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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:

- The sensory perception of a wine is influenced by the knowledge of the region of origin;
- The region of origin significantly affects the experienced quality;
- The region of origin significantly affects the expected quality;
- The region of origin significantly affects the perceived quality;
- The region of origin significantly affects the differences between expected and experienced quality;
- The region of origin significantly affects differences between perceived and experienced quality;
- 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'Hauterville 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

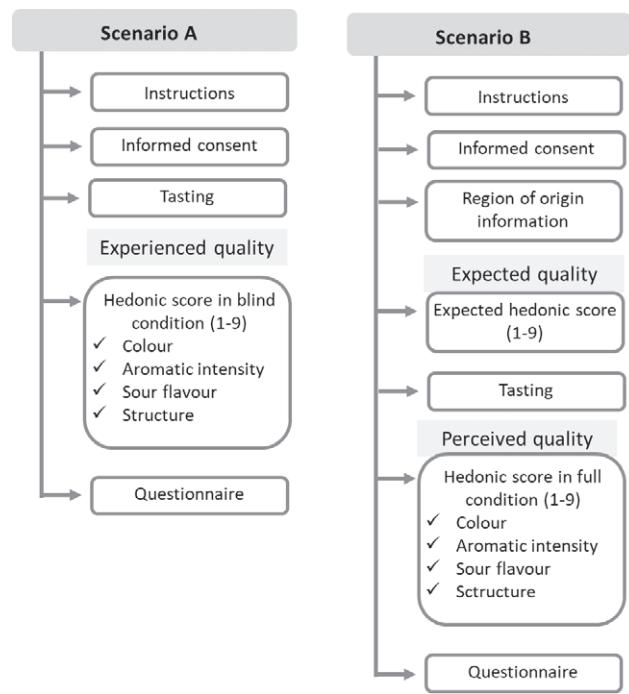


Figure 1. Summary of experimental protocol.

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; iii) 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.

#### *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 contribu-

**Table 1.** Objective wine knowledge test.

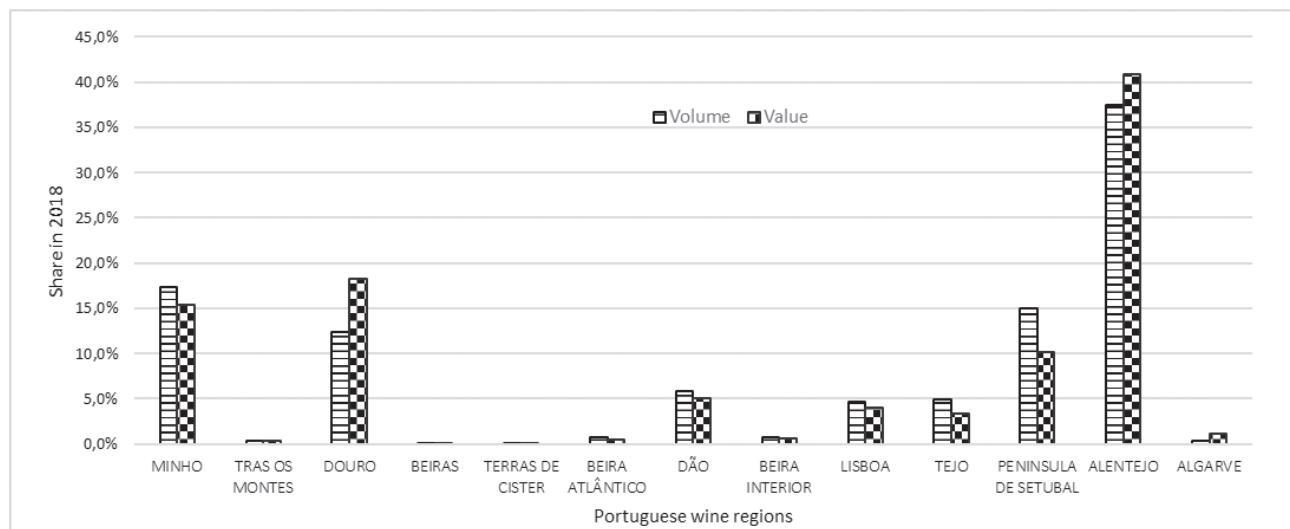
Question	Answer choice (correct choice in <i>italics</i> )
Which of the following is a grape of red wine?	Alvarinho Chardonnay <i>Touriga Nacional</i> Loureiro Don't know
A peppery character is most associated with which wine?	Merlot <i>Shiraz/Syrah</i> Semillion Pinot Noir Don't know
Which is not a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

tors 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	<i>Touriga Nacional, Tinta Roriz and Touriga Franca</i>	<i>Touriga Nacional, Tinta Roriz, Alfrocheiro and Jaen</i>	<i>Trincadeira and Aragonez</i>
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

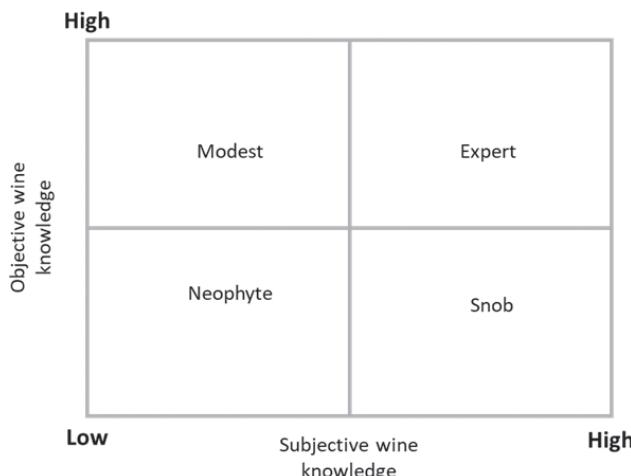
Participants' characteristics were analysed using univariate descriptive statistics for socio-demographics, wine consumption and purchasing habits, self-reported knowledge, subjective knowledge, opinion leadership, and opinion-seeking behaviour. For objective knowledge, a single score of individuals 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 shown 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 fac-

**Table 3.** Participants' profile description.

	Relative Frequency		Total	p-value
	Scenario A (N= 71)	Scenario B (N=65)		
<i>Gender</i>				0,128
Women	57,7	44,6	51,5	
Men	42,3	55,4	48,5	
<i>Education level</i>				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	
<i>Household monthly income</i>				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	
<i>Wine consumption frequency</i>				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	
<i>Wine region of origin that most buys</i>				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	
<i>Monthly purchasing of wine (bottle)</i>				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	
<i>Weekly spending of wine</i>				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	
<i>Place of purchase</i>				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.

tors. 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 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			
<i>Cronbach's α</i>	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			
<i>Cronbach's α</i>	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			
<i>Cronbach's α</i>	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			
<i>Cronbach's α</i>	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 lead-

er. 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 influ-

enced 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]. Stefan 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 wine 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 ( $\alpha$ ); 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'Hauterville 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 expected 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 ( $\alpha$ ), 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 ( $\alpha$ )	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-alcohol 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

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

Consumer knowledge type <sup>1</sup>	Region of origin	Hypotheses <sup>2</sup>	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
		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
		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
		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.

<sup>1</sup>The expert knowledge consumer group is composed of only one individual, thus the group is absent from the table.

<sup>2</sup>EQ=Experienced quality; PQ=Perceived quality.

quality was partially verified. This result is in line with those reported in previous literature [3,12,57].

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  $\alpha$ , 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 ( $\alpha$  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)	<ul style="list-style-type: none"> <li>- It is calculated to identify the effect of region of origin information on consumers preferences.</li> <li>- There are effects of region of origin on consumers preferences if E-B &gt;0</li> <li>- It is calculated to identify if there is assimilation or contrast effect</li> <li>- It shows to what extent product information (region of origin + sensory test) affects hedonic scores.</li> </ul>
Perceived quality – Experienced quality	Full information test liking score (F) - Blind test liking score (B)	<ul style="list-style-type: none"> <li>- It is calculated to identify if assimilation is partial or full;</li> <li>- There is complete assimilation if F-E=0.</li> <li>- if <math>\alpha &lt; 0,5</math>, then sensory features are the most important in the product evaluation;</li> <li>- if <math>\alpha &gt; 0,5</math> region of origin is preferable to sensory features.</li> </ul>
Perceived quality – Expected quality	Full information test liking score (F) - Expectation test liking score (E)	<ul style="list-style-type: none"> <li>- It is calculated to identify if assimilation is partial or full;</li> <li>- There is complete assimilation if F-E=0.</li> <li>- if <math>\alpha &lt; 0,5</math>, then sensory features are the most important in the product evaluation;</li> <li>- if <math>\alpha &gt; 0,5</math> region of origin is preferable to sensory features.</li> </ul>
Assimilation coefficients ( $\alpha$ )	$\alpha = \frac{\text{Perceived quality} - \text{Experienced quality (F-B)}}{\text{Expected quality} - \text{Experienced quality (E-B)}}, \quad 0 \leq \alpha \geq 1$	<ul style="list-style-type: none"> <li>- It measures the distance among expected quality and experienced quality as a percentage from the baseline outcome experienced quality</li> </ul>
Dissonance effect (DI)	$\text{DI}(\%) = \frac{\text{Expected quality} - \text{Experienced quality (E-B)}}{\text{Experienced quality (B)}} * 100$	<ul style="list-style-type: none"> <li>- It measures the average effect of information, as a percentage from the experienced quality on the perceived quality</li> </ul>
Moderating effect of information (MI)	$\alpha = \frac{\text{Perceived quality} - \text{Experienced quality (F-B)}}{\text{Experienced quality (B)}} * 100$	<ul style="list-style-type: none"> <li>- It measures the average effect of information, as a percentage from the experienced quality on the perceived quality</li> </ul>

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

	Present paper	Stefani <i>et al.</i> [18]	D'Hauterville <i>et al.</i> [3]	Masson <i>et al.</i> [12]	Vecchio <i>et al.</i> [57]
<i>Characteristics of study</i>					
Extrinsic cues under evaluation	Region of origin	Region of origin	Region of origin	Low-alcohol wine	Process impacts
<i>Main Results</i>					
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.