal heritage of its region of origin, and economic profitability for many small producers, should be enhanced.

The present study has limitations, which offer ample opportunities for future research. First, although the research model provided some novel insights into the evaluation of traditional wine in the millennial context, data collection involved only millennial students from a public university in Spain. Second, the geographical area in which the auctions were performed has a long winemaking tradition, and wine is present in daily life.

[8] In this regard, conflicts of interest in research related to the health benefits of wine should be acknowledged (e.g., [58,76]).

The traditional attribute may perform differently in areas where traditional is associated with greater exclusivity and high standing. Therefore, future research extending this analysis to more diverse samples and other geographical locations is recommended. Studies in diverse cultural settings may confirm (or not) our findings. Third, as the minimum bid of 0.00€, it could not be determined whether a person would have a negative bid (that is, actually pay to avoid drinking the wine). Fourth, the limitation of using a single product in the analysis should also be considered. Fifth, the research model does not consider the influence of the 'context' and the 'situation' of purchase. For that reason, generalization of the results to real market transactions should proceed with caution. Finally, the analysis was carried out using entry-level wines; thus, extrapolation of the results related to price elasticity and substitutability for the lower end of the market to the middle and upper ranges may not be possible. Future research could extend the analysis by integrating different price points (basic, premium, super premium, ultra-premium and luxury).

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