



Naturally biased? Experimental evidence on how the term natural influences wine consumers' perceptions and preferences

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ABSTRACT

Food consumption choices have relevant consequences on the environment, and consumers are getting more and more conscious about it. In the absence of perfect information, consumers use signals to infer product quality, but these can also mislead. The object of our work is to test how a label can influence product evaluations and test if halo effects exist after subjects have experienced the product. We focus on wine and the label natural. Using an experimental design in a wine tasting setting, we find that sensory and quality perceptions of the wine are altered by the use of the term natural. The term "natural" is associated with a perceived higher sustainability of the product, potentially misleading the choices of environmentally conscious consumers. However, there is no such effect on the health domain, which would be a deep concern for wine. To drive the influence of the label are the subjects with less wine expertise, for whom information about the naturalness of the wine alters also the evaluation on the health domain.

1. Introduction

Thanks to the growing attention to health and sustainability issues, consumers' interest in high-quality, low-additive products has grown (Román et al., 2017, Rana and Paul, 2020). Natural products are the response to this increased demand for artisanal and "transparent" products. Behind a product being "natural" often there is no precise definition, leaving the term "natural" as a vague concept. Thanks to this vagueness, the natural product can benefit from all the positive elements that consumers imagine relative to the term natural, without necessarily reflecting them. One of these can be related to the ecological impact of the natural product, leading eco-conscious consumers to value the natural product more, possibly being misled by the label.

As it happens with brands, a positive association with the term "natural" can make consumers fall into the so-called "halo effect", also known as assimilation-by-association effect (Nisbett and Wilson, 1977). This effect is a cognitive bias that claims that positive impressions of people, brands, and products in one area positively influence our feelings in another area. In our setting, it can be of peculiar importance for

wine given that: there is no precise definition of natural (Goldstein and Dubois, 2026), wine is an experience good, so signals of quality are particularly useful (Goldstein and Dubois, 2026a), and labels can importantly alter ecological and health concerns related to products (Schouteten et al., 2019). Consumers, therefore, can easily base and change their consumption decisions based on those labels, without going further into the evaluation of the product.

In the present work, we aim to test whether consumers' evaluation of a product can be biased by the use of the term "natural", even when subjects experience the product. We focus on natural wine, which represents the ideal case given its nature as an experience good, its close relationship with environmental and health issues, and the diffusion of the natural term in the market.

Natural wine is a conspicuous phenomenon. While research on the subject is limited, its diffusion and relevance are no longer negligible (Alonso González and Parga Dans, 2025). Even if natural is not a term that can be used on wine labels in the European Union, natural wines are demanded and sold. Raisin¹, the app whose aim is to collect and promote wine bars, restaurants, and shops where to find natural wine, reports the

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¹ <https://www.raisin.digital/en/> Data reported refer to June 2024.

existence of 3342 bars, 4609 restaurants, and 3144 shops in 1449 cities in 55 countries where the natural wine of 3129 winemakers is consumed. The Raisin app has been downloaded by around 420,862 people while their website has been consulted by 592,586 users in the last year², with France and Italy being the two main countries using it. The figures of natural wine highlight a growth that can possibly change the wine market and how consumers relate wine to health and environmental matters.

Calling a wine natural can bias consumers' perception of the wine. Studies showed that naturalness is related to healthiness as for other food categories (Román et al., 2017) and increases its perceived quality (Petty, 2015). Natural features were also shown as affecting food calorie content perception (Folwarczny et al., 2023). The term "natural" is related to natural elements (like grapes) and low processing and is able to raise positive feelings in the subjects (Rozin, 2026). Recent research on wine demonstrates that consumers' stated preferences can be influenced by the presence of signals of naturalness in wine production (Bazzani et al., 2024). Other terms and concepts have also been associated with changes in consumers' preferences - like organic, sustainable, or others (Amos et al., 2019, Sgroi et al., 2023, Vecchio et al., 2023). Such terms are influential for food products and especially wine, where the information asymmetry between producers and consumers is high. These can be of particular importance for the new generation, whose habits are a changing phenomenon (Agnoli et al., 2018) and can be differently susceptible to labels (Annunziata et al., 2019).

Natural wine is an interesting subject to study, given how its essence differs between theory and practice. On one side, it is not advised to use the natural term on wine labels (The EU Commission has rejected the words 2026) because of concerns about its potential misinterpretation; on the other, it is commonly used by wine producers, sellers, and consumers, such that it represents a well-known niche in the wine market, especially appealing for new consumers. The evidence reported in the literature evidenced that the use of the term natural would increase not only willingness to pay (Bazzani et al., 2024), but also the quality ranking and the positive features like healthiness and sustainability (Román et al., 2017, Petty, 2015, Folwarczny et al., 2023, Ballester et al., 2024) showed that natural wines tended to be different from conventional wines and, in particular, perceived to be of lower quality, therefore we can expect that taste could mitigate the positive effect of the label. The term "natural" can bias consumers' experience of wine's sensory attributes, although adding information to pin down the natural term may mitigate this effect, given that consumers' tastes are not very precise and easily biased (Hall et al., 2010, Spence, 2024, Lee et al., 2006, Goldstein et al., 2008, Bohannon et al., 2010).

The present research aims to study how the term natural associated with wine can influence consumers' perceptions and preferences. The novelty of this study is that subjects consume the product. While studies focusing on the effect of labels usually rely on choices about hypothetical products, we focus on a situation where subjects face a real product and are able to taste the wine. Such evidence is particularly relevant for testing the persistence of the halo effect in a setting with real consumption patterns. Our experiment represents a barometer for the persistence of the natural wine phenomenon in the market in the long run, when consumers will have to choose whether to buy the product again and taste matters. Since the use of the term "natural" is debated, the focus is on the use of the term "natural" and on adding information about the natural characteristics of the wine. We hypothesize that the term "natural" can bias subjects' evaluations and produce halo effects even after tasting. We also want to test if these effects are heterogeneous according to wine expertise.

To do so, we exploit an experimental design in a wine-tasting

experience built with the aim of measuring the influence of the term natural. We included in our study subjects with different degrees of wine knowledge. Subjects were randomly assigned to three conditions that differed in how the same natural wine was presented: i) a control treatment, where the wine was presented with just its grape variety and the year of production; ii) a natural treatment, besides the control information, the wine was said to be a natural wine and labelled as "natural"; iii) an information treatment, where subjects were also provided with a definition of natural production process. During the tasting, the same questionnaire was given to subjects. It contained taste and quality evaluations, elicited willingness to pay, and their perception of the impact of the product from an environmental, health, and social perspective. It also included demographics, experience with wine, and habits-related questions.

Results reveal that, even after tasting, subjects rate the visual quality of the wine higher and perceive different sensations when the wine is said to be natural, but subjects' stated willingness to pay is not affected. The term natural is also associated with a lower impact on the environment. Given that the term "natural" is not directly associated with more sustainable practices (Ghiglieri et al., 2023, Teissedre et al., 2022), this result indicates that subjects' choices can be biased by the term, at least those who are more eco-conscious. Health perceptions, on the other hand, are not affected by the term natural. The effects are driven by subjects with less knowledge about wine, who are more malleable. Experts are influenced only in the sensorial evaluation and only by the information. For these subjects with less wine expertise, information on how the natural wine is made affects the perception of it being healthier.

2. Materials and methods

2.1. Experimental design

The experimental design integrated a wine-tasting experience. Subjects were allocated to different conditions where they tested the wine and answered a questionnaire in a between-subjects design. There were three treatments, which differed in how wine was presented to the subjects: the term "natural" was or was not present, and whether it was accompanied by information about the elements that define the naturalness of its winemaking. In the control condition, the wine was presented with just its grape variety and the year of production. These basic elements were introduced to give common knowledge of the wine among differently experienced subjects. In the natural treatment, in addition to what stated in the control, the wine was said to be a natural wine. In the information treatment, subjects were additionally provided with a definition of natural. The information given was limited to three true characteristics: the organic certification of the vineyard, spontaneous fermentation, and the absence of added sulphites during the winemaking process. The bottle had a neutral label containing minimal graphics and information (pictures in Figure A.1 in the Appendix). The control information included in the label are the grape variety "Barbera", the indication "Vendemmia 2021" referring to the vintage, and a statement that the bottle's label was designed for the experiment. When the wine was served in the natural and information treatments, the label also included the "Vino Naturale" (*natural wine*) indication.

Our experimental setup differs from how natural wines are usually presented in two main ways: the presence of the words "natural wine" on the label and the absence of craft-looking elements on it. We are totally aware that it is forbidden, at least in Italy, to use the word "natural" on the label of the wines and that, also to overcome this limitation, natural wine producers make use of craft-looking labels to signal wine naturalness. However, given the necessity to take and remove the information about the wine being natural and to limit the confounding elements, like the appreciation of the artwork could be, we decided to convey the information about naturalness with words and not signals. Note that we clearly indicate that the label used is designed for experimental purposes

² Data on app download and website traffic are provided by the Raisin app and refer to September 2024. We want to thank Raisin staff for their availability.

only. In our setting, the naturalness of the wine is communicated orally and with a text on a neutral label, as it could happen with a waiter and menu, and not with indirect signals. Even if this choice has its benefits in allowing comparison between the different treatments, in reading our results, we need to keep in mind that the neutrality of the label limits them.

2.2. Questionnaire

The questionnaire administered was the same in the three conditions. This included the first part with the sensorial analysis. In the second part, the willingness to pay (WTP) for the wine and the perception of the product in terms of environmental, health, and social impacts were elicited. The last part included demographics, experience with wine, weekly frequency and expenditure relative to alcoholics, food, and sports habits. English translation of the survey (originally compiled in Italian) can be found in **Appendix B**.

The sensory analysis questionnaire consisted of two parts: in the first the panellist was asked to taste the wine and to evaluate by a Check-all-that-apply (CATA, [Varela & Ares, 2012](#)) approach the presence of descriptors. The descriptors were explained by the panel leader at the beginning of the tasting session. The second part consisted of evaluating the visual, aromatic/odour, in mouth, and overall quality of the tasted wines on a 10-point scale (where 0=low quality, 9=high quality). We therefore have some granularity in measuring quality and for different dimensions of wine quality following ([Charters and Pettigrew, 2005](#)). For the CATA, the descriptors chosen were taken from a study dealing with comparison between natural and conventional wines ([Sáenz-Navajas et al., 2024](#)). Some additional attributes were added as appropriate in the evaluation of Barbera wines. The descriptors were divided in four category: “odour/aroma” (i.e. *animal/barnyard, toasted/smoked, fruity, floral, butter, dried/candied fruit, oxidated/evolved, vinegar*); “in- mouth”, divided in taste (i.e. *sour/acidic, bitter*), tactile sensation (*tannic/astringent, silky/smooth*), mouthfeel (*bodied*); “complexity” that considered descriptors involving overall evaluation of the wines (*balanced, concentrated, elegant, complex, potential to age, faulty, clean, vegetative/green*), and finally the “appearance” of the wine (*light coloured, dark coloured*). Before the tasting, subjects were instructed on the meaning of the descriptors, the definitions provided are available in **Table A.1**. Descriptors were proposed in random order for each panelist. There were no restrictions on the number of choices. The option “other” was included with the possibility to add descriptors perceived and not preliminarily established by the CATA questionnaire.

Willingness to pay was elicited with an open question. This was meant to avoid giving reference points and range limits. Beliefs on winemaker environmental and social impacts together with wine health effects, were asked on a five-star scale, providing us with measures of sustainability, healthiness, and fairness. This scale is commonly used in settings where consumers provide reviews, as its use is intuitive and common. Moreover, ([Abell et al., 2024](#)) found it powerful for consumers’ evaluations.

Demographics were collected to ensure that the sample was balanced across conditions for gender, age, and wine expertise. Habits related to health, expenditures, and wine-related questions were also elicited.

2.3. Sample and procedure

The experimental sessions took place in a sensory analysis room of Uni-Astiss, equipped with individual booths and controlled temperature (**Figure A.2**) that allowed for the separation of the subjects and handling to serve the wine.

Subjects were recruited by email and fliers (**Figure A.3**) distributed among the students at the university venue of Uni-Astiss and the Department of Economics of the University of Genova, therefore most of them belong to Gen Z (born after 1997). A total of 253 subjects participated, 88 in the control condition, 83 in the natural treatment, and 82 in

the information treatment. The experiment run for three days. Uni-Astiss offers wine-related bachelor's and master's programs, therefore our sample includes subjects with good wine knowledge. We define as experts the subjects who are currently enrolled in a wine-related course of study or have just completed it. Our expert category, therefore, includes all the subjects with formal training in wine.

Table 1 reports the distribution of our main independent variables across conditions. The sample is balanced by gender, and the 50/50 distribution persists in all the treatments. The average age is 24 years old, with slightly younger subjects in the control condition. About one-third of the students fall within the category of experts.

The protocol for the experimental tasting was the same across treatments and just differed in the degree of information about the wine. Subjects were sitting distanced from each other, and the wine was served in the glass present on their desk. Each subject had a glass of water, an unsalted cracker, a napkin, and a spittoon. The wine was served in a Harmony 53 transparent wine glass (RASTAL GmbH & Co. KG, Höhr-Grenzhausen, Germany).

While receiving the wine, they had the opportunity to look at the bottle with its label. The description of the wine followed the same protocol in all the experimental sessions, where information differed according to the treatment. The experimenter also provided an explanation of the wine descriptors proposed (**Table A.1** was explained orally and projected on the screen) to ensure common knowledge.

After that information and wine were received, the questionnaire was distributed through a QR code and administered on personal devices. The questionnaire was programmed in Qualtrics (Provo, UT, USA). After completing the survey, subjects were allowed to leave the room. The whole procedure took 40 minutes on average. Subjects signed informed consent and did not receive a monetary payment.

2.4. Natural wine production and analysis

The wines were produced during the 2021 harvest in the experimental winery of the University of Torino located in Chieri (TO). In order to produce a wine that follows the definition of natural wine, we used the key points of the “Charte d’Engagement” of the Vin méthode Nature association. Contrary to other decalogies, this has been written in collaboration with institutional partners and therefore represents what is mostly close to an official definition. Moreover, their elements are quite similar to the ones shared by other associations that consumers of natural wine can be familiar with, like Raisin and Triple A.

The Barbera grapes were obtained by organic system viticulture (European commission, 2018; European commission, 2021).³ The alcoholic fermentation was spontaneous (no selected yeasts were added). Temperature and the sugar decrease were controlled daily. The maceration lasted 8 days. The wine was filtered before being bottled. The bottles were stored at a controlled temperature (10°C) until used for the tasting sessions. The wine was chemically tested to identify quantitatively its basic parameters. These, together with a detailed description of the methods employed, are available in **Appendix A**.

3. Results

3.1. Sensory evaluation: aroma and in-mouth descriptors

As the first aim, we test whether the treatment manipulation can

³ European commission (2018). Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007. <http://data.europa.eu/eli/reg/2018/848/oj> European commission (2021). Commission Implementing Regulation (EU) 2021/1165 of 15 July 2021 authorising certain products and substances for use in organic production and establishing their lists. http://data.europa.eu/eli/reg_impl/2021/1165/oj.

Table 1

Distribution of sample characteristics across conditions.

	Control N = 88(34.8 %)	Natural N = 82(32.4 %)	Information N = 83(32.8 %)	Total N = 253	P-value C vs N	P-value C vs I	P-value N vs I
Female	43.0 %	52.4 %	48.8 %	48.0 %	0.22	0.46	0.64
Age	23.341 (2.660)	25.378 (6.892)	25.024 (6.458)	24.552 (5.661)	0.01	0.03	0.73
Expert	37.5 %	26.8 %	41.0 %	35.2 %	0.14	0.65	0.06

Notes: reports subjects' characteristics in terms of gender (percentage of females), age (mean age $\pm$ standard deviation), and wine expertise (percentage of subjects studying wine). P-values from *t*-tests comparing the differences between treatments are provided.

alter the wine experience of subjects, assessed by descriptors' frequency. While the wine did not differ by treatment, the presence of the term "natural" and the information on the natural method can bias the subject's perception. Consumers are, in general, not very able at recognizing tastes (Hall et al., 2010) and information can alter quality evaluation, especially if it relates to consumers' prejudices (Lee et al., 2006). Sensorial evaluation of wines can be biased by information on price and relative signals (Spence, 2024). Studies on how labels and information alter products' perception have found that quality evaluation can be influenced by information like the origin of the product (Chen et al., 2013). In the case of wine, for which appellations and labels are extensively used, (Delmas et al., 2016) found that an eco-certification is associated with higher quality ratings in specialized websites.

Knowing if and how a term can alter taste perception is a fundamental step in evaluating how consumers' choices relative to a food product are altered by a signal; moreover, it helps us to understand if a possible halo effect is mediated by taste. Being wine an experience good, its taste is a fundamental part of its evaluation. Some sensory characteristics can therefore be associated with other attributes and generate halo effects, as well as some attributes can influence the perception of the sensory characteristics. In the present study, we test the link between the information provided and the perception of the sensory attributes of the wine in a controlled context that allows us to isolate the influence of the term and the information provided.

Comparing the frequency of descriptors (Table 2) between the control, where no terms were added to the 2021 Barbera, and the natural treatment, where the term "natural" was used, we find that the percentage of subjects who experienced notes of *vinegar* (31% vs 18% vs 27% for control, natural, and information treatment, respectively) were lower when subjects knew that the wine was natural (p -value=0.06). The same applies to the descriptor *sour/acidic* (67% of control vs 52% and 53% of natural and information, p -values= 0.05 and 0.06, respectively). This evidence is not consistent with common associations that consumers have been reported to have with the term "natural" and possible faults of the wine (Ballester et al., 2024). It can instead indicate that some subjects may be more "kind" with the same fault when the wine is said to be natural. The information treatment showed a higher *fruity* note (48%) than the control (34%, p -value = 0.06) and the other treatment (33%, p -value = 0.05). The presence of "fruit" is related more with the information than with the term "natural". In both treatments where the term "natural" was present, the wine was less likely to be described as *light coloured* and more likely to have *body*. Perceived lightness of colour was higher in the control (11 vs 4 vs 4%, p -value = 0.06). In the control the wine was perceived as less intense than the two treatments for (23 vs 39 vs 41%, p -value = 0.02). Colour is indeed an important element in the marketing of wine (Carlin et al., 2022). This positive change in colour perception could therefore have important implications for how natural wines are appreciated.

When we replicate our analysis separately for the sample of Non-experts and Experts, see Table A.3 and A.4 in Appendix A, we can see that the effect on *vinegar* is driven by the Non-experts, while the effect on *sour/acidic* is driven by the Experts. Non-experts are also the ones for which *fruity* notes are more associated with naturalness and, importantly, for whom the term "natural" affects the visual perception of the wine. Non-experts are, in general, more influenced both by the term and the information. For the Experts, the treatment with information is

the one that is able to alter their perception of the wine (relative to four descriptors: oxidative, sour, tannic, and complex), possibly because, in this case, some technical information was provided and the term organic was mentioned.

3.2. Quality ratings

Quality judgment can be influenced by extrinsic and intrinsic dimensions (Charters and Pettigrew, 2005). Extrinsic cues are related to the expected quality of the wine and include factors such as the characteristics of the grape, winemaking, and production process, and marketing elements such as the packaging, label, and reputation. In contrast, the intrinsic dimension involves pleasure and enjoyment, appearance, gustatory, paradigmatic, and potential to age cues, which may vary as effect magnitude depending on the consumer's involvement and expertise (Oyinseye et al., 2022). For instance, appearance - e.g. wine colour - plays an important role for low and medium-involvement tasters. Instead, ageing potential is more relevant for experts than naïve consumers. The 'gustatory' cue offers more sub-dimensions than any other. Taste, smoothness, mouthfeel and body, drinkability, balance, concentration, and complexity drive the gustatory quality of wines. The extrinsic dimension (winemaking, production, marketing) plays a synergistic role with the intrinsic dimension, in particular when connected to the sensory space, so the appearance and gustatory qualities dimension.

We test how our extrinsic cue, naturalness, influences quality ratings. Moreover, given that subjects' sensory evaluation results are influenced, we explore how these two effects correlate. Research on how labels and appellations affect wine evaluation has been done without allowing subjects to taste the product (Sáenz-Navajas et al., 2013) or using existing data in which the extrinsic cue of interest was not isolated ex-ante (Delmas et al., 2016). However, it is important to test how quality and also willingness to pay are influenced after experiencing the wine. Evaluation after experience is fundamental for repetitive purchases and purchases in bars and wine shops, where consumers can taste the wine before making their choice.

The wine scored 6.20 over 9 points as *overall quality* in the control, not significantly different from the score of 6.49 in the natural and 6.13 in the informational treatment (according to Mann-Whitney test). On the other hand, the average ranking for the quality reports in each sub-category showed a positive effect of the use of the natural term in *visual quality* (6.76 control vs 7.30 natural, p -value = 0.005), *aroma quality* (5.48 control vs 6.18 natural, p -value = 0.013) and *in-mouth quality* (5.61 control vs 6.05 natural, p -value = 0.055). Adding information on the natural winemaking instead does not have an effect on other ratings than *visual quality* (6.76 control vs 7.08 natural, p -value = 0.076). The pattern is confirmed by a Kruskal-Wallis test comparing the three treatments (p -value for *overall quality*=0.21, *visual quality* = 0.02, *aroma quality* = 0.02, and *in-mouth quality* = 0.17). How subjects experience wine can depend on experience and involvement (Oyinseye et al., 2022). Moreover, Ballester et al. (2024) found that in a panel of winemakers, different natural wines were perceived to be of lower quality than conventional ones, both in blind and in non-blind tasting. When we split our sample by knowledge of wine, we find that the difference in the ratings of visual quality is driven by the Non-experts. Fig. 1 illustrates the distribution of quality ratings in the three different treatments,

Table 2
Distribution of wine descriptors between treatments.

Descriptor		Control (%)	Natural (%)	Information (%)	(Control) vs. (Natural), p-value	(Control) vs. (Information), p-value	(Natural) vs. (Information), p-value
Animal/ barnyard	Animale/stalla	14	21	24	0.22	0.08	0.61
Toasted/smoked	Tostato/affumicato	17	27	24	0.12	0.26	0.69
Fruity	Fruttato	34	33	48	0.87	0.06	0.05
Floral	Floreale	14	22	19	0.16	0.32	0.67
Butter	Burro	6	7	7	0.67	0.68	0.98
Dried/candied fruit	Frutta Secca/frutta candita	15	20	20	0.41	0.33	0.88
Oxidative/ evolved	Ossidato/evoluto	25	28	19	0.65	0.37	0.19
Vinegar	Aceto	31	18	27	0.06	0.55	0.21
Sour/acidic	Aspro/acido	67	52	53	0.05	0.06	0.94
Bitter	Amaro	27	30	23	0.65	0.51	0.27
Tannic/ astringent	Tannico	18	26	22	0.24	0.57	0.56
Silky/smooth	Setoso	47	40	41	0.41	0.46	0.93
Bodied	Corposo	23	39	41	0.02	0.01	0.80
Balanced	Equilibrato/ bilanciato	22	29	25	0.25	0.57	0.57
Concentrated	Concentrato	38	45	37	0.32	0.98	0.31
Elegant	Elegante	16	29	22	0.04	0.34	0.27
Complex	Complesso	23	16	13	0.26	0.11	0.64
Potential to age	Da affinamento	22	20	24	0.74	0.70	0.48
Faulty	Difettoso	10	9	14	0.71	0.40	0.24
Clean	Pulito	23	29	30	0.33	0.28	0.91
Vegetative/ green	Vegetale	19	16	25	0.56	0.35	0.14
Light coloured	Colore scarico	11	4	4	0.06	0.06	0.99
Dark coloured	Colore intenso	77	88	82	0.07	0.45	0.30
Others	Altro	6	4	6	0.54	0.92	0.48
	N	88	82	83			

Notes: Total number of subjects = 253, frequency of citation (%) are expressed as percentage of citation inside each treatment (Control, Natural, Information, N=88, 82, 83, respectively). P-values in bold indicate $p < 0.1$ according to joint orthogonality test.

relative to the *visual*, *aroma*, *in-mouth*, and *overall quality*.

According to a Shapiro-Francia test, the distribution of quality rating is not normal for either type of *quality* considered. We performed Kolmogorov-Smirnov tests for the equality of the distribution across different treatments and found that only for the *visual quality*, the natural treatment exhibits a higher cumulative distribution ($D = 0.1932$, p -value = 0.042).

Results from an ordered logit regressions (oLogit) are reported in Table 3. Here we split the sample between Experts and Non-experts and control only for gender and age. In Appendix A, Table A.5 replicates the regression using the whole sample. Table A.6 provides the same estimates, adding one control: weekly drinking frequency. Table A.7 also adds habits related to smoking, sports, and eating⁴. Defining the wine as natural increased the probability of higher rankings, but only in the *visual quality*. This effect was driven by naïve consumers (Table 3). Quality evaluations were not influenced by demographics if not a small effect of age between experts: older experts tend to give higher rankings.

Our evidence suggests that the term "natural" has an effect on increasing the quality perceived by the subjects, but the effect is mainly focused on the *visual quality*. The fact that natural wines look better can be due to the association with the imaginary of natural wine that natural wine makers and places are carrying out. The result is also in line with the change in the perception of the color registered through the descriptors. However, given that the *overall quality* does not change, we can affirm that the natural effect is limited. Moreover, it is moderated by expertise in wine.

Concerning the descriptors and quality evaluations, *overall quality*

was negatively correlated with *sour/acidic* descriptor (-0.29 , p -value < 0.001 , Pearson's correlation test, data not shown), while the other descriptors affected by the term "natural" do not influence quality. This is in line with results revealing that the sensorial dimension is not the most important in determining wine preferences (Benfratello et al., 2009)

3.3. Willingness to pay

The main object of interest of the studies investigating the effect that labels and other commonly used signals on the product has been subjects' willingness to pay (WTP). Labels referring to official certifications can rationally reflect higher prices, given the cost incurred to obtain them. Overall, sustainability indicators have a positive effect on WTP (Schäufele and Hamm, 2017, Abraben et al., 2017) found that there is a price premium due to organic certification being present for low-quality wines, while for high-quality wines it represents a penalty. (Loureiro, 2003) found a lower WTP for environmentally friendly wines when the label was applied to wines with low reputation.

The association between the term "natural" and the WTP for the wine is interesting, as in our setting, there is neither cost nor a definition behind the use of the term that could possibly affect the consumer, therefore the term "natural" represents a cheap signal. Previous studies focused on the term "natural" associated with wine and found that WTP is still influenced (Bazzani et al., 2024, Vecchio et al., 2023, Galati et al., 2019). These studies, however, rely on hypothetical choices of subjects who could not experience the product. In our study, we are able to elicit WTP after the consumers assess wine quality. The relationship between price and quality in the wine market is strong (Kaimann et al., 2023), with price working as a signal of quality, especially for the less experienced subjects (Mastrobuoni et al., 2014). However, when unaware of the price, consumers do not enjoy better the more expensive wines

⁴ Note that we do not comment on these results as we believe that correlation with demographics can bias the estimates and therefore we rely uniquely on the estimates with basic demographics controls.

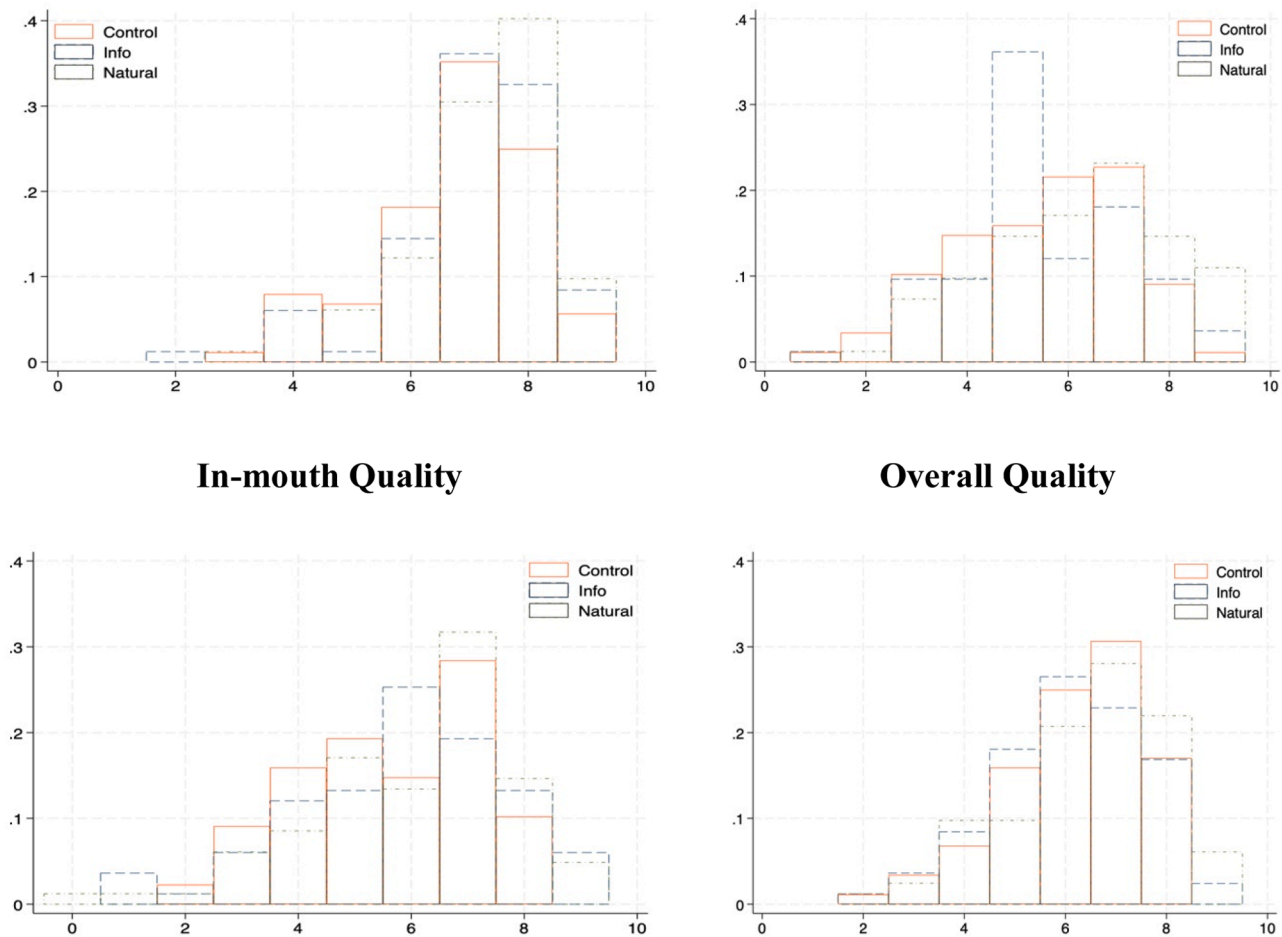


Fig. 1. Distribution of Quality ranking by treatment.

Notes: provides the distribution of the different quality rankings (Visual, Aroma, In-mouth and Overall) by treatment (Control, Information and Natural).

Table 3

Ordered logit regression of Quality evaluations.

	Overall Quality		Visual Quality		Aroma Quality		In-mouth Quality	
	NE	E	NE	E	NE	E	NE	E
Natural	0.31 (0.92)	-0.02 (-0.04)	0.73* (2.11)	0.98 (1.81)	0.52 (1.54)	0.41 (0.76)	0.25 (0.74)	0.61 (1.15)
Information	0.20 (0.57)	-0.49 (-1.09)	0.58 (1.59)	0.41 (0.92)	0.18 (0.52)	-0.28 (-0.63)	0.33 (0.93)	0.37 (0.84)
Female	-0.08 (-0.30)	0.59 (1.52)	0.19 (0.68)	0.21 (0.54)	-0.08 (-0.30)	0.60 (1.53)	-0.44 (-1.56)	0.41 (1.08)
Age	-0.00 (-0.10)	0.10* (2.05)	0.03 (1.45)	-0.01 (-0.21)	-0.00 (-0.16)	0.15** (2.92)	0.00 (0.08)	0.09 (1.89)
N	162	87	162	87	162	87	162	87

Notes: provides coefficients (and t-statistics) from oLogit regression of the overall quality and the visual, aroma and in-mouth quality evaluations, separately for the Non-expert (NE) and the Expert (E). Female (dummy) and age (continuous) variables are used as controls. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. N is the total number of subjects.

(Goldstein et al., 2008).

In this study, we remove the problem of asymmetry and compare quality and WTP after experiencing the good. Therefore, it is possible to test if the effect of introducing the natural label can give a price premium that persists after the wine is tested, in the long run, and if the premium is linked to (expected) quality or aesthetic factors. Fig. 2 illustrates the distribution of WTP for a bottle of the wine tasted, in each treatment condition. WTP was not normally distributed, but it did not differ between treatments.

Regression analysis (Table 4), where we add as controls gender and age, reveals that demographics did not affect WTP in our sample. Age could be an important factor in explaining WTP as it correlates with a higher budget and preference for wine, but also since naturalness is a trend especially for the age category of millennials (Galati et al., 2019).

Gender did not influence WTP in our experiment where the information was limited to wine characteristics, while it was shown to play a role when the gender of the winemaker is also revealed (Gallais and Livat, 2024).

It is to be noted that possibly our young sample had a limited capacity to pay for wine, therefore, it could be hard to find any effect of our treatments. However, we tried to limit this problem by using an abstract open question and giving no reference points. The distribution of values is indeed wide and reaches also high values (mean = 15.66, standard deviation = 11.72).

Our results indicate that the association between the term "natural" and higher WTP does not persist after experience. This can indicate that the use of the term "natural" itself or the production technique does not give a price premium that is independent from quality and taste

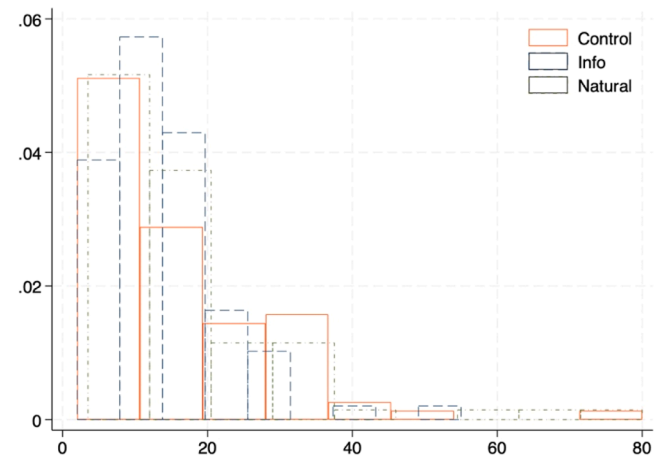


Fig. 2. Distribution of willingness to pay across the treatments
Notes: shows how willingness to pay is distributed in the Control, Information and Natural treatments.

Table 4
Ordinary least squares regression of willingness to pay.

	NE	E
Natural	-0.25 (-0.10)	1.06 (0.62)
Information	-4.03 (-1.51)	1.49 (1.04)
Female	-0.97 (-0.47)	1.32 (1.05)
Age	-0.22 (-1.29)	0.14 (0.96)
Const.	25.50*** (5.69)	6.21 (1.70)
N	162	87

Notes: reports regression coefficients (and robust standard errors) from OLS regressions of willingness to pay (WTP) for a bottle of wine. Female and Expert (dummies) and age (continuous) variables are used as controls. * corresponds to $p < 0.05$. N is the total number of answers used for each regression and represents subjects who answered the questionnaire in the treatment object of analysis.

evaluations.

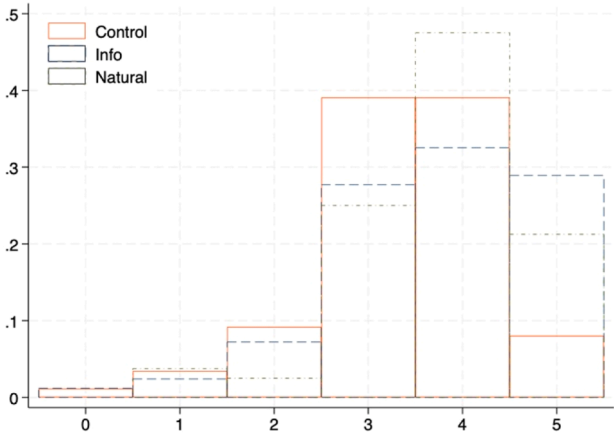
3.4. Perception of sustainability, healthiness, and fairness

Lastly, we focus on how naturalness can influence subjects' ranking in three domains: sustainability, healthiness, and fairness. We identify these domains to test for the presence of halo effects. While naturalness associates well with sustainability or healthiness, fairness is intended to represent a domain to use as control.

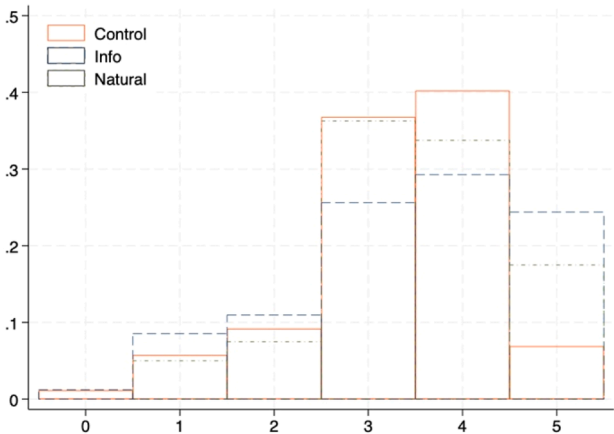
The use of the term "natural", which defines our natural treatment, itself is not directly related to these dimensions, while the information treatment gives some concrete elements to associate with (the absence of additions for health, the cultivation of the vineyards for sustainability).

Sustainability is the only characteristic associated with naturalness. Subjects declared that the wine is sustainable more often in the treatments with the term "natural" (3.35 for control, 3.80 for natural, and 3.75 for information, p -value < 0.001 , according to Mann–Whitney test), and there is no difference between the treatment with the term alone and the one with information. This is in line with qualitative data from (Fabbrizzi et al., 2021). Interestingly, subjects did not relate the term "natural" or the natural production method to a healthier product (mean of control 3.30 vs 3.46 natural and 3.48 information, p -value = 0.15, according to Mann–Whitney test). Fig. 3 illustrates the distribution of the rankings for each domain by treatments. According to Shapiro–Francia test, the distribution of these ratings is not normal. We implemented Kolmogorov–Smirnov tests for the equality of the distribution across different treatments and found that only the perception of sustainability in the natural treatments exhibited a higher cumulative distribution ($D = 0.1790$, p -value = 0.026). When we focus our analysis

Sustainability



Healthiness



Fairness

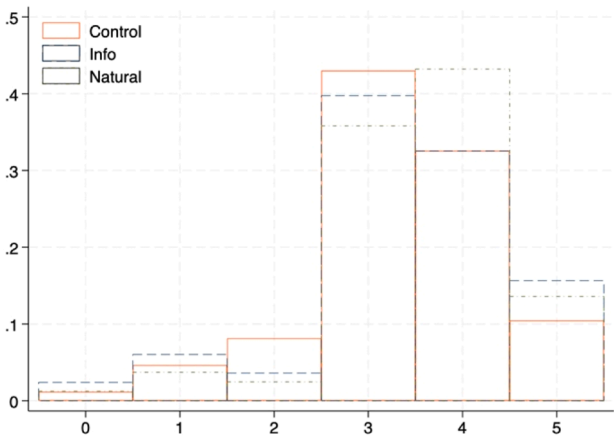


Fig. 3. Distribution of the perceptions of sustainability, healthiness, and fairness

Notes: provides the distribution of the different rankings (Sustainability, Healthiness and Fairness) by treatment (Control, Information and Natural).

on the subsample of Non-experts, we replicate the effect on the perception of sustainability. We also find an effect on the perception of healthiness limited to when information is given (3.44 for control, vs 3.79 for information, p -value = 0.022, according to Mann–Whitney

test). The perceptions of the Experts, instead, are not influenced by the treatments in any way.

The halo effect is limited to the sustainability domain: subjects with no training in wine believe that a natural wine also has less impact on the environment. This happens both when the subjects are not given any clues about the association between the term "natural" and the wine-making process, and when they are. Naïve consumers can be fooled by the use of the term "natural" and decide to choose the natural product for non-existent reasons⁵. However, our results indicate that they are not willing to pay a price premium. Importantly, the term "natural" is overall not associated with better health perceptions of the product, which could have relevant implications for a product like wine. However, the information on the production of natural wine, when we included information about the grapes being organic and the absence of added sulphur, can alter the healthy perception of the subjects with no training in wine.

4. Conclusion

Motivated by the diffusion of labels, tags, and certifications that signal ecological and health propriety of foods and the consequent proliferation of studies testing their effect on consumers' preferences, we study how these affect consumers who experience a real product. We aim to test whether consumers can be biased by the term "natural", even after experiencing the product, when evaluating quality and price, and for the existence of halo effects.

In the study, we implement an experiment during a wine tasting to study how a label can influence consumers' perceptions and preferences for a product that has been experienced. We focus on wine, a product for which experience is central, and on natural, a tag that does not imply any direct increase in costs.

In settings without a real product and the opportunity to taste it, previous evidence suggests that subjects are willing to pay more if the wine signals that it is natural. We do not find evidence of such a pattern when subjects can experience the product. However, the term "natural" is able to shift the quality rating, and it alters the perception of the wine. Calling the wine "natural" affects how subjects experience the wine, altering the tasting notes they perceive. Even if subjects' taste is only one element affecting consumption choices, a biased perception of the product due to the natural tag and the related information is a non-negligible factor to consider. Moreover, we find that the wine is perceived as better looking –higher *visual quality*– when it is defined as natural. Given the importance that aesthetics can have in the market of wine (Burnham and Skilleås, 2026), it can be an important channel affecting the consumption of natural products. We observe differences in the results according to wine expertise. Experts' perception and judgment are less influenced: only the treatment with information alters their choices, and its effect is limited to the sensorial analysis.

Interestingly, the term "natural" gives the idea of a more sustainable product, while it has no effect on how healthy the product is considered. The new European regulations in effect from December 2023⁶ are drawing attention to wine labelling: even for wine, the obligation of

nutritional declaration and list of ingredients now applies. The policy aim behind this application is to reduce the asymmetry of information, widespread in the wine industry. Consumers are indeed interested in receiving nutritional information relative to wine and use it (Annunziata et al., 2016). On the other hand, wine consumers are particularly susceptible to information and labels, suffering the charm of certifications: they prefer wines with a certification even when it is an invented one (Sigurdsson et al., 2024). If information and labels can serve as a trusted source of knowledge, allowing consumers to make better choices (Crosetto et al., 2020), it could produce a dangerous halo effect: labels containing information that transpires somewhat naturalness can make consumers perceive the product as healthier, safer, more environmentally friendly, and of higher quality (Crosetto et al., 2020, Sgroi et al., 2023, Larceneux et al., 2012, Boncinelli et al., 2021, Amos et al., 2019). In our experiment, we find out that health perception of the product by consumers who are drinking the wine aware of its naturalness does not differ from that of ones drinking the same wine without knowing it. Therefore, our results can rule out a backfire effect of sharing elements that signal naturalness relative to health concerns in the context of alcoholic beverages like wine. However, we highlight another important halo effect: subjects perceive the natural wine as more sustainable. Given the growth of consumer interest in products with less environmental impact, this represents a significant concern. Also regarding these results, we find heterogeneity based on wine expertise. Experts do not suffer from any halo effect, while Non-experts give a higher health ranking when given full information on the natural wine.

Our study adds to the discussion on the necessity of an official definition of natural wine and the opportunity to use this term. While the effects we highlight are limited to subjects with low wine knowledge, these represent the common consumers, especially in a market that wants to open to new generations. We both explore the effects that the term "natural" has in isolation and in addition to basic information, and find that the information, instead of mitigating all the effects, also alters the experts regarding taste and non-experts regarding the healthiness of the wine.

While our study provides useful insights, it has some limitations. First, the experimental setting, even if embodied in a wine tasting, may not capture totally the complexity of bars, restaurants, and wine shops. In these settings, many additional factors can influence subjects' perceptions and preferences. Second, our treatment manipulation was neutral, and the concept of natural wine was stated instead of being signalled, for example, with craft-looking elements. Third, the age range of our sample is mainly concentrated on Generation Z, therefore, we observe the ones who represent the future for natural wine but miss the long-term wine consumers. These young subjects could be more prone to liking novelties, as natural wine can be. Fourth, in our information treatment, we exploit one definition of natural wine, but there are many other possible. Our definition mentions the organic conduction of the vineyard, which could affect subjects differently than the term "natural". The use of the term organic could possibly have generated a rebound effect that explains why the information treatment has no effect on the quality evaluations.

Further research is needed to confirm the results in field settings like bars, restaurants, and events, testing if the results are confirmed in the presence of confounding elements. In particular, this would allow us to test if results hold with real bottles where the naturalness of the wine is conveyed using different signals and possibly not directly stated. While our study is focused on relatively young consumers who represent the palate of the future, adding insights from more experienced consumers would give a more complete picture of the phenomenon. Replicating the study with different types of wines, also given the impact of the label on taste and visual quality, would also be a desirable addition. Since wine consumption naturally embodies social and cultural elements, our experiment represents a first step to pin down the essential elements of a complex phenomenon in a neutral and controlled context.

⁵ For evidence that natural or organic wines are not by default more sustainable than conventional ones, see Ghiglieno et al., 2023; Laureati & Pagliarini, 2016; Teissedre et al., 2022.

⁶ European commission (2021). Regulation (EU) 2021/2117 of the European Parliament and of the Council of 02 December 2021 amending Regulations (EU) No 1308/2013 establishing a common organisation of the markets in agricultural products, (EU) No 1151/2012 on quality schemes for agricultural products and foodstuffs, (EU) No 251/2014 on the definition, description, presentation, labelling and the protection of geographical indications of aromatised wine products and (EU) No 228/2013 laying down specific measures for agriculture in the outermost regions of the Union. <http://data.europa.eu/eli/reg/2021/2117/oj>.

Ethical statement

The study was pre-registered on AEA-RCT Registry, registration ID AEARCTR-0012660, and obtained ethical approval from the ethical committee of the University of Genova, protocol N. 2024/29.

CRediT authorship contribution statement

Beatrice Braut: Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Maria Alessandra Paissoni:** Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Barbara Cavalletti:** Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Susana Río Segade:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Matteo Corsi:** Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Luca Rolle:** Conceptualization, Resources, Supervision, Writing – review & editing.

Declaration of competing interest

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

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.socce.2026.102527](https://doi.org/10.1016/j.socce.2026.102527).

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