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Experience goods and the role of experts : recommendation effects on wine purchasing decision

Magalie Dubois

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THÈSE PRÉSENTÉE
POUR OBTENIR LE GRADE DE

**DOCTEUR DE
L'UNIVERSITÉ DE BORDEAUX**

ÉCOLE DOCTORALE N°42 - ENTREPRISE, ÉCONOMIE, SOCIÉTÉ
SPÉCIALITÉ ÉCONOMIE

Par Magalie DUBOIS

**EXPERIENCE GOODS AND THE ROLE OF EXPERTS
Recommendation Effects on Wine Purchasing Decision**

Sous la direction de :

Pr. Jean-Marie CARDEBAT
Pr. Larry LOCKSHIN

Soutenu le 08/12/2023

Membres du jury :

M. CARDEBAT, Jean-Marie	Pr. Université de Bordeaux	Directeur de thèse
M. LOCKSHIN, Larry	Pr. University of South Australia	Co-Directeur de thèse
Mme LOOSE, Simone	Pr. Hochschule Geisenheim University	Rapporteuse
M. SCHAMEL, Günter	Pr. Free University of Bozen-Bolzano	Président du jury
Mme AGNOLI, Lara	Dr. Burgundy School of Business	Examinatrice
M. GOLDSTEIN, Robin	Dr. University of California Davis	Examinateur

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Effets de la Recommandation sur la Décision d'Achat de
Vin

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Acknowledgments

When I was a child, my favorite question was: "Why?". I had an urge to understand. My parents fed me with books, but this urge did not disappear as I grew up. It is curiosity that has driven my life until this point (and I can blame the delay in defending my thesis on this inexhaustible curiosity, as I always find it difficult to say no to projects that arouse my interest). As far as I can remember, the two months I spent working on my Master's thesis in Turkey were some of the most exciting of my life. Producing *Analysis of Country of Origin Effect and Consumption Situation on Attitude towards Wine in Turkey - Questioning French Wine Product-Country Image* (I already had a taste for short, concise titles at the time) quenched my thirst for research and knowledge for a while. By "a while" I mean the eight years I spent developing my sales skills and meeting wonderful clients all over the world. But the idea of doing a Ph.D. was never far away, and a simple conversation with Raimon Miroso over a glass of wine was enough to rekindle the excitement of research. A few months later, I enrolled for my Ph.D. I am grateful to you Ramon for those fantastic years of learning. These years would not have been the same without Charlotte and Vincent, thank you for your precious advice and these exceptional moments. This is also the occasion to thank my dearly missed friend Jacques Berthomeau for being more than a friend for so many years, my mentor in the industry, and for the support of his Club Sans Interdits.

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With immense gratitude,

Magalie Dubois - Bordeaux, December 8th, 2023

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Avec toute ma gratitude,

Magalie Dubois - Bordeaux, 8 décembre 2023

Biens d'Expérience et Rôle des Experts

Effets de la Recommandation sur la Décision d'Achat de Vin

Résumé

Cette thèse s'inscrit dans le cadre théorique de l'économie de l'information. Elle étudie le rôle des experts sur le marché du vin. Pour ce faire, elle mobilise différentes méthodes permettant d'évaluer (1) l'impact des experts sur les mécanismes du marché, (2) le contenu informatif de leurs notes pour les consommateurs, ainsi que (3) leur impact sur le prix du vin. Elle est constituée de quatre chapitres, chacun d'entre eux étudie un aspect du rôle des experts, en interaction avec d'autres indices de qualité.

L'introduction replace la problématique globale dans le contexte de l'économie de l'information. Elle détaille notamment les inefficiences informationnelles sur le marché du vin (asymétrie informationnelle, surcharge d'information et de choix, complexité) et l'incertitude qui en découle pour les consommateurs. Elle mobilise le contexte historique (naissance des sciences sensorielles, standardisation de la qualité du vin) pour retracer l'émergence des notations d'experts, et plus récemment des notations par les pairs.

Une revue intégrée de la littérature souligne l'importance de l'intermédiation évaluative pour pallier les inefficacités informationnelles du marché du vin. Elle suggère l'existence d'un marché de l'information biface. Les experts aussi bien que des agrégateurs de notes de pairs (ex. Vivino) sont dépendants de la filière, sans laquelle leur modèle économique ne serait pas viable. Les producteurs de contenu pur tels que le *Wine Advocate*, qui utilisent des structures unifaces (les abonnements sont leur seule source de revenus) sont susceptibles d'être désavantagés par la concurrence avec les structures bifaces opérant sur le marché. La revue de la littérature laisse entrevoir un probable déclin, et non une disparition, des experts.

Dans le second chapitre, nous présentons les résultats d'expériences en laboratoire menées parallèlement en France et en Espagne. Nous testons et comparons le contenu informatif *ex ante* des notes d'experts, des marques et des indications géographiques pour les

consommateurs. Dans les deux pays, la volonté à payer des consommateurs est plus élevée pour les avis d'experts que pour les autres indices de qualité. Nos résultats suggèrent que les avis d'experts, les indications géographiques et les marques ne sont que des substituts imparfaits et qu'ils peuvent s'adresser à des populations de consommateurs différentes.

Dans le troisième chapitre, afin d'évaluer l'impact des experts sur le prix des vins nous appliquons la méthode des prix hédoniques à 36,970 vins rouges français. Nous comparons cet impact à celui de la communauté Vivino. Les évaluations moyennes agrégées des prosommateurs (consommateurs producteurs de contenu) ont un effet plus important sur le prix des vins étudiés que les évaluations des experts. Ces résultats sont robustes aux valeurs atypiques. La prédominance des notes de pairs sur les notes d'experts demeure valide lorsque nous excluons les vins haut de gamme.

Le dernier chapitre présente les résultats d'une expérience en ligne menée pendant la crise sanitaire, dans le cadre de restrictions sévères limitant la possibilité de mener des expériences in situ. Nous avons développé un protocole d'expérience sans contact et envoyé des échantillons au domicile des 300 participants. La volonté à payer, compatible avec les incitations, a été révélée en même temps que plusieurs mesures de la qualité perçue, de l'appréciation et d'autres mesures subjectives d'évaluation du vin, y compris la lecture des émotions via webcam. D'un point de vue méthodologique, l'application d'un éventail aussi large de tests pose le problème de l'attrition de l'échantillon de participants. Nous montrons que seul un sous-ensemble réduit de variables est nécessaire pour aider à la fixation des prix et à la prise de décisions basées sur la volonté à payer des consommateurs de vin.

Mots clés : Économie du vin, Economie expérimentale, Biens d'expérience, Asymétrie informationnelle, Comportement du consommateur, Critiques, Experts, Perception de la qualité, Attitude, Décision d'achat, Prescription, Recommandation

Experience Goods and the Role of Experts

Recommendation Effects on Wine Purchasing Decisions

Abstract

This thesis falls within the theoretical framework of information economics. To study the role of experts in the wine market, it uses different methods to evaluate (1) the impact of experts' ratings on market dynamics, (2) their informational content for consumers, and (3) their impact on the price of wine. It is divided into four chapters, each of which examines a different aspect of the role of experts in comparison to other quality cues.

The thesis opens with an introduction that places the overall problem in the context of information economics. It reviews the information inefficiencies in the wine market (information asymmetry, information and choice overload, complexity) and the resulting uncertainty for consumers. It draws on the historical context (birth of sensory sciences, standardization of wine quality) to trace the emergence of expert reviews, and more recently of peer ratings.

The literature review highlights the importance of evaluative intermediation in overcoming information inefficiencies in the wine market. It suggests the existence of a two-sided information market. Both experts and peer rating aggregators (e.g., Vivino) are dependent on the trade, without which their business model would not be viable. Pure content producers such as the *Wine Advocate*, who use unilateral structures (subscriptions are their only source of revenue) are likely to be at a competitive disadvantage with two-sided structures operating on the market. The literature review suggests a decline, not a disappearance, of experts.

Using two laboratory experiments conducted in parallel in France and Spain, we test and compare the informational content of expert ratings, brands, and geographical indications for consumers. In both countries, willingness to pay is higher for expert ratings than for geographical indications and brands. Our results suggest that expert opinions, geographical indications, and brands are imperfect substitutes for each other and that they may appeal to different consumer populations.

To assess the impact of experts on wine prices, we apply the hedonic pricing method using a sample of 36,970 French red wines. We compare this impact with that of the Vivino community. Aggregate average consumer ratings have a greater effect on the price of the wines studied than expert ratings. These results are robust to atypical values, and the dominance of peer over expert effects remains valid if we exclude top-of-the-range wines.

The last chapter reports results from an online experiment run during Covid-19 crisis, under severe restrictions limiting the ability to run in situ (central location tests) experiments. Tasting protocols have been assisted by 2cl wine samples posted by mail to the 300 participants in France and Spain. Incentive-compatible willingness to pay has been elicited together with several measurements of perceived quality, liking and other subjective wine evaluation metrics, including automated emotion recognition. From a methodology point of view, the application of such a broad spectrum of tests entails the challenge of participant sample attrition. We show that only a small subset of variables is needed to assist pricing and policy decisions based on the consumer's willingness to pay for wine.

Keywords: Wine Economics, Wine Marketing, Experience Goods, Information asymmetry, Consumer Behavior, Wine experts, Quality perception, Attitude, Purchasing decision, Prescription, Recommendation, Influence, Delegation

Unités de recherche / Research units

BSE

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Notice

Except for the general introduction, the different chapters of this thesis are derived from research articles (published and working papers) which have an autonomous structure. Therefore, some information, especially literature, may sometimes be repeated from one chapter to another.

Note

A l'exception de l'introduction générale, les différents chapitres de cette thèse sont issus d'articles de recherche (publiés et documents de travail) et ont une structure autonome. Par conséquent certaines informations, notamment la littérature, sont susceptibles d'être répétées d'un chapitre à l'autre.

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General Introduction

The need for consumers to appraise products of unobservable quality based on incomplete information is a common issue in markets. Stigler (1961), in his seminal paper *The economics of information*, proposed a model of search behavior among imperfectly informed consumers. Nelson (1970) and Darby & Karni (1973) completed Stigler's model by developing a typology of goods according to the information available and identifying three typologies of goods accordingly: (1) *search goods*, for which quality information may be available prior to purchase, (2) *experience goods*, for which consumers can acquire quality information through purchase and consumption, and (3) *credence goods*, for which quality information cannot be acquired even after purchase and consumption (see Table 1 for an illustration with wine). Their research echoes the development by Akerlof (1970) of the concept of asymmetrical information in the theory of markets; this asymmetry appears in exchanges under uncertain situations when buyers have access to limited information about the quality of their prospective purchase. In that context, information uncertainty may drive good products out of the market.

The issue of judging quality is not limited to the "market for lemons" problem described by Akerlof (1970). The central question, beyond asymmetrically distributed information, is to establish what qualifies as quality. In the case of experience goods, if consumers cannot experience or directly assess the quality of a product, other sources of information may inform their decision-making (Huang et al., 2009). Sellers can use price, marketing, or warranty to signal quality and to reduce information asymmetries (Boulding & Kirmani, 1993). Consumers will use these quality cues as decision heuristics. However, providing consumers with more information may not be sufficient to reduce information asymmetry, because consumers may lack the confidence necessary for an effective use of the information needed for quality evaluation (Moussa & Touzani, 2008; Onur et al., 2020). Even external official certifications have proven confusing for consumers (Moscovici & Reed, 2018). The importance of third-party (external) experiential information is thus growing (Lallement et al., 2019). Experts, and now peers' opinions are critical determinants of the demand for experiential products and services (Huang et al., 2009; Oczkowski & Pawsey, 2019; Storchmann, 2012). Non-official and informal

prescriptions judgement are gaining importance, and a participatory culture is emerging among consumers in experience goods markets such as hospitality, gastronomy, and culture (Choi & Burnes, 2016; Keuschnigg, 2015; Schiefer & Fischer, 2008).

Wine qualifies as an experience good: before drinking it, consumers cannot assess its quality, nor know whether they will like it or not (Cardebat, 2017). Studies on valuation and quality signaling have frequently used wine as an object (Benjamin & Podolny, 1999; Diaz-Bone, 2013; Hay, 2010). The wine market is very competitive, highly fragmented, and the product category displays a unique range and hierarchy of quality (Charters & Pettigrew, 2007; Peynaud & Blouin, 1996; Verdú Jover et al., 2004). Unlike standardized goods, wine quality can vary widely depending on weather conditions and production decisions (Ashenfelter, 2007). It is also sensitive to transportation (Jung et al., 2021), storage conditions (Lam et al., 2013), and aging potential (Verdú Jover et al., 2004). This high quality variability triggers uncertainty that hinders customers' engagement in the product category, hindering market development: "To wine amateurs, the choice of which wine to buy can be a daunting and stressful experience." (Mazzoli & Palumbo, 2022, WP). Information guides consumer choice, while wine quality is considered by economists as being a multidimensional concept (see Table 1).

For consumers, the first-time purchase of a specific wine often gives rise to uncertain expectations as to its quality (Horowitz & Lockshin, 2002). Due to information inefficiencies (information asymmetry, complexity, and information overload) that generate consumer uncertainty, recommendations from third parties play an important role in the wine market.

Wine market information inefficiencies

According to Akerlof (1970), quality uncertainty and information asymmetry challenge the market mechanism and even the mere existence of a market. When the product's quality cannot be verified before purchase, the unique (weighted average) market price falls below the true value of the good products, driving the latter out of the market. In the wine market, information asymmetries about the quality of wine exist between wine consumers and wine

makers, both regarding preferences and product quality (Baritoux et al., 2006; Penagos-Londoño et al., 2022). Information asymmetry has a special importance in markets in which product differentiation is not only based on prices but on product characteristics (Karpik, 2007).

Quality	Social	Technical	Sensory	
Good type	Search	Credence (Cognitive)	Experiential	Credence
Defined by	<i>Nelson (1970)</i>	<i>Darbi & Karni (1973)</i>	<i>Nelson (1970)</i>	<i>Darbi & Karni (1973)</i>
Mentioned by	Ketron, 2017; Klein, 1998	Caracciolo et al., 2016; Liu et al., 2013; Parga-Dans et al., 2022	Ashton, 2017; Beninger et al., 2014; Heslop et al., 2010; Storchmann, 2011	
Quality cues	Extrinsic Reputation of producer or origin (collective reputation)	Extrinsic Varietal(s), vine growing techniques, maturity, winemaking choices, price, brand name, vintage Healthfulness, naturalness, environmental friendliness,	Intrinsic Organoleptic characteristics – Age, appearance, color, shape of the bottle, size, structure	
Quality attributes	Awards, ratings, rankings, distribution channel	wholesomeness, exclusiveness, way of production	Taste, freshness, convenience, drinkability, balance, complexity	
Evaluation before purchase	Possible	Difficult or impossible	Impossible except for prior knowledge	
Evaluation after purchase	Possible	Difficult or impossible	Possible when mature	Difficult to assess upon early consumption for aging wines

Table 1 - Quality dimensions of wine¹

The complexity of the wine market and the subjective nature of wine appreciation make it particularly susceptible to information inefficiencies. The absence of ingredient labeling for wine (as for other alcoholic beverages) is a good illustration of the information asymmetry in the market; the producers are aware of the ingredients (beyond grape juice) used to produce the wine, but this information is not accessible to consumers. On the other hand, wine producers are not aware of the reasons behind the purchase of their wine, or of the choice and

¹ Adapted from Oude Ophuis & Van Trijp (1995), Müller (2004) and Ashton (2014)

consumption context (Teil, 2021). Both the supply and demand sides of the market must make decisions based on incomplete and asymmetric information (Odorici & Corrado, 2004). However, information asymmetry on product quality hurts consumer demand and is a likely source of market suboptimalities (Akerlof, 1970; Nelson, 1970).

Numerous studies have examined the large range of extrinsic quality cues (i.e. brand, geographical indication, peer or expert ratings) in wine selection, in which consumers have heterogeneous levels of trust (Storchmann, 2012). In the pre-purchase stage, choice overload, perceived choice complexity, and the multiplication of decision-relevant information lead to information overload (Ketron et al., 2016; Mitchell et al., 2005). As detailed by Mitchell and Papavassiliou (1999), the (1) proliferation of choice of products and points of sale, (2) similarity of products, and (3) ambiguous, misleading, or inadequate information conveyed through marketing communications are the three dimensions of consumer confusion. Despite the scant scientific research dedicated to the concept of consumer confusion for this product category, many studies highlight the existence of an important proportion of consumers overwhelmed by the task of wine selection (Drummond & Rule, 2005; Friberg & Grönqvist, 2012; Marks, 2015). On retail shelves, the case of wine is unique: while most retail categories have less than a dozen brands, wine can have hundreds of similarly labelled products, and even well-informed consumers can struggle to accurately perceive the differentiation between them (Chivu-Draghia & Antoce, 2016; Lockshin & Corsi, 2012). Wine is one of the consumer product categories where the diversity of alternative options is the highest (Lockshin & Corsi, 2012), so the correlation between choice overload and market suboptimality might be stronger than for other product categories.

The impact of choice overload on consumers is strengthened by the complexity of the product category (Bruwer et al., 2013; Casini et al., 2008; Drummond & Rule, 2005; Ketron et al., 2016). Wine is unanimously qualified by academics as a complex product category, considering, beyond the brand, the existing diversity of grape varieties and blends, production methods, prices, producing countries and regions, winemakers, terroirs, vintages, regulations, labels, design, bottles, and packaging (Orth et al., 2007). Even official signs of quality (e.g.,

the difference between a regional appellation, a village appellation, a premier cru, and a grand cru in a region like Burgundy) remain poor indicators of quality for most wine consumers² (Bories et al., 2014).

The internet offers unprecedented access to detailed information about products, including price comparisons (e.g., www.wine-searcher.com) peer reviews (e.g. www.vivino.com), and expert reviews (e.g. www.robertparker.com). It significantly reduces the time, effort, and financial costs (i.e., search cost) consumers incur to obtain information about products (although the range of opinions and recommendations may increase the length of the pre-purchase phase). Recent publications show that social media are gaining importance in the process of wine selection, especially among Millennials (Albright et al., 2018; Cosenza et al., 2015; Higgins et al., 2016; Atkin and Thach, 2012). Nevertheless, this access to information and reduction of information asymmetry could still prevent optimal situations because consumers are limited, especially in their cognitive capacity for processing information (Bettman et al., 1998). This abundance of information and choices, far from being perceived as an opportunity, can induce uncertainty, especially for wine consumers with a low involvement (Barber et al., 2007).

Wine is mostly consumed for hedonic purposes. There is a high level of uncertainty about the level of pleasure that a consumer can derive from a selection prior to consumption (Yaniv, 2004). According to Horowitz & Lockshin (2002) the first-time purchase of a specific wine is often the source of uncertain expectations as to its quality. All wine consumption involves uncertainty (pre-consumption) and an act of valuation. Purchasing wine is exposing oneself to the functional risk of opening a bottle of wine that might be corked or might not correspond to the consumer's expectations (Mitchell & Grotorex, 1989). The valuation moment can thus be the source of dissonance because of the intrinsic nature of the wine and the possible perception of a disconformity with the expectation (Antal et al., 2015). If the

² even for experts who regularly give higher scores to supposedly 'lesser' wines.

consumers are uncertain about the outcome of their selection, risk emerges (Cox & Kaimann, 2015). Wine-related risks encompass financial, taste performance-related, self-esteem, and psychosocial risks (Bories et al., 2014).

When faced with complexity and considering the opportunity cost associated with choice time, consumers need to set up a strategy to cope with the risk of suboptimal decisions (Broniarczyk & Griffin, 2014; Yoon et al., 2009). When confronted with uncertainty about product quality, consumers often use multiple product quality cues as substitutes to assess the latter (Hjorth-Andersen, 1991; Narwal & Nayak, 2020). In consumers' search strategy, experiential information has the highest informational content (Lallement et al., 2019). To reduce perceived risks when selecting a wine and to maximize their satisfaction, wine consumers can delegate quality judgment to others (Karpik, 2007). They seek the (experiential) advice of wine experts, friends, family members, and clerks who are deemed knowledgeable (Vigar-Ellis et al., 2015). Because it contributes to correcting the information inefficiencies of the wine market, wine quality characterization and signaling based on sensory evaluation has long been a subject of scholarly interest, as described hereafter.

Milestones in the history of wine quality signaling

The length of the history of quality evaluation for wine bears no comparison with that of any other food product (Amerine et al., 1959). The first traces of quality evaluations and recommendations, based on geographical origin, date back to Ancient Greece³. Before the twentieth century, winemakers were often farmers who suffered significant productivity and quality variations from year to year, making it difficult for traders and retailers to source quality wines (Cawley, 2018; Conca Messina et al., 2019). Wine was mainly sold in bulk to merchants (Lecat et al., 2017). Those latter tasted wines mostly to detect flaws (Simpson, 2004) and

³ Homer praised Pramnian and Maronean wines, Pliny commended the wines from Falerne, and Horace the ones from Chios and Lesbos islands.

consumers relied on the judgment of their wine merchants to avoid fraud and adulterated wines (Shapin, 2012). The question at that time was more “Is it drinkable?” rather than “How good is it?”. Globally, except for a few exceptions, quality control was left in the hands of traders and retailers rather than in those of producers (Shapin, 2012). There was still a limited direct relationship between wine producers and consumers (Cawley, 2018) and the asymmetry of information prevailed in the wine market, as wine producers and merchants had significantly more information on the quality of the product than wine consumers. The origin of wine was a helpful indication of wine quality.

In the first half of the twentieth century, Geographical Indications (GIs) were created to protect the unique qualities of wines linked to their location-specific characteristics (e.g., Jerez-Xérès-Sherry DO, 1933, Spain, Arbois AOC, 1936, France). GI were also a common tool employed to protect from forgery which was common at the time. The emergence of both government and industry developed standards after the Second World War (Carsky et al., 1998) led to the foundation of the International Standards Organization (ISO) in 1947. In the middle of the twentieth century, the process of industrialization brought scientific and technical changes, along with an increase in the competitiveness and internationalization of the food and beverage industry (Stone & Sidel, 2003). It fostered the development of sensory science based on standardized sensory evaluation techniques as a systematic way of understanding the human sensory perception of foods and beverages (Lahne, 2016). Organic chemistry scientists started to focus on the goodness of wine (Shapin, 2012) and analyzed the tasting methods used by merchants to develop a norm and training methods for wine tasting (Fernandez, 2004). Amerine’s eponymous wine rating system was created at UC (University of California) Davis in 1959, during the infancy of the region’s wine industry. Amerine’s concept was to evaluate sensory impressions of wine by assigning a weighted numerical value to its different sensorial components according to their relative importance (appearance, color, aroma and bouquet, acetic acid, total acidity, sweetness, body, flavor, bitterness, and astringency, general quality), for a total score of 20. Its creation lent credence to the possibility

of assessing all types of wine with the same numerical system (Hommerberg, 2011), in an attempt to standardize and objectify general quality assessment.

The 1970s saw the definition of the first standardized terms relating to sensory analysis of food in the framework of *ISO 3972-1979 Sensory analysis - determination of sensitivity of taste* and *ISO 5492-1977 Sensory analysis - vocabulary* (Drake et al., 2009) to allow taster alignment on a shared terminology. The creation of standardized tools allowing the replicability of sensory analysis, and especially the wine-tasting glass based on the international standard *ISO 3591:1977 Sensory analysis — Apparatus — Wine-tasting glass*, has also been key in allowing globalization of wine sensory evaluation. The beverage industry made its first steps towards quality standardization with the publications of *Development of a vocabulary and profile assessment methods for cider and perry* (Williams, 1975), *The flavour terminology of Scotch Whiskey* (Shortreed et al., 1979) or *Progress towards an international system of Beer Flavour Terminology* (Meilgaard et al., 1979). Carsky et al. (1998), in *The evolution of quality in consumer goods*, noted that product standardization, government legislation, improvements in the manufacturing processes, and product testing organizations led to an increasing level of substantive quality in consumer goods. The authors identify the 1970s as the turning point from a production-driven to a consumer-oriented market.⁴

At a time when most of the population had very limited knowledge of wine, most books about wine were aimed at professionals, dealing with viticulture and enology, vineyards, regions, and how to serve and drink wine (Cawley, 2018; Fernandez, 2004; Shapin, 2012). Before the 1970s there were no widely circulated magazines offering consumer ratings of wine that would allow consumers to compare relative quality in a specific type of wine (James, 2018). Historically, and unlike in the continental Europe, the United States and the United Kingdom are two countries with very limited domestic production. The scarcity or absence of

⁴ This shift was also driven by the change in retailing. The advent of containers and groupage facilitated the export of wide ranges of wine – and of supermarkets and modern self-service retail which reduced the role of the wine merchant as a provider of advice.

local wines make imports necessary. It creates the opportunity to import wines from more diverse origins (closely linked to the importance of diasporas). While the French mainly drink wines from regions that are geographically close to them, or at least national wines, this is not the case across the Channel or the Atlantic. The availability in the market of this greater variety of origins can prove problematic when trying to learn about wine: where do you start without local roots? In this case, the best solution is to learn by following the advice of connoisseurs: the experts. In the United Kingdom, consumer-oriented wine publications began to emerge, such as *Vine* and *Decanter* in 1975 (Shapin, 2012). Referring to that period, the British wine critic Jancis Robinson wrote in a column published on September 4th, 2015: “Back in those days, wine used to be one of those subjects about which ordinary people in anglophone countries would hesitate to express an opinion. It used to be left to us experts to tell ordinary tasters what to think and how to describe those thoughts.”⁵. The combined emergence of Californian wine publications, cheaper flights to Europe (James, 2018), and the impact of the famous comparative blind tasting between Californian and French wines organized by Steven Spurrier in 1976 (Morrison & Rabellotti, 2017) triggered an interest in wine in the United States (see Figure 1). *Wine Spectator* was launched that same year, *Food & Wine*, and *Wine Advocate* two years later, and *Wine Enthusiast* in 1979, reflecting the rapid increase in demand for wine experts’ opinions in the United States (Storchmann, 2012). “The emergence of the modern wine critic followed the rise of the United States as a serious wine-consuming country in the early 1960s and then as a serious wine-producing country by the late 1970s. U.S. wine markets lacked the historical and institutional support to offer much guidance to the new consumers who were trying to address the problem of hidden quality information. They concomitantly lacked the ability to provide guidance to the many new producers vying to compete and set prices based on product quality.” (Hsu et al., 2007, p. 11).

⁵ <https://www.ft.com/content/9de45762-5230-11e5-b029-b9d50a74fd14> (Consulted March 2020)

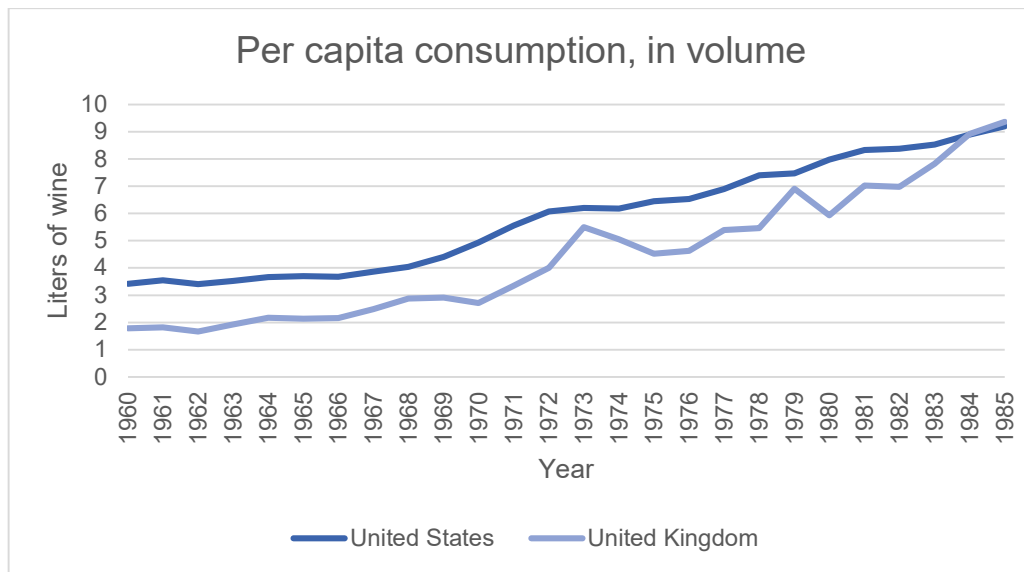


Figure 1 - Per capita consumption in the United Kingdom and the United States⁶

This evolution boosted social demand for wine quality assessment and purchasing recommendations among consumers, who wanted to drink high-quality products (Jackson, 2017): “Around this interest grew the need for describing wines so as to guide consumers in their choice, giving rise to professional wine critics and educators.” (James, 2018, p. 3). In the 1970s, a decline in consumption in the traditional producing countries and a steady increase in demand in non-producing countries (Morrison & Rabellotti, 2017), along with a shift upmarket in consumption (Wittwer et al., 2003) and the introduction of the Anglo-Saxon tradition of wine tasting and criticism in the 1970s (Fernandez, 2004), represented a major turning point for the world wine industry. A new generation of educated consumers and consumer-centric product judgments emerged worldwide (Carsky et al., 1998).

At the end of the 1970s, at a time when most ratings were using the star system inspired by the Michelin’s Guide award of a quality symbol (Shapin, 2012), Robert M. Parker Jr. (hereinafter, Robert Parker) was among the first wine critics to assign a numerical score to wines. “The real innovation is often one of format and presentation rather than a methodology that allows for evaluations that are more intelligible, decisive, and critical. This is frequently

⁶ data from Anderson et al. (2017)

done by supplementing or replacing qualitative descriptors with numerical ratings.” (Kwon & Easton, 2010, p. 132). Parker’s performative evaluation of wine quality on a 100-point scale (copied from the American educational grading system) aimed to provide an assessment (other than price) allowing consumers to evaluate the real worth of the product comparatively to other products (Shapin, 2016). This kind of scoring system for wine became the first truly international evaluation system for consumers: no wine vocabulary or education is needed to understand instantly and intuitively the standardized and identifiable rating, from 50 to 100 (Smith, 2019). It is also easier for wine retailers to display numbers (between 90 and 100) than exhaustive wine descriptions in their shops and online. The points-scoring system was rapidly adopted, first by competing American publications such as *Wine Spectator* - in 1980 – (see Table 2) and then worldwide by most influential wine critics, becoming a global norm in the wine industry to the present day (Shapin, 2012).

The Wine Spectator	The Wine Advocate (Robert Parker)
95-100 Classic: a great wine	96-100 An extraordinary wine of profound and complex character displaying all the attributes expected of a classic wine of its variety. Wines of this caliber are worth a special effort to find, purchase and consume.
90-94 Outstanding: a wine of superior character and style	90-95 An outstanding wine of exceptional complexity and character. In short, these are terrific wines.
85-89 Very good: a wine with special qualities	80-89 A barely above average to very good wine displaying various degrees of finesse and flavor as well as character with no noticeable flaws.
80-84 Good: a solid, well-made wine	70-79 An average wine with little distinction except that it is a soundly made. In essence, a straightforward, innocuous wine.
75-79 Mediocre: a drinkable wine that may have minor flaws	60-69 A below average wine containing noticeable deficiencies, such as excessive acidity and/or tannin, an absence of flavor or possibly dirty aromas or flavors.
50-74 Not recommended	50-59 A wine deemed to be unacceptable.

Table 2 - The Wine Advocate (Robert Parker) & The Wine Spectator rating systems⁷

The evaluative innovation of the 1970s marked a shift toward an increasingly globalized, less technical, and more pleasure-oriented way of speaking about wine in Anglophone settings, especially in the United States (Shapin, 2012). Jackson (2008) also notes that evaluative innovation and academic research impacted both consumption and production during the

⁷ Source <https://www.robertparker.com/about/the-rating-system> & <https://www.winespectator.com/articles/scoring-scale> (consulted 20.07.2023)

second half of the twentieth century, as it resulted in a marked improvement in wine quality and brought fine-quality wines to more consumers than ever before. Information about wine quality and quality evaluation has played a major role in current consumption trends: “In many respects, the resurgence of the U.S. wine industry was predicated upon the existence of a critic-generated classification system that helped new consumers navigate the complexities of products and ‘appreciate’ wine.” (Jamerson, 2009, p. 385). The democratization of wine purchases and consumption in the 1970s and the transformation of the wine industry from a production-oriented to a market-driven industry increased consumers’ dependency on analytical sensory evaluation techniques (Jenster & Jenster, 1993; Langstaff, 2010).

Before the emergence of the internet, comparison between prices was more difficult and time-consuming for wine consumers. They had for example to visit different shops or spend time gathering information to compare prices. Likewise, information that was not available on the bottle or communicated by the seller was difficult and costly to gather. The cost of expertise was also higher since you could either acquire it, which requires investing a considerable amount of time and money, or purchase it, buying a wine guide or subscribing to a wine magazine.

The internet offers unprecedented access to detailed information about products, including price comparisons (e.g., www.wine-searcher.com) community reviews (e.g. www.vivino.com) and expert reviews (e.g., www.robertparker.com). It results in a subsequent search cost reduction and increased information capability and provides opportunities for better decision-making (Branco et al., 2012; Lynch & Ariely, 2000; Yuan et al., 2019). Thanks to the internet, the search costs for (1) price, (2) information, and (3) expertise have fallen (Anderson, 2004), threatening profits through the search cost for price (price comparison, easy access to other online sellers), but at the same time potentially enhancing them through information and expertise. With the emergence of digital technology, internet content, usage, and the community involved in the creation of content (i.e., prosumers) are evolving at a rapid pace (Choi & Burnes, 2016; Marsh & Rajaram, 2019). The historical development of quality signaling in the wine market could be graphically represented as in Figure 2.

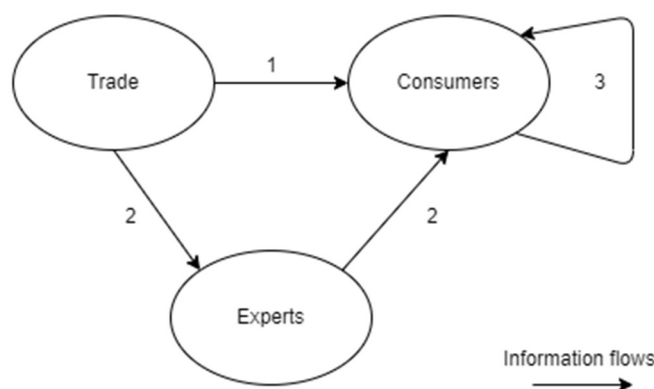


Figure 2 – Historical development of quality signaling in the wine market – Source: author

The reduction of the search costs for price, information, and expertise challenges traditional wine experts. Another quality information source has emerged and is increasingly popular online: online review aggregators. Vivino; a wine rating app, embodies this phenomenon. In 2015, the Vivino app had been downloaded by 10 million users and totaled 133 million scanned labels. Today, in October 2023, the world's most downloaded wine app and largest online wine marketplace claims 65 million users and 2.5 billion scanned labels (see Table 3).

16 974 238 WINES	2 534 440 751 SCANNED LABELS	97 499 531 REVIEWS	280 481 998 RATINGS
2 155 673 PRICES	65 768 715 USERS	3 477 WINE REGIONS	246 198 WINERIES

Table 3 - Vivino by the numbers⁸

The rapid growth of the number of users, wines, wineries, scanned labels, ratings, and reviews available on the platform reveals a shift occurring in the wine market. Vivino’s mission statement illustrates this shift: “Empower people everywhere to enjoy wine to the fullest. We do this by giving you access to information to always buy the best wine for you.”⁹ Vivino offers its users to withdraw barriers to wine enjoyment by providing the information they need to buy

⁸ www.vivino.com/about - consulted 01.10.23

⁹ <https://www.vivino.com/wine-news/big-news-about-the-vivino-community> (consulted 16.07.2023)

the right wine. And this information is experiential information from peers. As mentioned earlier, the Internet lowered search costs for price, information, and expertise. Expertise, stemming from a different type of source than traditional experts has been commoditized and digitized. Aggregated peer ratings are free and easily accessible through apps, with instant access to community ratings by scanning the label of a wine bottle or the wine menu (Figure 3).



Figure 3 - Viñas Jovenes 2018 (Vivino)

Despite the popularity of this new type of information source, most marketplaces and online retailers still display the ratings of professional wine experts (e.g., Jeb Dunnuck, James Suckling, Robert Parker, Tim Atkin) to inform consumers' choices. Commercial websites also propose wine awards and expert rating sources as a filtering option (e.g., Antonio Galloni >90). Expert ratings are thus available to online wine customers for free. In an attempt to signal quality to their users, major retailers (e.g., wine.com or Vinatis) also display aggregated community ratings (see Figure 4). They can leverage on the wisdom of the crowd by offering “best sellers” as a filtering option.



Figure 4 - Morgon Corcelette 2021 (Vinatis)

However, as illustrated in Figure 4, they often fail to offer a significant amount of peer reviews. When the volume of peer reviews is low, online consumers tend to favor expert-generated information (Flanagin & Metzger, 2013). Which begs the question: do community ratings and experts' ratings complement or compete with each other? Are they used by wine consumers in different momentum? The interplay between wine experts and online review aggregators is shaping a new landscape in the wine market.

Motivations and objectives

The need for external quality evaluation is rooted in the information inefficiencies of the wine market (information asymmetry, complexity, information overload) and the resulting uncertainty for customers. The study of the role of experts gives an enlightening perspective on the key economic question of quality signaling for experience goods. In the context of changing consumer behavior and technological advancements, the omnipresence of experts' ratings on wine online stores and the fast-growing pace of online review aggregators like Vivino raise questions. The expansion of online wine sales increases the relevance of the subject for the future of the industry. According to Statista, in 2022 global online wine sales reached \$69 billion out of the \$309B generated by the industry (see the evolution since 2017 in Figure 1Figure 5).

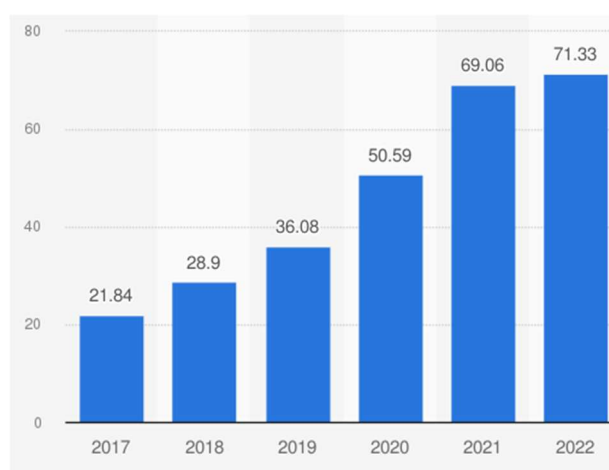


Figure 5 - E-commerce revenue of the wine industry worldwide (in billion USD)¹⁰

¹⁰ Source: Statista market insights 2023

Wine experts have been a major topic in wine economics for decades, while wine community ratings have only recently come to the attention of scholars. This new type of information source is bringing heterogeneity to the supply of quality ratings. The emergence of professional wine evaluation in the 1970s has generated evaluation criteria for fine wines, but it has also left aside cheaper segments. Some took advantage of these neglected segments writing bestselling guides to inexpensive wines (see Herschkowitsch & Goldstein, 2009). Crowd-based sources of wine evaluation are now covering not only the categories neglected by professional evaluators but also their core market: the fine wine category. In its mission statement, Vivino stresses that the experience is “fun, accessible and effortless”. GQ editors, in an article from December 16, 2016 on “the 20 new rules of drinking (and buying) wine” name its rule #7 “Robert Parker can S.T.F.U¹¹ now” - stating that the reign of the wine expert dictating what to drink is now over, thanks to new information sources: “There are now a thousand sources to help us find, understand, order and enjoy more wine”.¹²

Markets are not static and evolve over time. Wine availability and variety have been greatly increasing in recent decades, and so has the availability of wine ratings and quality information sources online. Since the 1930s, GIs have been (legally) certifying geographically anchored quality and fostered collective reputation. For five decades, experts have reduced the information asymmetry in the wine market thanks to their reviews and ratings. Although experts offered a much more immediate, specific, and comparative measure of quality, the number of GIs has kept expanding (but might have lost traction). With the consolidation of online review aggregators, the evolution of the information search strategies of wine consumers is likely to affect market dynamics. The new type of information source is also likely to impact both the role and the future of wine experts in the market. Addressing the identified research gap, the objective of this thesis is to offer an updated vision of the role of wine experts considering the recent market developments.

¹¹ i.e., Close the mouthpiece

¹² <https://www.gq.com/story/20-new-rules-of-drinking-wine> (accessed October 2023)

Research questions

Two questions drive the research in this thesis:

1. How does quality signaling stemming from experts improve the information efficiency of the wine market?
2. How is the role of experts likely to evolve in the future considering changing market dynamics?

Scope and outline of the thesis

This thesis sheds light on one of the great questions in economics: quality signaling for experience goods. It deals with issues of information asymmetry and signal theory for experience goods. In 2012, Karl Storchmann, editor-in-chief of the *Journal of Wine Economics* identified finance, climate change, and the role of expert opinion as the three main research issues in wine economics. Ten years later, his perspective is still relevant while other information sources have emerged and rapidly expanded online. For decades now, wine economists have endeavored to show that experts disagree, are prejudiced, inconsistent, biased, and that they reiterate public knowledge. Econometric models based on weather (public knowledge) are more performant than experts in predicting wine quality (Ali & Nauges, 2007; Ashenfelter et al., 1995). Despite the numerous publications tackling experts' weaknesses, their survival until today raises the question of their usefulness to signal quality and improve the information efficiency of the market, and more broadly of the evolution of their role.

Two European countries with a wide wine-producing and wine-consuming tradition, have been selected as research terrain for this thesis. The thesis considers red wines and consumers from France and Spain. This is particularly relevant for the industry because France and Spain are both major wines producing countries. In 2022, according to the International Organisation of Vine and Wine (OIV)¹³ they rank respectively second and third producing countries (after Italy) in volume and account together for 31% of the world's production. France

¹³ Source : <https://www.oiv.int/what-we-do/data-discovery-report?oiv>

and Spain are also the two major red wine-producing countries in the world. Their wines are among the most represented on the shelves worldwide since they rank respectively first and third in export volume. They conjointly total 33% of the export of wine worldwide. Those aspects make very relevant the choice of French and Spanish red wines for our analysis. The iconic wine regions of Bordeaux and Rioja represent especially attractive fields for this study. Regarding consumption, both France and Spain are traditional wine-consuming countries sharing similar lifestyles. We can expect a converging level of familiarity with wine considering that, still according to OIV data, in 2022 France is the second leading consumer of wine worldwide (in volume) after the United States whereas Spain ranks 7th after Russia. While e-commerce represents 9.9% of the sales value in France, it represents 3.1% in Spain¹⁴. The similarities and differences make those two countries particularly interesting as a terrain to measure how sensory wine quality evaluation affects consumer preference through cross-border experiments.

To holistically address the two research questions, we use multimethod research. This thesis consists of 4 chapters, each one investigating an aspect of the role of wine experts in comparison with other quality cues (see Table 4). The financial support received from the University of Bordeaux (ECO department), Interreg SUDOE VinCi project¹⁵, INSEEC Wine & Spirits Chair, and Burgundy School of Business has offered me a unique opportunity to set up ambitious and innovative experiments. Chapter I integrates the literature on wine quality evaluation into a market framework and develops its outlook for the future. Chapter II measures the *ex ante* information content of experts' ratings comparatively to geographical indications and wine brands. It concludes that expert ratings outweigh the other quality cues in both France and Spain. Chapter III compares the relative relationship of community (Vivino) and experts' ratings with French red wine prices using an extensive dataset and concludes that community

¹⁴ Source: [Il nostro Wine Report 2021 realizzato con VINO.COM è ora disponibile|Growth Capital](#) (consulted January 2022)

¹⁵ <http://vincisudoe.eu/>

ratings prevail over experts' ratings. Chapter IV explores the *ex post* information content of expert ratings comparatively to peer ratings. Peer ratings are found to have a greater impact than expert ratings.

Chapter	Method	Analysis	Wines	Research terrain	Role of experts
I	Literature review	Experts & Community ratings	All	Global	In the wine market
II	Incentive-compatible lab experiments	Experts' ratings, GIs & Brands	Spanish & French red wines	Spain & France, lab	Compared to other quality cues
III	Hedonic price analysis	Experts & Community ratings	French red wines	Global, online ¹⁶	On wine prices
IV	Incentive-compatible at-home experiments	Experts & Community ratings	Spanish & French red wines	Spain & France, field	Compared to community ratings

Table 4 - Scope and outline of the thesis

A more detailed outline of the thesis structure is presented below.

Chapter I - Information dynamics in the wine market

Chapter I is an integrative literature review. It aims at documenting the role of the evaluation intermediaries in the wine market. There are two main sources of information about quality in the wine market: wine experts and online review aggregators (e.g., Vivino). Online review aggregators now supply free quality information on all the wine segments, including cheaper wines, a wide segment traditionally ignored by experts. This chapter sheds light on the existence of a wine evaluation market and describes its structure (supply and demand sides) and dynamics. The review suggests the existence of an expanding two-sided market structure. Wine media conveying expert evaluations in the form of reviews, ratings or awards subsidize readers and make money out of advertisers or entry fees. Online review aggregators subsidize the supply of free (zero price) online consumer reviews charging commissions on its marketplace sales, selling wine to their users and marketing services (including data) to the

¹⁶ The community ratings used in our hedonic price regression have been produced by Vivino prosumers globally.

trade. Content producers such as the *Wine Advocate*, who employ one-sided structures (subscriptions are their only source of revenue) are likely to be disfavored by the competition in the market. This chapter foresees a decline, not a disappearance, of experts, who will confine themselves to reviewing fine wines. They might finally be replaced by influencers or prosumers gaining recognition among their peers.

Chapter II - The Information Content of Geographical Indications, Expert Reviews, and Brands: Experimental Evidence from Spain and France

Chapter II is a joint work with Marco Costanigro, Azucena Gracia, and Jean-Marie Cardebat. It is currently under review in the *American Journal of Agricultural Economics*. We study the effectiveness of expert ratings in serving as a signal of quality and facilitating consumer choices. We conduct laboratory experiments in Spain (N=148) and France (N=143) simulating a wine shopping experience in which participants choose among four wines in a limited information environment. Expert review scores, GI information, and winery names (brands) are “purchased” in a multiple-price listing auction. We find that expert ratings generate a consumer surplus between EUR 0.35 (Spain) and EUR 0.37 (France) for each purchasing occasion, and GI provides a similar level of information. These findings are consistent across different price segments (high: EUR 13 to 17 vs. low: EUR 4 to 7). Winery names (brands) have lower average information content but are more useful to high-knowledge consumers.

Chapter III - The Role of Customer and Expert Ratings in a Hedonic Analysis of French Red Wine Prices: from Gurus to Geeks?

Chapter III is a joint work with Stephen Bazen and Jean-Marie Cardebat. It has been published in *Applied Economics*¹⁷. We aim to determine the relative relationship of expert and Vivino community ratings with wine prices. We received from Vivino a database of 82,296 white, red, and rosé wines from France, Spain, Portugal, and Italy that met our selection criteria (at least ten consumer ratings and one expert rating per wine). We limit our scope to 36,970 French red

¹⁷ <https://doi.org/10.1080/00036846.2023.2257036>

wines for the hedonic regression framework on the attributes of the wine. Our econometric analysis aims at capturing the effect of peer and expert ratings on wine prices using a hedonic method. Average consumer ratings are found to have a stronger relationship to French red wine prices than expert scores. These results are found to be robust to outliers and the general conclusion that peers matter more than experts holds when we exclude the top-end wines. We plan to analyze Spanish red wines in a sequel paper.

Chapter IV - How to Use (or Not to Use) No-Contact Home Use Tests (N-HUT) to Elicit Consumer Preferences

Chapter IV is a joint work with Jean-Marie Cardebat, François Ric, Michel Visalli, and Effrosyni Vasileiou. This at-home experiment conducted in Spain (n=98) and France (n=106) aims to unveil the information value of peers' and experts' ratings on different dimensions of consumers' quality evaluation, namely stated liking, willingness-to-pay (through an online incentive-compatible experimental auction), quality evaluation, quality ranking, social acceptability, and wine-evoked emotions (using automated emotion recognition software).

The recent Covid-19 crisis has created a challenging environment for usual Central Location Test (CLT) studies aimed at eliciting consumers' preferences for wine. An obvious alternative to CLT is presented here; No-Contact Home-Use Test (N-HUT). The paper reports challenges and benefits associated with such N-HUT for preference elicitation. We designed a "maximal" experiment, including several stated and revealed preferences elicitation methods under different information conditions (control, peers or experts ratings). Our aim is to determine how much we can and how much we need to know to address the main challenges of preference-oriented research when contact with the consumer is difficult or impossible. We used a panel selection agency to recruit and screen 660 French and Spanish consumers and selected 300 of them to receive four 2cl wine samples at home and participate in the online incentive-compatible experiment. We assessed the isolated and combined effectiveness of the evaluation methods. Many of the tests were successfully implemented, offering extensive and heterogeneous information on the participants' reactions to the wine tasting experience under different conditions regarding information on expert and peer ratings of the wines. Video

recording and automated emotion recognition software worked poorly, mainly due to noncompliance of the participants with instructions. Only stated liking (SL) matters in the explanation of consumers' willingness to pay.

Appendices

The three papers in the appendices are closely linked and complementary to this thesis, all three have been published in peer-reviewed journals. The first one *A dataset on Bordeaux and Rioja red wines sensory and affective perception collected from French and Spanish consumers at home and international wine students in lab* is a joint work with Michel Visalli, Pascal Schlich, François Ric, Jean-Marie Cardebat and Nikolaos Georgantzis. This paper details the data of the fourth chapter, it has been published in *Data in Brief* (2022). The second paper *Using Free-Comment to investigate expertise and cultural differences in wine sensory description* is also a joint work with Michel Visalli, Pascal Schlich, François Ric, Jean-Marie Cardebat, and Nikolaos Georgantzis. It uses the data from the experiment of the fourth chapter, with a sensory science scope. It has been published in *Food Quality and Preference* (2023). The third paper *Hedonic valence of descriptive sensory terms as an indirect measure of liking: a preliminary study with red wines* is a joint work with Michel Visalli, Benjamin Mahieu, and Pascal Schlich. It engages, among others, part of the data from the experiment of the fourth chapter. It has been published in *Food Quality and Preference* (2023).

Contributions

Within the frameworks of information economics and consumer behavior this thesis engages different methods (integrative literature review, both in-lab and at-home experiments with incentive-compatible experimental auctions, and hedonic price analysis using online data) to investigate the role of experts in the wine market. We evaluate its impact on market dynamics, its informational content for consumers and its impact on wine prices. We discuss the role of wine experts as information intermediaries within this framework. The main contributions of the thesis are outlined as follows:

- The introduction identifies the information inefficiencies (information asymmetry, complexity, and information overload) in the wine market that have led to the emergence of consumer-oriented professional written criticism in the 1970s and the development of scoring systems to signal superior quality to consumers.
- The integrative literature review that opens the thesis reveals the dependence of both wine experts and online review aggregators on the wine trade. To the best of our knowledge, it is the first paper to defend the existence of a wine quality evaluation market based on two-sided strategies.
- The experiment presented in the second chapter is the first of its kind to have approached the hedonic valuation of wines by auctioning the information *ex ante* using a multiple price list mechanism instead of disclosing more information at each round and observing the variations in willingness to pay for the bottle. It opens the way to a new approach to experimental auction for quality cues.
- The third chapter contributes to the literature by confirming, based on a much larger sample, the conclusions of the sole paper to have performed a hedonic analysis to compare the role of customer and expert ratings on wine prices.
- The development of a novel sampling technique for wine, applied in a (1) no-contact (2) incentive-compatible (3) between-subjects experimental design is the greatest contribution of the fourth chapter. It is the first exploratory study developing a fully remote experimental design for wine. It opens a path to run cross-country experiments. Our interdisciplinary study contributes by presenting the first protocol for conducting a combined HUT, online auction (Becker-De Groot Marschak) as well as implicit (using automated emotion recognition software) and explicit (stated) measures of the sensory and hedonic analysis.

This thesis contributes to both the economic and the marketing literature. Combining the two approaches it offers new insights into the role of wine experts in changing market dynamics.

Chapter I – Information dynamics in the wine market

An earlier version of this paper titled “The market for wine quality evaluation - evolution and future perspectives” has been published as AAWE (American Association of Wine Economists) Working Paper No. 261 (Dubois, 2021) in January 2021. This is a revised version; it has been submitted to the Journal of Economic Surveys.

Abstract

Experts and online review aggregators provide quality information products. They improve the information efficiency in the wine market, signaling quality to the wine customers. However, neither would be financially sustainable without the trade. This integrative review of the literature on wine reviews, ratings, and scores suggests that their business models rely on a two-sided strategy. Based on an exhaustive data collection strategy, I conducted a cross-disciplinary integrative review of the literature on wine reviews, ratings, and scores. Based on this review I do not foresee a disappearance but a decline of wine experts (in the limited perimeter of fine wines), and a rise of the importance of online review aggregators in the wine evaluation market globally. The future probably lies in hybrid internet-based evaluation aggregators that combine the functions of review aggregator and marketplace.

Keywords: Quality evaluation, Quality perception, Wine experts, Prescription, Digital transformation

1.1 Introduction

Under information asymmetry, the information provided to the less informed agents in the market becomes a valuable and scarce good for which a market emerges. Compés-López et al. (2018) suggest that an industry of information and specialized valuation has emerged in the major wine markets. Similarly, various papers refer to the existence or the emergence of a wine quality evaluation market, at the crossroads between wine sellers, wine buyers, and wine experts, but fail to describe its structure and dynamics (e.g., Barbe & Durrieu, 2005; Stenger, 2017).

Economists have long been interested in the upstream (reputation) or downstream (search cost reduction, impact on demand) value generation of wine experts (e.g., Friberg & Grönqvist, 2012; Hilger et al., 2011; Schamel, 2009). However, significantly less scholarly work has been conducted on the market inefficiencies (information asymmetry, complexity, and information overload) that have led to the emergence and development of evaluative intermediation in the wine market. They tackled in depth the inconsistencies of wine experts but not the competition for attention between experts and online rating aggregators. Nor did they investigate the structure of this secondary market. In line with Ashenfelter and Jones (2013), I seek to explore the exact nature of the demand for expert opinion. However, as today different sources of quality evaluation (peers and experts) coexist in the wine market, it is essential to first study the supply side to understand the interrelations between the various players in the market. The supply comprises heterogeneous information products (experts versus community ratings) at different prices (positive versus negative) suggesting that value cannot be measured through price.

In the present research, I use a market framework to integrate studies on wine ratings and propose a holistic view of previous research. The review suggests the existence of an expanding two-sided market structure because the demand for expert opinion from wine consumers does not generate sufficient income to sustain the suppliers. Wine media must subsidize readers and make money out of advertisers or competition entry fees. Meanwhile, online review aggregators subsidize the free of charge (zero price) of online prosumer reviews

by charging commissions on sales (or by selling wine directly to their users) and selling both promotional services and data intelligence to the trade. The survival of both experts and online review aggregators is thus dependent on the trade through a two-sided strategy.

The remaining part of this paper is structured as follows: after presenting the review approach in the next section, I shed light on the existence of a wine evaluation market and describe its structure (supply and demand sides). The discussion of research belonging to two traditionally separated disciplines, economics, and business, focuses mainly on the interrelations and interdependencies in the supply chain and suggests the existence of a two-sided quality information market. Finally, I comment on future research directions before concluding.

1.2 Review approach

1.2.1 Reasons behind the choice of an integrative literature review approach

Wine valuation has generated the interest of a number of scholars from different fields in recent years (Bodington, 2020; Gergaud et al., 2021; Gokcekus & Gokcekus, 2019; Honoré-Chedozeau et al., 2020; Kaimann et al., 2023; Khalafyan et al., 2021; Kwak et al., 2021; Marks, 2020; Oczkowski & Pawsey, 2019; Ribeiro et al., 2020; Villas-Boas et al., 2021). The authors tackle the effect of ratings on wine prices, consistency (within and between) of the ratings, and consumers' preference for quality information. Those recent publications illustrate the fragmentation of academic production on wine evaluation. Previously, research has been conducted in various disciplines within the field of business research, including sociology, marketing, and economics, without much crossover (Snyder, 2019). Most of the previous publications on wine evaluation focus either on experts' performance, prices, or consumers' behavior.

Because research on wine evaluation originates from different fields and uses multiple study designs and methodologies, the use of an integrative literature review is indicated. Integrative literature reviews are versatile, and, unlike systematic reviews, they allow the use of grey literature. It is particularly useful when studying a recent change in the direction of a

phenomenon, as is the case here (Torraco, 2005). Integrative literature reviews provide broader insights and allow us to gain a holistic perspective. Following the updated methodology of integrative review proposed by Whitemore & Knafelz (2005), I aim to conceptually structure the topic of quality evaluation and valuation in the wine market while critically analyzing the literature¹⁸. This review weaves together the streams of research of different disciplines to propose a new holistic perspective on the topic.

1.2.2 Selection criteria

The vocabulary used to refer to quality evaluation, quality signaling and quality evaluation intermediaries in the wine market is extensive (see Table 5).

Topic	Keywords	Examples of references
Experts	expert*, critic*, guru*, connoisseur*, rater*, assessor*, judg*, jur*	Ali et al., 2010 Brien et al., 1987 Gokcekus & Gokcekus, 2019 Honoré-Chedozeau et al., 2015 Parga-Dans et al., 2022
Peers	peer*, apps, crowd-sourced, pannel*, prosumer*, influenc*, opinion, community	Buonanno et al., 2008 Oczkowski & Pawsey, 2019 Thrane, 2019
Quality evaluations	quality, competition*, show*, rat*, scor*, review*, award*, medal*, apprais*, evaluat*, valu*, appreciat*, prescri*, advi*, recommend*, apprais*, assess*	Bessy & Chauvin, 2013 Cicchetti, 2009 D'Alessandro & Pecotich, 2013 Dunphy & Lockshin, 1998 Neuninger et al., 2017 Paroissien & Visser, 2020
Intermediation	intermedia*, mediat*, coordinat*, tier-part*, opinion leader*	Bessy & Chauvin, 2013 Hsu et al., 2007 Karpik, 2007 Sharkey et al., 2022

Table 5 - Topics and keywords

Considering this diversity, I have deliberately opted for broad inclusion criteria to capture the evaluative content produced by experts and peers. Using Boolean logic, the search strings in Web of Science, Science Direct, Scopus, and Google Scholar databases consisted of the terms *wine ratings*, *wine review*, and *wine scores*, including synonyms, and abbreviations. Recently published peer-reviewed articles and earlier literature (from 1970 onwards) published in English were searched. I also reviewed the articles citing the articles obtained through this

¹⁸ The literature review approach for this paper is methodologically inspired by the PRISMA 2020 statement (Page et al., 2021).

search as well as their references to identify potentially relevant additional studies¹⁹. The record selection process is displayed in Figure 6.

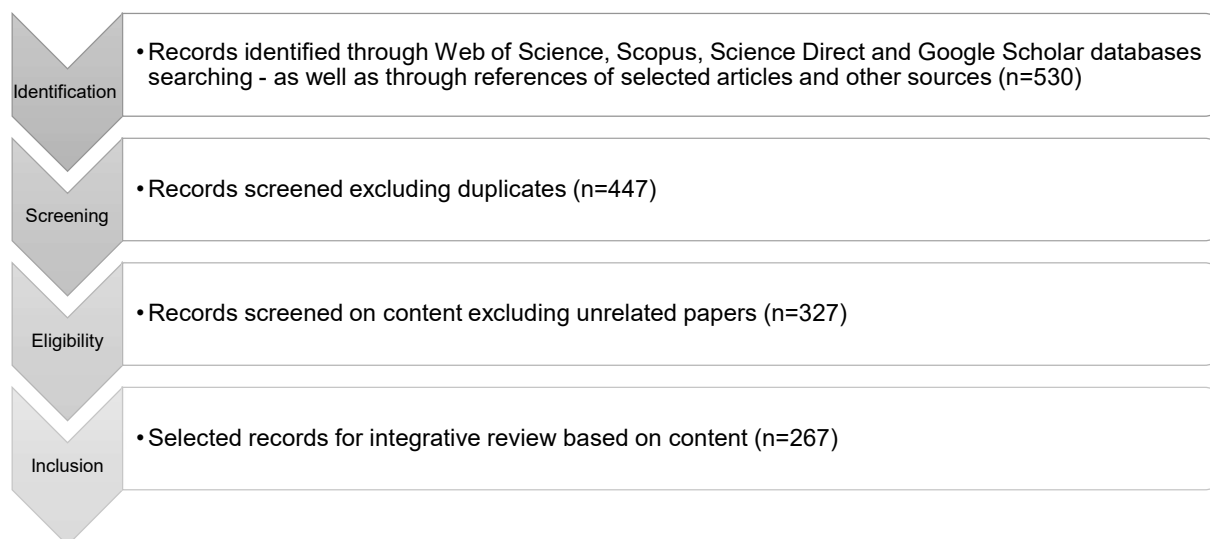


Figure 6 - Records selection process for integrative review²⁰

I identified 530 books and papers published prior to July 2023 and removed 83 duplicate records before the screening. I then screened the records on content excluding 120 unrelated papers (especially comparisons of experts' and consumers' sensory performances) and selected 267 of them, based on reading, for the integrative review. The number of records per year in the final selection appears in Figure 7.

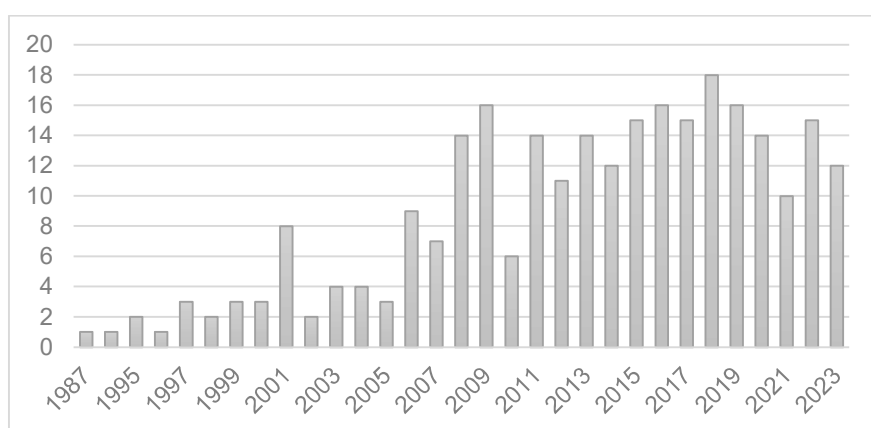


Figure 7 – Number of publications per year on wine scores, ratings, and reviews in the final selection

¹⁹ Against the recommendation of Podsakoff et al. (2003), I include publications from conference proceedings. I acknowledge that those publications do not offer sufficient guarantees as validated knowledge, but I consider that the importance of the insight they provide in the study of a recent phenomenon is a sufficient justification for their careful consideration.

²⁰ Inspired by PRISMA - Page et al., 2021

Among the records selected for the integrative review, the Journal of Wine Economics, first published in 2006, is by far the best represented (59), followed by the International Journal of Wine Business Research (16), the Journal of Wine Research (18), and Food Quality and Preference (13). The overview of all final used papers within the scope of the integrative literature review is available in the Appendix.

1.2.3 Conceptual integrative framework

The critical analysis of the literature is facilitated by the deconstruction of the topic into the key relationships and interactions between the supply and demand sides of wine quality information. In Figure 8 we present the integrative framework of the market for information on wine quality. The arrows indicate the flow of information about wine quality between the stakeholders.

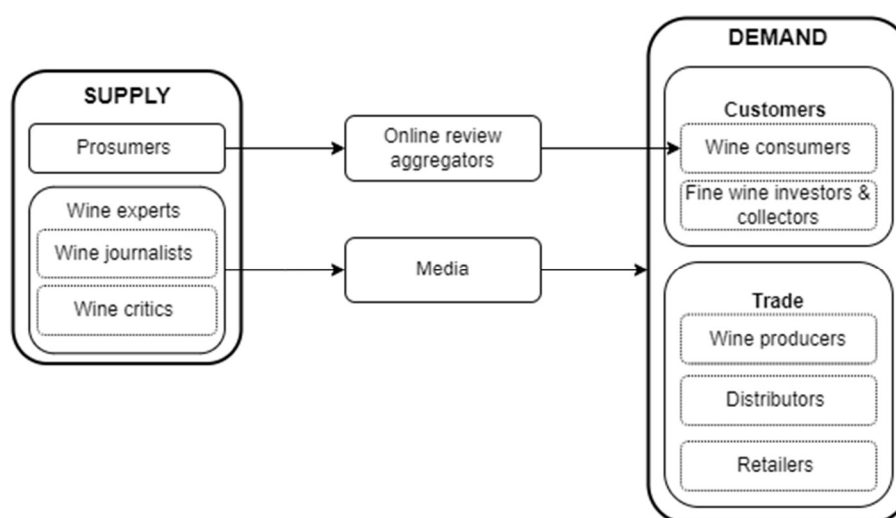


Figure 8 – Wine evaluation market framework

In the next section, I will detail the supply and demand sides of the market for wine quality information.

1.3 The market for quality evaluation

1.3.1 Analysis of the supply

Wine experts

Professional wine experts possess both conceptual knowledge (of terroirs, grape varieties, vintages) and perceptual (sensory) knowledge of wine (Frøst & Noble, 2002; Honoré-Chedozeau et al., 2020). While opinion leaders are traditionally difficult to identify, since the

1970s professional wine expert tasters have identified themselves through their public roles (Edwards & Mort, 1991). Figure 9 presents the main interactions between wine experts and the stakeholders of the primary market.

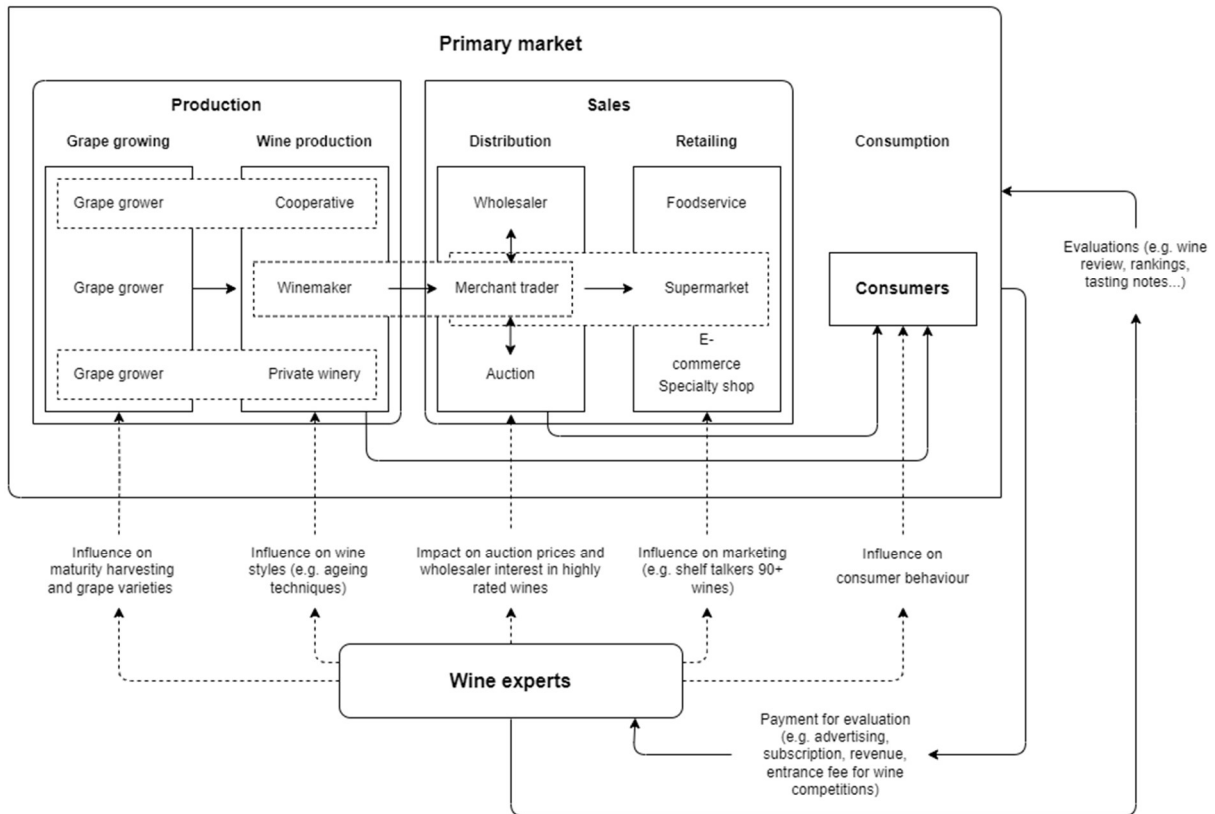


Figure 9 - Integration of wine experts in the wine value chain²¹

Wine experts' evaluations are multi-faceted. Experts can use different channels in their communication strategy including their own publications, wine magazines, specialized and general print press, and online channels (Chocarro & Cortiñas, 2013; Marks, 2015). Apart from print media, online marketplaces supply wine critics (especially English-speaking ones) with a much wider network of prescriptive channels and reach than ever before (Benghozi & Paris, 2003; Lamour & De la Robertie, 2015). Prior to the 1970s wine critics were addressing only

²¹ adapted from Kwon & Easton (2010) and Goncharuk (2017)

professional audiences. They are nowadays granted access to numerous channels²². When critic's ratings are not displayed in store or online, wine consumers are usually charged with positive prices (subscription) to access their ratings.

We would like to nuance the vision of Fernandez (2004). According to him, in the wine market, the core of wine critics' activity remains the publication of wine reviews and consumer guides: their opinion is their living. The main source of revenue for wine critics and magazines is circulation and advertising revenue as well as subscriptions to access their ratings (structure of a two-sided market). According to Storchmann discussing the US wine market ten years ago (2012, p. 22), "The market for expert opinion on wine is large. The seven major U.S. wine magazines have a combined subscribership of more than 500,000, with 350,000 alone for the *Wine Spectator*; wine magazine sales total more than \$25 million". Today, most of the wine publications mentioned by Storchmann in 2012 (data from 2010) have increased their readership base. The three major U.S wine magazines (*Wine Spectator*, *Wine Enthusiast*, and *Wine & Spirits*) have a combined subscribership of more than 750,000, with 389,000 alone for the *Wine Spectator* (Kantar, 2020). Those figures do not reveal possible overlap (especially among professionals) nor the indirect reach of experts (e.g., one magazine can be read by multiple readers, WOM). Nevertheless, the supply and demand for expert reviews is not homogeneous among regions and market sectors. Whereas in the US we have seen that this market is still expanding, in France, for example, the market for wine books and magazines is only a limited business (Fernandez, 2004). Still, researchers deplore the difficulty of determining the area of influence beyond publications and subscribers, as well as the scarce availability of figures on publications and sales of magazines and guides dedicated to wine (Olivesi, 2018). We know that wineries are important customers for guidebooks, as they tend

²² "Robert Parker has been profiled in such major magazines as Time, Newsweek, Atlantic Monthly, People, Money, The Traveler, Changing Times, Esquire, GQ, Business Week, Smart Money, The Robb Report, notable newspapers such as The Los Angeles Times, USA Today, The Boston Globe, The New York Times, The Baltimore Sun, The London Sunday Times, The Sunday Telegraph, The Independent, The Financial Times, Le Journal du Dimanche, and L'Express, and in virtually all of Europe's leading magazines, including The Economist, Paris Match, and Figaro." <https://www.robertparker.com/about> (Consulted March 2020)

to share them among themselves (Odorici & Corrado, 2004). However, there is no mention made in the literature of the proportion of this subscription or of the purchase of guides actually generated by the trade (e.g., wine producers, distributors, retailers) and not by wine consumers²³. Anecdotal evidence mentioned in Bazen et al. (2023) suggest that producers are now telling trade about Vivino scores to help get listings and that both importers and retailers are starting to pay greater attention to Vivino ratings (e.g. Vivino and Sainsbury's partnership²⁴).

Experts generally focus their prescription work on fine wines (wine with higher prices and superior reputation)²⁵. Top critic scores are crucial globally for *en primeur* (Ali et al., 2010; Cyr et al., 2019). However, most wines in the market are never rated by critics, and quality ratings seem to matter only for the fine wine category (Angulo et al., 2000; Jackson, 2017; Paroissien, 2017). Although the *Wine Spectator* tasting team reviews more than 15,000 wines a year, they also exclude thousands of (non-premium) wines from their selection (Humphreys & Carpenter, 2018). While there may not be a link between advertising and scores, it is suggested that advertisers are more likely to get their wines tasted. The wine magazines could be suspected of opportunistic behavior to attract more advertisers. However, Reuter (2009) studying Wine Spectator publication bias (product coverage and review) concluded that advertising influences ratings only on the margin, particularly enhancing retasting of wines rated less than 70 during the first single-blind tasting. According to him, wine media's

²³ *La Revue du vin de France* is one of the most important wine magazines in France, with 40,000 subscribers and 300,000 unique visitors on their website. A recent qualitative survey (n=1736) distributed to their readers gives interesting hints of their profile: from the 87% males and 13% females, 83% are enthusiasts and 17% work in the wine industry (of which 27% are winemakers, 17% sommeliers, 15% wine merchants, 11% salespersons). Their interest goes primarily to tasting notes (source: <https://www.larvf.com/qui-sont-les-lecteurs-et-lectrices-de-la-rvf,4667518.asp>)

²⁴ https://harpers.co.uk/news/fullstory.php/aid/29169/_Sainsbury_92s_and_Vivino_partner_for_wine-aisle_recommendations.html (accessed October 2023)

²⁵ Although fine wines have no commonly accepted definition in the literature, they are commonly distinguished from so-called "normal wines" by their higher prices and superior reputation (Ben Ameur & Le Fur, 2020; Le Fur & Outreville, 2019).

readership is a function of both subscription prices and the publication's reputation for being unbiased (Reuter, 2009).

Experts rate both the present and future value of wine, while peers rate it only through the scope of their current appreciation (Corsi & Ashenfelter, 2001). This leads Schiefer & Fischer (2008) to question the usefulness of wine experts' ratings as a predictor of wine consumer liking and to infer that most expert ratings do not reflect consumer taste. Peers may be more relevant than experts to super-premium available wines for example, because they may taste them more often than critics (more bankers can afford drinking/tasting Romanée Conti than wine critics).

In this context, the evolution of other experience goods markets, such as art or hospitality, foresees the disappearance of experts in favor of peer recommendations (Arora & Vermeulen, 2012; Kiatkawsin & Han, 2019). A similar trend (see Figure 10) might be ongoing in the wine industry (Albright et al. (2018); Smith (2019)). In recent hedonic analysis peers' ratings better explain wine prices than experts' ratings (Bazen et al., 2023; Oczkowski & Pawsey, 2019).

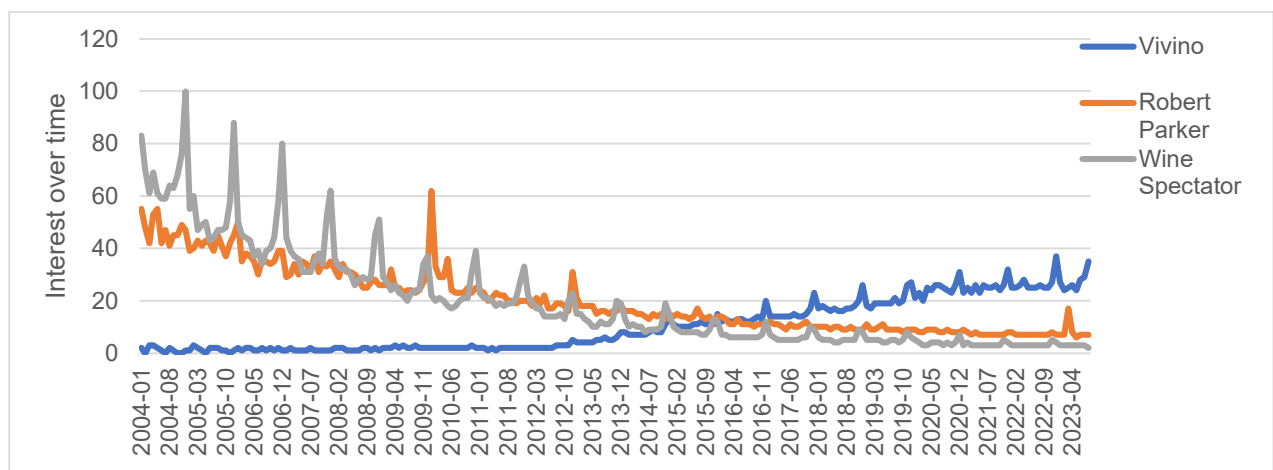


Figure 10 - Google trends (Vivino, Robert Parker, Wine Spectator)²⁶

²⁶ Accessed 22.08.2023

Online review aggregators

A participatory culture is emerging among consumers (Choi & Burnes, 2016). Unofficial and informal prescription is gaining importance in the wine market; in these segments, novices' tastes (general hedonic rating) prevail over quality evaluation because the personal taste is simply more relevant than quality when choosing a wine (Schiefer & Fischer, 2008). Experts are no longer the only benchmark for quality, the wisdom of the crowd is gaining prevalence for knowledge construction and evaluation (Arora & Vermeulen, 2012). With the internet and the emergence of online ratings, wine consumers have shifted from passive to active purchase evaluation, and their comments displayed online provide an informative signal of quality (Cheung & Lee, 2012). "That is democracy at an organoleptic level; it is subjective individualism raised to a moral principle." (Shapin, 2012, p. 83). The wine drinkers who share their wine-tasting experience on platforms like Vivino or CellarTracker also produce information about wine quality. Online review aggregators bundle this (prosumers) user-generated content (UGC) to provide quality information to other users, creating what Chan et al. (2022) call "prosumers communities".

The importance of crowdsourcing prosumers' opinions is increasing, and so is their impact on the market (Steinberger, 2008; Zhang et al., 2010). Hedonic price function estimates suggest that wine prices are better explained by online community rating scores than by expert ratings (Bazen et al., 2023; Oczkowski & Pawsey, 2019). Cox & Kaimann (2015) predict that the growing influence of word-of-mouth and consumer-generated content in consumer purchase decision-making could decrease consumers' reliance on the opinions of experts or professional critics. Clauzel et al. (2019) recommend that experts capitalize on the empowerment of consumers by integrating prosumers' reviews into their content, alongside their own ratings.

While wine experts use (1) product selection and (2) reviewer expertise as a differentiation strategy, online review aggregators use (a) product inclusion and (b) peer-reviewing to review a much more extensive range of wines than wine critics: all rated by all rather than only the best rated by only the best. Unlike many wine critics, Vivino does not sell

its content, (c) ratings are available for free (and easily accessible). Zero-price (free of charge) strategies increase user adoption and allow platforms to capture large market shares (Barnett, 2018). Today the world's largest online wine rating community and marketplace is called Vivino. The first academic mention of Vivino in a working paper by Kotonya et al. dates back to 2018. It mentions 29.9 million users and 89.4 million ratings. The evolution of the number of users, wines, wineries, scanned labels, and ratings is detailed in Table 6.

Year	Users	Wines	Scanned labels	Ratings	% of wines rated	Reviews	% of wines reviewed
2014	4,762,336	1,298,332	40,322,319	10,496,576	26%	2,329,346	6%
2015	10,332,744	6,826,573	147,057,872	29,878,575	20%	9,794,912	7%
2016	17,055,145	8,983,693	250,731,923	45,999,716	18%	15,890,474	6%
2017	23,012,455	10,573,756	375,347,597	64,499,224	17%	21,731,482	6%
2018	35,464,050	10,573,996	834,357,775	123,819,828	15%	42,025,965	5%
2019	36,911,161	10,868,691	892,534,812	130,613,064	15%	44,550,050	5%
2021	51,880,356	13,625,480	1,629,548,572	207,065,136	13%	73,297,000	4%
2022	57,881,172	15,003,610	1,959,609,646	234,159,998	12%	83,915,528	4%
2023	64,582,058	16,647,522	2,429,210,838	272,963,324	11%	95,343,375	4%

Table 6 – Evolution of the number of users, wines, scanned labels, and ratings on Vivino²⁷

Vivino's wide adoption has been facilitated by the rise of apps use from more than 2.7 billion users (Akdin et al., 2022). Comparatively, CellarTracker, another online review aggregator and inventory management tool²⁸ mostly used by wine collectors, claims 4.3 million wines and 11.8 million community and professional ratings (compared to 7 million in the summer of 2018).²⁹ Its users (232,000 in 2012³⁰) manage more than 164 million bottles in their private cellars and have access to professional experts' ratings, market value, and inventory management (Mastroberardino et al., 2019; Stuen et al., 2015).

Although wine quality evaluation by critics has an important impact on a wine's popularity, it is targeted at a very narrow market of fine wines; meanwhile prosumer

²⁷ Source: Author, based on Vivino Internet Archive

²⁸ Launched in 2003

²⁹ <https://www.cellartracker.com> (consulted January 2023)

³⁰ We were unable to find updated figures concerning the number of users

communities cover all categories without discrimination³¹. Online review aggregators have expanded the market for wine quality evaluation, providing ratings where they were not available before (cheaper wines) and supplying those ratings aggregated at zero price (free of charge). Before aggregators' emergence, the market for wine quality evaluation was limited (limited number of suppliers and limited demand) and focused only on fine wines. The supply was not very elastic, since it was based on the expertise of the suppliers, and their ability to be recognized as reliable experts in the market. The limitation of expert wine evaluation to fine wine and the complexity of the evocative vocabulary have created an opportunity for peer-reviewing.

Even though the empowerment of the vox populi in the wine market has been noticed for almost two decades, the literature about online consumer-generated content on wine is still scarce (Steinberger, 2008). In a recent European survey, more than 30% of the 7,324 respondents stated that they had a wine app on their mobile phone³² (Dubois et al., 2021). Nevertheless, only a limited number of papers have integrated prosumers' reviews in their reflection (e.g., Smith, 2019) or compared their relative influence with experts' ratings using empirical (e.g. Bazen et al., 2023; Oczkowski & Pawsey, 2019) or experimental methods (Buonanno et al., 2008; Parsons & Thompson, 2009; Thrane, 2019). Still, part of the literature available on the topic consists of working papers, unpublished in peer-reviewed journals to date (Adalja et al., 2022; Oczkowski & Pawsey, 2019; Kopsacheilis et al., 2023; Kotonya et al., 2018; Mazzoli & Palumbo, 2022; Schamel & Gastaldello, 2022). In 2022 only, more than 10 projects using Vivino data were presented at the three major wine economics and business conferences in 2022 (European Association of Wine Economists, American Association of Wine Economists, Association of Wine Business Research). The most recent publication available investigates the emotional response to Vivino reviews exposure (Rizo et al., 2023).

³¹ "There's a problem in wine: Over 75% of wines are never rated by experts. This is where crowdsourced ratings on Vivino become useful" <https://www.vivino.com/wine-news/vivino-ratings-explained> (consulted November 2019)

³² Even though having downloaded an app does not necessarily imply that this is used on a regular basis

As there are to date no published studies that used other methods than hedonic price analysis to compare the influence of peers' and experts' ratings in the wine market, the results reported here should be considered as part of a larger effort to develop more empirical research about the wine evaluation market. To sum up, there are two sources of quality ratings in the wine market, offering heterogeneous information products (experts versus community ratings) at different prices (positive versus negative). Historically dominated by wine experts (reviewing only fine wines), evaluative intermediation now reaches cheaper wines and a wider audience with online review aggregators (see Table 7).

Supplier	Source	Rated wines	Scale	Typology	Main users	Credibility based in	Price
Content review aggregators	Prosumers	All	Over 5	Inclusion & Algorithmic egalitarianism (<i>synthesis of the ratings</i>)	Wine consumers	Number of ratings (aggregation)	Free
Media	Experts	Fine wines	Over 100	Selection & reviewer's singularity or editorial elitism	Wine consumers, investors & collectors, Producers & organizations, distributors & retailers	Taster's or media's reputation of being unbiased	Free if provided by a seller / positive price in other cases (subscription)

Table 7 - Sensory quality evaluation in the wine market. Source: author

In the next section, we will review the demand for wine quality evaluation. Consistent with my expectations, demand stems from consumers, investors, and collectors, because external wine quality evaluation lowers their search cost and narrows their consideration set. However, it also, more unexpectedly, originates from the trade, namely from producers and organizations, as well as from distributors and retailers, because ratings and reviews constitute an efficient promotion tool.

1.3.2 Analysis of the demand

Demand by wine consumers: lowering search cost

Most consumers declare that liking a specific wine they tasted before is the most important reason for their (re)purchase (Mueller et al., 2010; Song, 2012). However, previously purchased wines are not systematically available for purchase (see on-trade for example).

Since wine is an experience good, wine quality evaluation only occurs through post-purchase consumption. Wine consumers are subject to information asymmetry. Moreover, unlike in other markets, the wine market offers no homogenized institutional quality signaling system at a global level. The high complexity and heterogeneity of existing quality signaling systems can be perceived as confusing by consumers, who may look for alternative sources of quality information (Castillo-Valero & García-Cortijo, 2015; Costanigro et al., 2019; Malorgio et al., 2007). More broadly, the complexity of the wine market is a source of consumer confusion and qualifies wine buying as a risky activity for most wine consumers (Atkin & Johnson, 2010). When confronted with uncertainty about product quality, consumers often use multiple product quality cues as proxies for quality (Hjorth-Andersen, 1991; Narwal & Nayak, 2020). Another solution to cope with this confusion is for consumers to rely on better-informed agents when making their decisions (Drummond & Rule, 2005). These third parties supply homogenous information mapped on a single rating scale comparable among wines (Smith, 2019). To reduce perceived risks when selecting a wine and to maximize their satisfaction, wine consumers can delegate quality judgment to others (Karpik, 2007). They seek the advice of wine experts, friends, family members, and clerks who are deemed knowledgeable (Vigar-Ellis et al., 2015). There is a wide literature on wine experts focused on perceived risk reduction and subsequent purchase intention stimulation (Aqueveque, 2006; Lacey et al., 2009). Although experiential information has the highest informational content, sources of quality evaluation such as peers have not been extensively investigated (Lallement et al., 2019). The information inefficiencies in the market (information asymmetry, complexity, choice, and information overload) generate consumer confusion and demand for third-party evaluation.

Demand by fine wine investors and collectors: warranty

Since professional wine experts work as proxies for rating agencies, wine critics' scores have opened the market for Bordeaux fine wines to investors (Masset & Weisskopf, 2018). The financial indices of Liv-ex.com were built using wines rated 95 and above by Robert Parker (Kwon & Easton, 2010). Liv-Ex is nowadays the primary electronic exchange platform for trading fine wine. Merchants, brokers, retailers, and consumers can use the platform to

purchase these wine futures in advance of their distribution for retail operations. Along with the process of financialization in the fine wine market, several economic studies have shown the correlation between experts' ratings, *en primeur*, and auction prices (e.g., Schamel, 2004; Chauvin, 2013; Faye et al., 2015). Wine is the only agricultural market to have reached such a valorization of variability in the premium part of its market (Teil, 2021). But there might be an interdependency here since in her attempt to identify the macroeconomic determinants of fine wine prices, Jiao (2017) concluded that the increasing volatility of prices triggers demand for expert appraisal from fine wine investors.

Demand by wine producers and organizations: marketing quality as a business strategy

Wine prices no longer depend merely on production costs but are also determined by collective and individual reputations (Cardebat & Figuet, 2009; Ling & Lockshin, 2003; Olivesi, 2018; Schamel, 2000; Landon & Smith, 1997). The marketing of quality, a key element of a differentiation strategy for wine producers, involves close contact with critics as part of their communication and reputational strategy (Parga-Dans & Alonso González, 2017). Evidence abounds that reviews of professional critics enhance commercial success, though consumer sensitivity to reputation is higher for premium, super-premium, and icon wines (Castriota & Delmastro, 2015; Cox & Kaimann, 2015). Wine reputation is positively correlated with expert ratings (Oczkowski & Pawsey, 2019). Collective reputation is shown to have an impact on consumers' willingness to pay, which rises in line with the reputation of individual wine producers (Landon & Smith, 1997). The individual reputation of wineries will also enable them to select their retailers and distributors depending on the positioning they wish to reflect: hotels, restaurants, independent wine stores and export for fine wines, and supermarkets for bigger-volume wine producers (Beverland, 2004). This explains why, for high-end wineries, reputation management can become almost as important as revenue management (Dressler, 2018). Organizational reputation has become a strategic intangible asset for firms and is one of the most important drivers of their success (Barnett & Pollock, 2012), which is why some companies place wine critics at the core of their marketing and communication strategy (Lamour & De La Robertie, 2016).

Wine critics benefit from close contact with wine producers enabling them to publish interesting articles and well-informed reviews. They reciprocate by disseminating products and company messages (Chaney, 2001). “Producers, and intermediaries such as distributors and retailers, often use favorable reviews to promote products, resulting in a multiplier effect for evaluation where the eventual audience can be magnitudes of order higher than the direct audience (e.g., paid subscription).” (Kwon & Easton, 2010, p. 136).

Demand by wine distributors and retailers: quality signaling.

The academic literature has studied the effect of shelf-talkers (product cards including ratings that appeal in stores) on sales, and shown from early on their positive correlation with sales: scored wines outsell non-scored wines in retail studies (e.g. Atkin & Thach, 2012; Gluckman, 1986). Retailers are therefore encouraged to use a wide range of wine experts’ references in shelf talkers that will boost their sales. Distribution networks are increasingly important in the wine evaluation market, reflecting the transformation of economic competition into a more vigorous struggle for attention and visibility (Franck, 2019; Kwon & Easton, 2010; Odorici & Corrado, 2004). Hsu et al. (2012) and Hennion (2015) underline the importance of evaluative schemata and procedure clarity, to help both consumers and producers cope with uncertainty, and to allow producers to anticipate quality assessment and adequately adjust their production strategy. Even when distributors, retailers, or sommeliers state that they do not pay attention to ratings, their audience base (customers) might force them to recognize the judgment of critics and to adapt to it, listing iconic 100-point wines, for example (Waibel et al., 2021).

The demand for wine quality evaluation originates, as would be expected, from wine consumers as well as wine investors and collectors. Online review aggregators and experts reduce quality information asymmetry, simplify decision-making, reduce confusion, and help wine consumers, investors and collectors ensure that they have made the right choice. However, the demand for wine quality evaluation also originates, concomitantly, from the production and distribution side. For producers as well as for distributors and retailers, ratings increase the media exposure of their wines and constitute an efficient promotion tool.

1.4 Discussion

Wine experts have been found to be less reliable and consistent than experts in fields such as medicine, clinical psychology, business, auditing, personnel management, or meteorology (Ashton, 2012). They have even been charged with opportunistic behavior, grade (rating) inflation, and conflict of interest (Bessy & Chauvin, 2013). The accuracy of wine experts' judgment has been discussed, particularly by Ashenfelter & Jones (2013, p. 1): "the expert opinions are not efficient, in the sense that they can be easily improved, and that these opinions must be demanded, at least in part, for some purpose other than their accuracy". In his study of publication bias in *Wine Spectator*, Reuter (2009) suggests that wine consumers may be more tolerant of review bias than consumers of other product categories, due mainly to the subjectivity of wine tasting. Analyzing both sides of the market, this review highlighted the financial reliance of wine experts and online review aggregators on the wine trade. A vast majority of experts rely on free requested samples and advertisement income to carry out their activities. Without the sale of advertisements (and more recently other side activities like competition or events), most wine publications would not be profitable (Reuter, 2009). Nor would the online review aggregators without the sale of wine promotional services and data intelligence (since they do not sell the ratings but provide them for free). Both revenue models are based on two-sided strategies (See Figure 11).

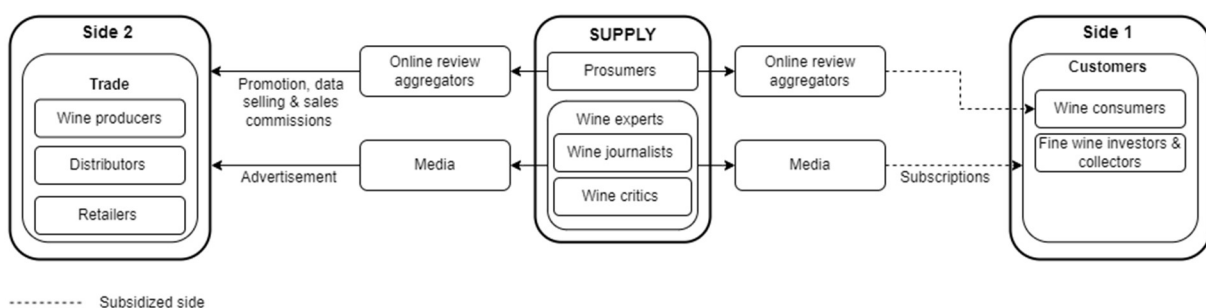


Figure 11 – Revenue model of the wine evaluation market: a two-sided strategy³³

³³ Source: author

According to Evans (2003), in two-sided markets, the intermediaries must (1) select a price and (2) use a differential pricing structure (not only how much they will charge, but to whom). They usually skew the prices on the less price-sensitive side of their two sets of customers. The wine valuation market behaves like a two-sided market when suppliers subsidize one side of the market to earn profit from the other side. The reliance on solicited samples, for example, might explain the censorship applied to negative reviews by wine experts (Steinberger, 2008). A negative rating on one vintage could jeopardize the possibility of receiving samples the following year (Fernandez, 2004; Gans & Kaplan, 2017; Thode et al., 2002). By limiting their selection to fine wines and censoring low ratings, wine experts inform the customers about what is deemed to be good but not about what is deemed to be bad. Their efficiency is therefore limited to (1) positive ratings and (2) the fine wine market (Teil, 2001). Meanwhile, online review aggregators declare tackling the negative review censorship issue³⁴. However, they fail to mention three major issues with community ratings. First, the under-reporting bias: prosumers might not be willing to spend (waste) time scanning, rating, or reviewing the wines that they dislike. Under-reporting leads consumers to comment only on the wines they liked or disliked a lot. Second, the acquisition bias: a positive predisposition towards a wine enhances purchase and comment generation likelihood. Finally, beyond those two self-selection biases remains the broad spectrum of wine knowledge levels, and above all the fake reviews issue.

Experts' ratings reach three different categories of stakeholders: industry readers, consumer readers and consumers who see scores in the store or online (not to mention word of mouth from any of those three segments). Wine consumers, investors, and collectors can pay to get access to most of the media through which expert reviews are conveyed: Magazines, guides, and online reviews. But information is also made available for free to

³⁴ "Another advantage our ratings have is that our community members are honest, sometimes brutally so, with their ratings. Many experts opt not to publish poor ratings, assuming that wines that are lacking will eventually take themselves out of the running. But with Vivino, you'll find a wide range of ratings, letting you know what you can buy with confidence and what wine might not be the best fit" <https://www.vivino.com/wine-news/vivino-5-star-rating-system> (consulted November 2019)

consumers: wine ratings and awards are often shown in both online and brick-and-mortar shops. Meanwhile, online review aggregators provide free ratings to their users. Those free ratings inform the customers of their marketplace, which positively impacts sales (including commissions or sales margin). Wine producers, distributors, and retailers do not pay to have their wines listed by online review aggregators. Prosumers review wines for free through their smartphones or computers. But producers must pay if they want to correct inaccuracies in the information available about their wines on the platform, advertise their production (enhancing their profile or purchasing triggered email campaigns), or purchase data about specific markets and consumers' preferences (brand awareness, engagement, sales)³⁵. Wine producers, distributors, and retailers also pay fees to list their wines in competitions (and potentially receive an award), and to advertise in the wine media. Based on the review of the literature, Table 8 presents the two-sided strategies for experts and online review aggregators.

Two-sided market	Side one	Side two	Subsidized side	Source of revenue	Prospect
Online review aggregators	Wine consumers	Wine producers and business	Wine consumers – negative price for ratings	Wine consumers through direct wine selling Wine producers and Business through promotional services, data intelligence & sales commission (marketplace)	Growth
Wine media	Readers	Wine producers and business	Readers	Readers subscriptions Advertisements from wine producers & business	Slow decline

Table 8 - Two-sided strategy and prospect. Source: author.

Online review aggregators in the wine market benefit from both positive same-side and cross-side network effects. The increasing number of Vivino users, for example, feeds the platform and increases its utility to other users (same side). At the same time its value as a data provider or as a marketplace for wines increases with the number of potential customers (cross-side).

³⁵ <https://www.vivino.com/partners> (consulted October 2023)

Entry into the market is free but made more difficult for newcomers because of the same and the cross-side effects for online review aggregators and because of the expertise effect for wine experts.

This review has important implications for managers. With the expansion of the audience of online review aggregators emerges the possibility that the so-called “wisdom of the crowd” (or “preference of the crowd” - Smith, 2019) channels attention to a limited number of products already favored by other consumers. The importance of a plurality of supply of wine evaluations is therefore of prime importance for the sustainability of the wine market: online review aggregators inform customers, complementing the work of wine experts that attract attention to producers. Online review aggregators contribute to the stabilization of a hierarchy in which professional experts sustain the variability of an artistic fine wine market where no two wines should be perfectly identical, even to two vintages of the same wine (see Teil, 2021). Based on this review I do not foresee a disappearance but a decline of wine experts (in the limited perimeter of fine wines), and a rise of the importance of online review aggregators in the wine evaluation market globally. Pure content producers such as *The Wine Advocate*, who employ one-sided structures (subscriptions are their only source of revenue), are likely to remain small³⁶ and be disfavored by competition against online review aggregators as their consumer base grows older.

From an economic standpoint, the findings also offer insights into how wine experts and online review aggregators help tackle the information inefficiencies in the wine market. Facing the heterogeneity of quality on the market, and uncertainty regarding product quality until after consumption, wine buyers bear very high valuation costs. Wine experts and online review aggregators inform consumers' choice. They reduce the information asymmetry on the consumer side, allowing consumers to avoid suboptimal decisions or consumption coping

³⁶ 50,000 paid readers for the *Wine Advocate*, against 375,000 for the *Wine Spectator* (Kantar, 2020)

(purchase abandonment). Both information sources contribute to the efficiency of the wine market.

1.5 Limitations of the study and future research directions

This study has integrated fragmented literature in the domain of wine quality information intermediation following the updated methodology by Whitemore & Knafl (2005). I acknowledge that combining diverse data sources and methodologies can be challenging. Despite the adoption of an exhaustive data collection strategy, the selection of inclusion criteria might have led to the omission of parts of the literature (the Journal of Wine Economics, the leading outlet of articles related to the scope of the thesis, did not require keywords until 2013, which may have resulted in some missing references). Moreover, an estimate of the economic contribution of the wine evaluation market would have been valuable. However, such an estimate is complicated by the opacity of the transactions (e.g., advertisements, price of promotional services or data intelligence) between stakeholders in the market. Seemingly, the value generated by the wine evaluation market cannot be easily measured through price.

This review highlighted the fact that only a tiny proportion of the ratings users are willing to pay for a subscription to get access to professional wine evaluations. Most consumers do not disdain the value of ratings when provided for free, but they do not buy them³⁷. In future research we plan to assess the *ex ante* value of those ratings: how much are consumers willing to pay for experts' ratings when facing a purchasing decision? We also plan to measure their *ex post* value to the wine consumers using experimental auctions in a natural setting.

The disappearance of the border between the marketplace and prescription is also a central question for the wine industry. The acquisition of prosumer data gives online review aggregators access to valuable knowledge about consumer preferences that may provide them an unfair competitive advantage over traditional competitors (experts). Online review aggregators can, as Vivino does, purchase and sell themselves the wines they have identified

³⁷ Reminding us of digital journalism, for a systematic review see O'Brien et al. (2020)

as being the most popular or the wines with high potential according to their users and earn a direct sales margin instead of a commission on sales. Studying the business models of online review aggregators would be of utmost interest to the industry.

When wine experts supply information on wine quality, online review aggregators also provide their users with a personalized likelihood of liking based on past evaluations. The consumer purchasing path has been fundamentally transformed by recommendation systems, offering customized choices while obviating the requirement for intensive information search (Malter et al., 2020). The rating of a wine doesn't tell you how it tastes, nor if you will like it. This interaction between past evaluations and personalized recommendations using algorithms is worth investigating. The use of consumer data to reduce the asymmetry of information in the market is likely to become a key research area in the near future.

1.6 Conclusion

This integrative review is a first attempt to organize existing knowledge and reflections on modeling the wine evaluation market. The literature searched in Web of Science, Science Direct, Scopus, and Google Scholar databases focused on the content produced (wine reviews, ratings, and scores). It has been integrated into a framework built on the key relationships and interactions between the supply and demand sides of wine quality information.

According to the literature, on the supply side, two sources of ratings coexist: experts and online review aggregators. While the literature on wine experts is extensive, the one on online review aggregators remains scarce. The supply of professional quality evaluation (wine experts) is characterized by its multiplicity and fragmentation over the years whereas online review aggregators offering for-free content are highly concentrated in the market, corroborating the conclusions of Barnett (2018). In other experience goods markets, such as hospitality, the influence of peer ratings now surpasses the influence of experts' ratings. In the wine market, their coexistence illustrates two different definitions of quality. Professional wine experts focus on fine wines, charge positive prices to access their ratings (subscription) and impact the entire value chain (production, sales, consumption). In the meantime, peers rate all

kinds of wines, for free, across a wider price range. While the Wine Spectator experts claim to produce 15,000 wine ratings a year, the Vivino community produces more than 31 million³⁸. While the *Wine Advocate* prides itself on the 450,000 ratings housed in their online database, Vivino has 620 times more. If online review aggregators become the dominant evaluation source on the market, they could similarly influence the market and different wines could be favored. Since they rate all wine segments, it may lead to a renewal of the demand for less high-end wines globally.

This integrative literature review of the recent trends underlying the market for wine quality evaluation reveals distinct patterns. Even though the importance of experts is decreasing, the wine market is likely to sustain both peer and expert quality information sources in the long run (they complement rather than substitute for each other). Their coexistence is likely to sustain and stimulate the E-commerce market for wines in the coming years, including direct-to-consumer (DTC) sales. The literature review has revealed that both sources of ratings base their business models on a two-sided strategy and could not be sustainable without the trade. Online review aggregators offer free access to wine drinkers' reviews and use the generated data to source and sell popular and high-rated wines to their users. In the meanwhile, they also act as marketplaces, collect sales commissions, and sell promotional services as well as data intelligence to the industry. The predictions identified by this literature review (a decline, but not disappearance, of experts) are in line with the conclusions of Kwon & Easton (2010) and suggest that the future lies in hybrid internet-based evaluation aggregators, like Vivino, that combine the functions of review aggregator and marketplace.

Disclosure Statement

No potential competing interest was reported by the author.

³⁸ Source: Vivino internet archive, from September 5, 2021 to September 5, 2022.

Appendix

Author(s)	Publication Year	Article Title	Source Title	Volume	Issue	Start Page	End Page
Abbal P, Sablayrolles JM, Matzner-Lober E, Carbonneau A	2019	A Model for Predicting Wine Quality in a Rhone Valley Vineyard	Agonomy Journal	111	2	545	554
Adalja A, Livat F, Rickard B, Susskind, A	2022	Dissonant Opinions and the Home Bias: Consumer Response to Crowd Sourced Reviews for Wine.	13th Academy of Wine Business Research Conference - Working Paper				
Albright A, Pedroni P, Sheppard S	2018	Uncorking Expert Reviews with Social Media: A Case Study Served with Wine	Case Study - Williams University				
Ali H H, Nauges C	2007	The Pricing of Experience Goods: The Example of en primeur Wine	American Journal of Agricultural Economics	89	1	91	103
Ali HH, Lecocq S, Visser M	2005	The impact of gurus: Parker grades and en primeur wine prices	Journal of Wine Economics	5	1	22	39
Allen MP, Germov J	2011	Judging taste and creating value The cultural consecration of Australian wines	Journal of Sociology	47	1	35	51
Amédée-Manesme CO, Faye B, Le Fur E	2020	Heterogeneity and fine wine prices: application of the quantile regression approach	Applied Economics	52	26	2821	2840
Aqueveque C	2015	The Influence of Experts' Positive Word-of-Mouth on a Wine's Perceived Quality and Value: The Moderator Role of Consumers' Expertise	Journal of Wine Research	26	3	181	191
Arias-Bolzmann L, Sak O, Musalem A, Lodish L, Báez KR, De Sousa LJ	2003	Wine Pricing: The Influence of Country of Origin, Variety, and Wine Magazine Ratings	International Journal of Wine Marketing	15	2	47	57
Ariely D, Lynch JG	2001	Wine Online: Search Costs and Competition on Price, Quality, and Distribution	SSRN Electronic Journal				
Ashenfelter O	2007	Predicting the Quality and Prices of Bordeaux Wines	The Economic Journal	118	529	174	184
Ashenfelter O, Jones GV	2013	The Demand for Expert Opinion: Bordeaux Wine	Journal of Wine Economics	8	3	285	293
Ashenfelter O, Ashmore D, Lalonde R	1995	Bordeaux Wine Vintage Quality and the Weather	Chance	8	4	7-14	
Ashenfelter O, Quandt R	1999	Analyzing a Wine Tasting Statistically	Chance	12	3	16	20
Ashton RH	2012	Reliability and Consensus of Experienced Wine Judges: Expertise Within and Between?	Journal of Wine Economics	7	1	70	87
Ashton RH	2017	Dimensions of Expertise in Wine Evaluation	Journal of Wine Economics	12	1	59	83

Ashton RH	2011	Improving Experts' Wine Quality Judgments: Two Heads Are Better than One	Journal of Wine Economics	6	2	160	178
Ashton RH	2013	Is There Consensus Among Wine Quality Ratings of Prominent Critics? An Empirical Analysis of Red Bordeaux, 2004-2010	Journal of Wine Economics	8	2	225	234
Ashton RH	2016	The Value of Expert Opinion in the Pricing of Bordeaux Wine Futures	Journal of Wine Economics	11	2	261	288
Atkin T, Nowak L, Garcia R	2007	Women Wine Consumers: Information Search and Retailing Implications	International Journal of Wine Business Research	19	4	327	339
Babin BJ, Bushardt C	2019	Third-Party Ratings and The US Wine Market	International Journal of Wine Business Research	31	2	151	162
Baciocco KA, Davis RE, Jones GV	2014	Climate and Bordeaux Wine Quality: Identifying the Key Factors that Differentiate Vintages Based on Consensus Rankings	Journal of Wine Research	25	2	75	90
Barbe P, Durrieu F	2005	Evaluation of the Quality of the Great Bordeaux Wines: Are There Significant Differences Between Critics?	International Journal of Wine Marketing	17	3	55	66
Barber N	2009	Wine consumers information search: Gender differences and implications for the hospitality industry	Tourism and Hospitality Research	9	3	250	269
Barbera S, Bossert W, Moreno-Ternero JD	2023	Wine Rankings and the Borda Method	Journal of Wine Economics			1	17
Barbos, A; Hartman, J	2023	Reputational effects on third-party agents: A study of the market for fine and rare wines	Journal of Economic Behavior & Organization	359	372	March	
Bazen S, Cardebat JM	2022	Why have Bordeaux wine prices become so difficult to forecast?	Economics Bulletin	42	1		
Beckert J, Rössel J, Schenk P	2014	Wine as a Cultural Product: Symbolic Capital and Price Formation in the Wine Field	Sociological Perspectives	60	1	206	222
Benfratello L, Piacenza M, Sacchetto S	2009	Taste or reputation: what drives market prices in the wine industry? Estimation of a hedonic model for Italian premium wines	Applied Economics	41	17	2197	2209
Beninger S, Parent M, Pitt L, Chan A	2014	A content analysis of influential wine blogs	International Journal of Wine Business Research	26	3	168	+
Benjamin BA, Podolny JM	1999	Status, Quality, and Social Order in the California Wine Industry	Administrative Science Quarterly	44	3	563	589

Bentzen J, Smith V	2008	Do expert ratings or economic models explain champagne prices?	International Journal of Wine Business Research	20	3	230	+
Berg EC, Mascha M, Capehart KW	2022	Judging reliability at wine and water competitions	Journal of Wine Economics	17	4	311	328
Bessy C, Chauvin PM	2013	The Power of Market Intermediaries: From Information to Valuation Processes	Valuation Studies	1	1	83	117
Bicknell KB, MacDonald IA	2012	Regional reputation and expert opinion in the domestic market for New Zealand wine	Journal of Wine Research	23	2	172	184
Bitter C	2017	Wine Competitions: Reevaluating the Gold Standard	Journal of Wine Economics	12	4	395	404
Boatto V, DeFrancesco E, Trestini S	2011	The price premium for wine quality signals: does retailers' information provision matter?	British Food Journal	113	5	669	679
Bodington JC	2015	Testing a Mixture of Rank Preference Models on Judges' Scores in Paris and Princeton	Journal of Wine Economics	10	2	173	189
Bodington JC	2017	Wine, Women, Men, and Type II Error	Journal of Wine Economics	12	2	161	172
Bodington JC	2017	Disentangling Wine Judges' Consensus, Idiosyncratic, and Random Expressions of Quality or Preference	Journal of Wine Economics	12	3	267	281
Bodington JC	2017	The Distribution of Ratings Assigned to Blind Replicates	Journal of Wine Economics	12	4	363	369
Bodington JC	2020	Rate the Raters: A Note on Wine Judge Consistency	Journal of Wine Economics	15	4	363	369
Bodington JC	2022	A maximum entropy estimate of uncertainty about a wine rating What can be deduced about the shape of a latent distribution from one observation?	Journal of Wine Economics	17	4	296	310
Bodington JC	2022	Stochastic error and biases remain in blind wine ratings	Journal of Wine Economics	17	4	345	351
Bodington JC, Malfeito-Ferreira M	2019	Should Ties Be Broken in Commercial Wine Competitions? When Yes, What Method Is Practical and Defensible?	Journal of Wine Economics	14	3	298	308
Bodington JC, Malfeito-Ferreira M	2018	Do Female and Male Judges Assign the Same Ratings to the Same Wines? Large Sample Results	Journal of Wine Economics	13	4	403	408
Bonn MA, Kim WG, Kang S, Choo M	2016	Purchasing Wine Online: The Effects of Social Influence, Perceived Usefulness, Perceived Ease of Use, and Wine Involvement	Journal of Hospitality Marketing & Management	25	7	841	869
Bonnet C, Hilger J, Villas-Boas SB	2020	Reduced form evidence on belief updating under asymmetric information-consumers' response to wine expert opinions	European Review of Agricultural Economics	47	5	1668	1696

Boon E, Foppiani O	2019	An exploratory analysis of cross-country biases in expert wine reviews	Journal of Wine Research	30	2	144	156
Bouzdine-Chameeva T, Galam S	2011	Experts versus word-of-mouth in the wine purchasing dynamics: a model from physics	6th AWBR International Conference - Working Paper				
Bouzdine-Chameeva T, Galam S	2011	Word-of-Mouth Versus Experts and Reputation in the Individual Dynamics of Wine Purchasing	Advances in Complex Systems	14	06	871	885
Brand J, Panzeri V, Buica A	2020	Wine Quality Drivers: A Case Study on South African Chenin Blanc and Pinotage Wines	Foods	9	6		
Brien CJ, May P, Mayo O	1987	Analysis of Judge Performance in Wine-Quality Evaluations	Journal of Food Science	52	5	1273	1279
Brunel AA, Kernevez A, Leclere F, Trenteseaux J	2016	Quantitative Ranking Evaluation of Wine Quality	International Journal of Nutrition and Food Engineering	10	2	101	107
Buonanno P, Caggiano G, Galizzi MM, Leonida L, Vanin P	2008	Expert and Peer Pressure in Food and Wine Tasting: Evidence from a Pilot Experiment	Enometrica - Working Paper				
Burnham D, Skilleas OM	2012	The Aesthetics of Wine	John Wiley & Sons, Inc				
Cacchiarelli L, Carbone A, Esti M, Laureti T, Sorrentino A	2016	Assessing Italian wine quality and prices: de gustibus non disputandum est	British Food Journal	118	5	1006	1024
Caldas J, Rebelo J	2013	Portuguese wine ratings: An old product a new assessment	Wine Economics and Policy	2	2	102	110
Cao J, Stokes L	2010	Evaluation of Wine Judge Performance through Three Characteristics: Bias, Discrimination, and Variation*	Journal of Wine Economics	5	1	132	142
Cao J, Stokes L	2017	Comparison of Different Ranking Methods in Wine Tasting	Journal of Wine Economics	12	2	203	210
Cao J, Stokes L	2014	Quantifying Randomness Versus Consensus in Wine Quality Ratings	Journal of Wine Economics	9	2	202	213
Caracciolo F, Cembalo L, Pomarici E	2013	The Hedonic Price for an Italian Grape Variety	Italian Journal of Food Science	25	3	289	294
Carbone A	2021	From Flasks to Fine Glasses: Recent Trends in Wine Economics	Italian Economic Journal	7	2	187	198
Cardebat JM, Livat F	2016	Wine experts' rating: a matter of taste?	International Journal of Wine Business Research	28	1	43	58
Cardebat JM, Corsinovi P, Gaeta D	2018	Do Top 100 wine lists provide consumers with better information?	Economics Bulletin	38	2	983	+

Cardebat JM, Figuet JM, Paroissien E	2014	Expert Opinion and Bordeaux Wine Prices: An Attempt to Correct Biases in Subjective Judgments	Journal of Wine Economics	9	3	282	303
Cardebat JM, Figuet JM	2004	What explains Bordeaux wine prices?	Applied Economics Letters	11	5	293	296
Cardebat JM, Paroissien E	2015	Standardizing Expert Wine Scores: An Application for Bordeaux en primeur	Journal of Wine Economics	10	3	329	348
Carollo A, Fong S, Gabrieli G, Mulatti C, Esposito G	2022	To wine or not to wine? A scientometric approach to 65+years of wine preference and selection studies	British Food Journal	124	13	409	431
Castriota S, Corsi S, Frumento P, Ruggeri G	2022	Does quality pay off? Superstar wines and the uncertain price premium across quality grades	Journal of Wine Economics	17	2	141	158
Castriota S, Curzi D, Delmastro M	2013	Tasters' bias in wine guides' quality evaluations	Applied Economics Letters	20	12	1174	1177
Castriota S, Delmastro M	2008	Individual and Collective Reputation: Lessons from the Wine Market	SSRN Electronic Journal				
Chaney I	2000	A comparative analysis of wine reviews	British Food Journal	102	7	470	480
Charlin V, Cifuentes A	2023	The quality of the Argentinean Malbec and the weather in the Mendoza region	International Journal of Wine Business Research	35	3	487	503
Charters S, Pettigrew S	2006	The relevance of the quality construct to wine consumption	European Advances in Consumer Research				
Charters S, Pettigrew S	2007	The Dimensions of Wine Quality	Food Quality and Preference	18	7	997	1007
Charters S, Pettigrew S	2003	I like it but how do I know if it's any good? Quality and preference in wine consumption	ECU Publications	5			
Chen KJ, McCluskey JJ	2018	Impacts of Expert Information on Prices for an Experience Good across Product Segments: Tasting Notes and Wine Prices	Journal of Agricultural and Resource Economics	43	3	388	402
Chern CC, Wei CP, Shen FY, Fan YN	2015	A sales forecasting model for consumer products based on the influence of online word-of-mouth	Information Systems and e-Business Management	13	3	445	473
Chivu-Draghia C, Antocea AO	2016	Consumer Preferences Regarding Sources of Information and Use of Technology for Wine Selection – A Survey of Millennials and Generation X Sample in Romania	Economic Engineering in Agriculture and Rural Development	16	2	10	
Chocarro R, Cortinas M	2013	The impact of expert opinion in consumer perception of wines	International Journal of Wine Business Research	25	3	227	+
Cicchetti D, Cicchetti A	2013	As wine experts disagree, consumers' taste buds flourish: how two experts rate the 2004 Bordeaux vintage	Journal of Wine Research	24	4	311	317

Cicchetti D, Cicchetti A	2009	Wine rating scales: Assessing their utility for producers, consumers, and oenologic researchers	International Journal of Wine Research						73
Cicchetti D, Cicchetti A	2006	The Paris 1976 Wine Tastings Revisited Once More: Comparing Ratings of Consistent and Inconsistent Tasters	Journal of Wine Economics	1	2	125	140		
Cicchetti D, Cicchetti A	2009	A Proposed System for Awarding Medals at a Major U.S. Wine Competition	Journal of Wine Economics	4	2	242	247		
Cicchetti D, Cicchetti A	2014	Two enological titans rate the 2009 Bordeaux wines	Wine Economics and Policy	3	1	28	36		
Cliff MA, King M	1999	Use of principal component analysis for the evaluation of judge performance at wine competitions	Journal of Wine Research	10	1	25	32		
Cliff MA, King M	1996	A proposed approach for evaluating expert wine judge performance using descriptive statistics	Journal of Wine Research	7	2	83	90		
Cliff MA, King M	1997	The evaluation of judges at wine competitions: the application of Eggshell plots	Journal of Wine Research	8	2	75	80		
Colman T	2008	Wine Politics: How Governments, Environmentalists, Mobsters, and Critics Influence the Wines We Drink	University of California Press						
Combris P, Lecocq S, Visser M	1997	Estimation of a Hedonic Price Equation for Bordeaux Wine: Does Quality Matter?	The Economic Journal	107	March	390	402		
Compés-López R, Font-Julian CI, Orduna-Malea E	2018	Has Robert Parker lost his hegemony as a prescriptor in the wine World? A preliminar inquiry through Twitter.	CARMA 2018 - 2nd International Conference on Advanced Research Methods and Analytics - Working Paper						
Conrad JM, Gomez MI, Lamadrid AJ	2011	Wine in Your Knapsack?	Journal of Wine Economics	6	1	83	110		
Corsi A, Ashenfelter O	2019	Predicting Italian Wine Quality from Weather Data and Expert Ratings	Journal of Wine Economics	14	3	234	251		
Corsi A, Ashenfelter O	2001	Wine Quality: Experts' Ratings and Weather Determinants	71st EAAE Seminar - Working Paper						
Cosenza TR, Solomon MR, Kwon WS	2015	Credibility in the blogosphere: A study of measurement and influence of wine blogs as an information source: Credibility first: the influence of wine blogs	Journal of Consumer Behaviour	14	2	71	91		
Croijmans I, Majid A	2016	Not All Flavor Expertise Is Equal: The Language of Wine and Coffee Experts	Plos One	11	6	e0155845			

Cruz C, Van CN, Gautier L	2018	Word Embeddings for Wine Recommender Systems Using Vocabularies of Experts and Consumers	Open Journal of Web Technologies (OJWT)	5	1	23	30
Cyr D, Kwong L, Sun L	2017	An Examination of Tail Dependence in Bordeaux Futures Prices and Parker Ratings	Journal of Wine Economics	12	3	252	266
Cyr D, Kwong L, Sun L	2019	Who Will Replace Parker? A Copula Function Analysis of Bordeaux En Primeur Wine Raters	Journal of Wine Economics	14	2	133	144
D'Alessandro S, Pecotich A	2013	Evaluation of wine by expert and novice consumers in the presence of variations in quality, brand and country of origin cues	Food Quality and Preference	28	1	287	303
Danner L, Johnson TE, Ristic R, MeiselmanHL, Bastian SEP	2017	I like the sound of that! Wine descriptions influence consumers' expectations, liking, emotions and willingness to pay for Australian white wines	Food Research International	99	1	263	274
Davis RE; Dimon RA; Jones GV; Bois B	2019	The effect of climate on Burgundy vintage quality rankings	Oeno One	53	1	60	74
Di Vita G, Caracciolo F, Brun F, D'Amico M	2019	Picking out a wine: Consumer motivation behind different quality wines choice	Wine Economics and Policy	8	1	16	27
Dong ZQ, Atkison T, Chen B	2021	Wineinformatics: Using the Full Power of the Computational Wine Wheel to Understand 21st Century Bordeaux Wines from the Reviews	Beverages	7	1		
Dong ZQ, Guo XW, Rajana S, Chen B	2020	Understanding 21st Century Bordeaux Wines from Wine Reviews Using Naive Bayes Classifier	Beverages	6	1		
Dubois P, Nauges C	2010	Identifying the effect of unobserved quality and expert reviews in the pricing of experience goods: Empirical application on Bordeaux wine	International Journal of Industrial Organization	28	3	205	212
Dunphy R, Lockshin L	1998	A contemporary perspective of the Australian wine show system as a marketing tool	Journal of Wine Research	9	2	107	129
Dunphy R, Lockshin L	1998	A history of the Australian wine show system	Journal of Wine Research	9	2	87	105
Edwards F, Mort M	1991	The Expert Wine Taster	International Marketing Review	8	4		
Eyler R	2001	Competing in the US Wine Market: Australian Imports and Tasting Scores	International Journal of Wine Marketing	13	2	32	42
Ferro G, Amaro IB	2018	What factors explain the price of top quality wines?	International Journal of Wine Business Research	30	1	117	134
Fleming E, Mounter S, Grant B, Griffith G	2014	Can we explain variations in winery ratings in Victoria?	Australasian Agribusiness Review	22	1	1	13

Forbes SL	2008	The influence of individual characteristics, product attributes and usage situations on consumer behaviour: An exploratory study of the New Zealand, Australian, UK and US wine markets	PhD Thesis					
Friberg R, Gronqvist E	2012	Do Expert Reviews Affect the Demand for Wine?	American Economic Journal - Applied Economics	4	1	193	211	
Frick B, Simmons R	2013	The impact of individual and collective reputation on wine prices: empirical evidence from the Mosel valley	Journal of Business Economics	83	2	101	119	
Frick B, Simmons R	2020	The Legacy of Gurus: The Impact of Armin Diel and Joel Payne on Winery Ratings in Germany	Journal of Wine Economics	15	4	370	377	
Fried HO, Tauer LW	2019	Efficient Wine Pricing Using Stochastic Frontier Models	Journal of Wine Economics	14	2	164	181	
Galizzi MM	2013	Wine Judging and Tasting	Wine Economics: Quantitative Studies and Empirical Applications					
Gawel R, Godden PW	2008	Evaluation of the consistency of wine quality assessments from expert wine tasters	Australian Journal of Grape and Wine Research	14	1	1-8		
Gergaud O, Ginsburgh V, Moreno-Ternero JD	2022	Tracking the wines of the Judgment of Paris over time: The case of Stag's Leap Wine Cellars' Cabernet Sauvignon	Journal of Wine Economics	17	2	159	166	
Gergaud O, Ginsburgh V, Moreno-Ternero JD	2021	Wine Ratings: Seeking a Consensus among Tasters via Normalization, Approval, and Aggregation	Journal of Wine Economics	16	3	321	342	
Gergaud O, Livat F, Rickard B, Warzynski F	2017	Evaluating the net benefits of collective reputation: The case of Bordeaux wine	Food Policy	71	1	8	16	
Gibbs M, Tapia M, Warzynski F	2009	Globalization, Superstars, and Reputation: Theory & Evidence from the Wine Industry	Journal of Wine Economics	4	1	46	61	
Ginsburgh V, Monzak M, Monzak A	2013	Red Wines of Médoc: What is Wine Tasting Worth?	Journal of Wine Economics	8	2	159	188	
Gokcekus O; Gokcekus S; Hewstone M	2023	A long-term archival analysis of social influence on online wine evaluations: Effects of consensus and expertise	Journal Of Community & Applied Social Psychology	33	4	970	984	
Gokcekus O, Nottebaum D	2011	The buyer's dilemma – To whose rating should a wine drinker pay attention?	American Association of Wine Economists - Working Paper					
Grifoni D, Mancini M, Maracchi G, Orlandini S, Zipoli G	2006	Analysis of Italian Wine Quality Using Freely Available Meteorological Information	American Journal of Enology and Viticulture	57	3	339	346	

Grohmann B, Peña C, Joy A	2018	Wine quality and sensory assessments: do distinct local groups of wine experts differ?	Journal of Wine Research	29	4	278	289
Guidry JA, Babin BJ, GrazianoWG; Schneider WJ	2009	Pride and prejudice in the evaluation of wine?	International Journal of Wine Business Research	21	4	298	+
Haeger JW, Storchmann K	2006	Prices of American Pinot Noir wines: Climate, craftsmanship, critics	Agricultural Economics	35	1	67	78
Hay C	2010	The political economy of price and status formation in the Bordeaux en primeur market: The role of wine critics as rating agencies	Socio-Economic Review	8	4	685	707
Hekimoglu MH, Kazaz B	2020	Analytics for Wine Futures: Realistic Prices	Production and Operations Management	29	9	2096	2120
Herbst KC, Leary MR, McColskey-Leary CP	2013	Social-evaluative influences moderate the relationship between price and perceived quality	Social Influence	8	1	54	69
Herdendam APF, Hammarén M, Ahlström R, Wiktorsson PA	2009	The Professional Language of Wine: Perception, Training and Dialogue	Journal of Wine Research	20	1	53	84
Higgins LM, Wolf MM, Wolf MJ	2016	Wine on Facebook: A Look at Millennials' Wine Information Search	Successful Social Media and Ecommerce Strategies in the Wine Industry				
Higgins LM, Wolf MM, Wolf MJ	2014	Technological change in the wine market? The role of QR codes and wine apps in consumer wine purchases	Wine Economics and Policy	3	1	19	27
Hilger J, Rafert G; Villas-Boas S	2011	Expert Opinion and the Demand for Experience Goods: An Experimental Approach in the Retail Wine Market	Review Of Economics and Statistics	93	4	1289	1296
Hodgson R; Cao J	2014	Criteria for Accrediting Expert Wine Judges	Journal of Wine Economics	9	1	62	74
Hodgson RT	2009	An Analysis of the Concordance Among 13 U.S. Wine Competitions*	Journal of Wine Economics	4	1	1-9	
Hodgson RT	2008	An Examination of Judge Reliability at a major U.S. Wine Competition	Journal of Wine Economics	3	2	105	113
Hodgson RT	2008	On Rating Wines with Unequal Judges	Journal of Wine Economics	3	2	226	227
Hodgson RT	2009	How Expert are "Expert" Wine Judges?	Journal of Wine Economics	4	2	233	241
Hommerberg C	2015	Bringing consumption reviews into relief by combining Appraisal and argumentation analysis	Text & Talk	35	2	155	175
Honoré-Chedozeau C.; Chollet S.; Lelièvre-Desmas M.; Ballester J.; Valentin D	2020	From perceptual to conceptual categorization of wines: What is the effect of expertise?	Food Quality and Preference	80	103806		

Honoré-Chedozeau C, Ballester J, Chatelet B, Lempereur V	2015	Wine competition: from between-juries consistency to sensory perception of consumers	BIO Web of Conferences				
Honore-Chedozeau C, Desmas M, Ballester J, Parr WV, Chollet S	2019	Representation of wine and beer: influence of expertise	Current Opinion in Food Science	27	1	104	114
Horowitz DM	2012	"Cult" Wine?	Journal of Food Products Marketing	18	1	50	64
Horowitz I, Lockshin L	2002	What Price Quality? An Investigation into the Prediction of Wine-quality Ratings	Journal of Wine Research	13	1	7-22	
Horverak O	2009	Wine Journalism-Marketing or Consumers' Guide?	Marketing Science	28	3	573	579
Hsu G, Roberts PW, Swaminathan A	2007	Standards for quality and the coordinating role of critics	Enometrics XIII - Working Paper				
Huber A, Weiß C	2010	Quality, Reputation, and the Price of Wine	Enometrics XXII - Working Paper				
Hughson AL, Boakes RA	2001	Perceptual and cognitive aspects of wine expertise	Australian Journal of Psychology	53	2	103	108
Humphreys A, Carpenter GS	2018	Status Games: Market Driving through Social Influence in the U.S. Wine Industry	Journal of Marketing	82	5	141	159
Jackson RS	2017	Nature and Origins of Wine Quality	Wine Tasting		321	383	
Jaeger SR, Lee PY, Ares G	2018	Product involvement and consumer food-elicited emotional associations: Insights from emoji questionnaires	Food Research International	106	1	999	1011
Jaeger SR; Danaher PJ; Brodie RJ	2009	Wine purchase decisions and consumption behaviours: Insights from a probability sample drawn in Auckland, New Zealand	Food Quality and Preference	20	4	312	319
Jamerson H	2009	Intoxicators, educators, and gatekeepers: The enactment of symbolic boundaries in Napa Valley wineries	Poetics	37	4	383	398
James A	2018	How Robert Parker's 90+ and Ann Noble's Aroma Wheel Changed the Discourse of Wine Tasting Notes	ILCEA. Revue de l'Institut des langues et cultures d'Europe, Amérique, Afrique, Asie et Australie				
Jones GV, Storchmann K	2001	Wine market prices and investment under uncertainty: an econometric model for Bordeaux Crus Classes	Agricultural Economics	26	2	115	133
Kamakura WA, Moon S	2012	How to Speak 'Winese': Learning the Language of Wine Reviews	SSRN Electronic Journal				

Katumullage D, Yang CY, Barth J, Cao J	2022	Using Neural Network Models for Wine Review Classification	Journal of Wine Economics	17	1	27	41
Khalafyan AA; Temerdashev ZA; Akin'shina VA; Yakuba YF	2021	Study of consistency of expert evaluations of wine sensory characteristics by positional analysis	Heliyon	7	2		
King A	2008	Wine quality uncorked	Chemistry & Industry	24	1	20	22
Kopsacheilis O, Pipergias Analytis P, Kaushik K, Herzog S, Bahrami B, Deroy O	2023	Crowdsourcing the Assessment of Wine Quality—Evidence from Vivino	SSRN Electronic Journal				
Kotonya N, De Cristofaro P, De Cristofaro E	2018	Of Wines and Reviews: Measuring and Modeling the Vivino Wine Social Network	2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) - Working Paper				
Kozierkiewicz-Hetmańska A	2017	The analysis of expert opinions' consensus quality	Information Fusion	34	1	80	86
Kwak YS, Nam YJ, Hong JW	2021	Effect of Online Collective Intelligence in Wine Industry: Focus on Correlation between Wine Quality Ratings and On-Premise Prices	Sustainability	13	14		
Kwong LMK, Sun L	2018	On linear wine score aggregators and the preservation of group preferences	International Journal of Wine Business Research	30	3	265	276
Lallement J, Dejean S, Euzéby F, Martinez C	2019	The interaction between reputation and information search: Evidence of information avoidance and confirmation bias	Journal of Retailing and Consumer Services	53			
Landon S, Smith CE	2018	Quality Expectations, Reputation, and Price	World Scientific Handbook in Financial Economics Series	2	1	3	31
Landon S, Smith CE	1997	The Use of Quality and Reputation Indicators by Consumers: The Case of Bordeaux Wine	Journal of Consumer Policy	20	3	289	323
Langlois J, Dacremont C, Peyron D, Valentin D, Dubois D	2011	Lexicon and types of discourse in wine expertise: The case of vin de garde	Food Quality and Preference	22	6	491	498
Le Fur E, Outreville JF	2022	Do vintage scores by regions matters? The case of French wine regions	Applied Economics Letters	29	14	1243	1247
Lecocq S, Magnac T, Pichery MC, Visser M	2005	The Impact of Information on Wine Auction Prices: Results of an Experiment	Annales d'Économie et de Statistique		77	37	
Lecocq S, Visser M	2006	What Determines Wine Prices: Objective vs. Sensory Characteristics	Journal of Wine Economics	1	1	42	56

Lee FS	2012	Wine and the Consumer Price-perceived Quality Heuristics	International Journal of Marketing Studies	4	3	p31	
Lefever E, Hendrickx I, Croijmans I, van den Bosch A, Majid A	2018	Discovering the Language of Wine Reviews: A Text Mining Account	Proceedings Of The Eleventh International Conference On Language Resources And Evaluation (Lrec 2018)				
Li M, Liu L, Li CB	2011	An approach to expert recommendation based on fuzzy linguistic method and fuzzy text classification in knowledge management systems	Expert Systems with Applications	38	7	8586	8596
Ling BH, Lockshin L	2003	Components of Wine Prices for Australian Wine: How Winery Reputation, Wine Quality, Region, Vintage, and Winery Size Contribute to the Price of Varietal Wines	Australasian Marketing Journal	11	3	19	32
Lockshin L, Jarvis W, d'Hauteville F, Perrouy JP	2006	Using simulations from discrete choice experiments to measure consumer sensitivity to brand, region, price, and awards in wine choice	Food Quality and Preference	17	3-4	166	178
Loose SM, Szolnoki G	2012	Market price differentials for food packaging characteristics	Food Quality and Preference	25	2	171	182
Luxen MF	2018	Consensus between Ratings of Red Bordeaux Wines by Prominent Critics and Correlations with Prices 2004-2010 and 2011-2016: Ashton Revisited and Expanded	Journal of Wine Economics	13	1	83	91
Malfeito-Ferreira M, Diako C, Ross CF	2019	Sensory and chemical characteristics of 'dry' wines awarded gold medals in an international wine competition	Journal of Wine Research	30	3	204	219
Malorgio G, Grazia C	2007	Quantity and quality regulation in the wine sector: the Chianti Classico appellation of origin	International Journal of Wine Business Research	19	4	298	+
Marks D	2020	Erring Experts? A Critique of Wine Ratings as Hedonic Scaling	Journal of Wine Economics	15	4	386	393
Marks D	2015	Seeking the Veritas about the Vino: fine wine ratings as wine knowledge	Journal of Wine Research	26	4	319	335
Marks D	2014	"In Vino Veritas"—But What, In Truth, Is In the Bottle? Experience Goods, Fine Wine Ratings, and Wine Knowledge	Academy of Wine Business Research Conference - Working paper				
Masset P, Mondoux A, Weisskopf JP	2023	Fine wine pricing in a small and highly competitive market	International Journal of Wine Business Research	35	1	164	186
Masset P, Mondoux A, Weisskopf JP	2021	The Pricing of an Experience Good in a Competitive and Opaque Market	SSRN Electronic Journal				

Masset P, Weiskopf JP, Cardebat JM	2023	Efficient pricing of Bordeaux en primeur wines	Journal of Wine Economics	18	1	39	65
Masset P, Weisskopf JP	2018	Wine indices in practice: Nicely labeled but slightly corked	Economic Modelling	68	1	555	569
Masset P, Weisskopf JP, Cossutta M	2015	Wine Tasters, Ratings, and En Primeur Prices	Journal of Wine Economics	10	1	75	107
Mazzoli E, Palumbo L	2022	In Vivino Veritas: An Investigation on Consumers' Quality Perception and Wine Choice Determinants	American Association of Wine Economists Conference - Working Paper				
McCannon BC	2020	Wine Descriptions Provide Information: A Text Analysis	Journal of Wine Economics	15	1	71	94
Moon S, Kamakura WA	2017	A picture is worth a thousand words: Translating product reviews into a product positioning map	International Journal of Research in Marketing	34	1	265	285
Moussa S, Touzani M	2008	The perceived credibility of quality labels: a scale validation with refinement	International Journal of Consumer Studies	32	5	526	533
Mueller S, Lockshin L, Louviere JJ	2010	What you see may not be what you get: Asking consumers what matters may not reflect what they choose	Marketing Letters	21	4	335	350
Neuninger R, Mather D, Duncan T	2017	Consumer's scepticism of wine awards: A study of consumers' use of wine awards	Journal of Retailing and Consumer Services	35	1	98	105
Neuninger R, Mather D, Duncan T	2016	The Effectiveness of Extrinsic Cues on Different Consumer Segments: The Case of Wine Awards	Universal Journal of Management	4	11	628	638
Neuninger R, Mather D, Duncan T, Aitken R	2016	Questioning the Way That We Measure Consumers' Product Involvement Levels: How Wine Awards Exposed Differing Involvement Levels	Universal Journal of Management	4	11	615	620
Nishiyama Y	2023	Wine quality and pricing in the global wine export market: the case of Chilean wines	Applied Economics Letters	30	7	986	990
Noparumpa T; Kazaz B; Webster S	2015	Wine Futures and Advance Selling Under Quality Uncertainty	M&Som-Manufacturing & Service Operations Management	17	3	411	426
Oczkowski E	2018	Modelling prices and the reputation of individual named wines	Applied Economics	50	32	3464	3476
Oczkowski E	2016	The Effect of Weather on Wine Quality and Prices: An Australian Spatial Analysis	Journal of Wine Economics	11	1	48	65
Oczkowski E	2016	Identifying the Effects of Objective and Subjective Quality on Wine Prices	Journal of Wine Economics	11	2	249	260
Oczkowski E	2017	The preferences and prejudices of Australian wine critics	Journal of Wine Research	28	1	56	67

Oczkowski E	2016	Hedonic wine price functions with different prices	Australian Journal of Agricultural and Resource Economics	60	2	196	211
Oczkowski E	2001	Hedonic wine price functions and measurement error	Economic Record	77	9	374	382
Oczkowski E, Doucouliagos H	2015	Wine Prices and Quality Ratings: A Meta-regression Analysis	American Journal of Agricultural Economics	97	1	103	121
Oczkowski E, Pawsey N	2019	Community and Expert Wine Ratings and Prices Between Supply and Demand: Intermediaries, Social Networks and the Construction of Quality in the Italian Wine Industry	Economic Papers	38	1	27	40
Odorici V, Corrado R	2004	Community and Expert Wine Ratings and Prices Between Supply and Demand: Intermediaries, Social Networks and the Construction of Quality in the Italian Wine Industry	Journal of Management & Governance	8	2	149	171
Oleksy P, Czupryna M, Jakubczyk M	2021	On Fine Wine Pricing across Different Trading Venues	Journal of Wine Economics	16	2	189	209
Onur I, Bruwer J, Lockshin L	2020	Reducing information asymmetry in the auctioning of non-perishable experience goods: The case of online wine auctions	Journal of Retailing and Consumer Services	54	102060		
Orth U	2001	Quality signals in wine marketing: the role of exhibition awards	The International Food and Agribusiness Management Review	4	4	385	397
Outreville JF, Le Fur E	2020	Hedonic Price Functions and Wine Price Determinants: A Review of Empirical Research	Journal of Agricultural & Food Industrial Organization	18	2		
Paroissien, E; Visser, M	2020	The Causal Impact of Medals on Wine Producers' Prices and the Gains from Participating in Contests	American Journal of Agricultural Economics	102	4	1135	1153
Parr WV, Green JA, White KG	2006	Wine judging, context and New Zealand Sauvignon Blanc	European Review of Applied Psychology-Revue Européenne de Psychologie Appliquée	56	4	231	238
Parr WV, Green JA, White KG, Heatherbell DA	2004	Exploring the nature of wine expertise: what underlies wine experts' olfactory recognition memory advantage?	Food Quality and Preference	15	5	411	420
Parr WV, Mouret M, Blackmore S, Pelquest-Hunt T, Urdapilleta I	2011	Representation of complexity in wine: Influence of expertise	Food Quality and Preference	22	7	647	660
Parsons AG, Thompson AM	2009	Wine recommendations: who do I believe?	British Food Journal	111	9	1003	1015
Pelet JE, Lecat B	2014	Smartphones and wine consumers: a study of Gen-Y	International Journal of Wine Business Research	26	3	188	207

Penagos-Londoño GI, Ruiz Moreno F, Sellers Rubio R, Del Barrio- García S, Casado-Díaz AB	2022	Consistency of expert product reviews: An application to wine guides	Wine Economics and Policy	11	1	51	60
Priilaid D, Feinberg J, Carter O, Ross G	2009	Follow the leader: How expert ratings mediate consumer assessments of hedonic quality	South African Journal of Business Management	40	4	51	58
Priilaid D, Hall D	2016	Price-quality heuristic correlation with rates of product consumption	British Food Journal	118	3	541	559
Ramirez CD	2008	Wine Quality, Wine Prices, and the Weather: Is Napa Different?	Journal of Wine Economics	3	2	114	131
Reuter J	2009	Does Advertising Bias Product Reviews? An Analysis of Wine Ratings	Journal of Wine Economics	4	2	125	151
Ribeiro T, Corsi A, Lockshin L, Louviere J, Loose S	2020	Analysis of Consumer Preferences for Information and Expert Opinion Using a Discrete Choice Experiment	Portuguese Economic Journal	19	1	67	80
Rihn A, Jensen KL, Hughes D	2023	Quality assurance program provider's influence on wine purchases among Tennessee and US consumers: a multiple indicators multiple causes model analysis	International Journal of Wine Business Research	35	1	142	163
Rizo A, Bartu A, Laguna L, Tarrega A	2023	Effect of an opinion app on expectations and emotional responses of young consumers toward white wines	Food Quality and Preference	103	104706		
Roberts PW, Reagans R	2007	Critical Exposure and Price-Quality Relationships for New World Wines in the U.S. Market	Journal of Wine Economics	2	1	84	97
Rössel J, Beckert J	2012	Quality Classifications in Competition: Price Formation in the German Wine Market	MPIfG Discussion Paper 12/3				
Saenz-Navajas MP, Avizcuri JM, Echavarri JF, Ferreira V, Fernandez- Zurbano P, Valentin	2016	Understanding quality judgements of red wines by experts: Effect of evaluation condition	Food Quality and Preference	48	1	216	227
Santos JF	2011	Promoting Wine on the Internet: An Exploratory Study of the Portuguese Wine Blog Community	International Journal of Online Marketing	1	4	48	63
Sauvageot F, Urdapilleta I, Peyron D	2006	Within and between variations of texts elicited from nine wine experts	Food Quality and Preference	17	6	429	444
Scaman CH, Dou J, Cliff MA, Yuksel D, King MC	2001	Evaluation of wine competition judge performance using principal component similarity analysis	Journal of Sensory Studies	16	3	287	300
Schamel G	2000	Individual and collective reputations indicators of wine quality	CIES Working Paper No. 10				

Schamel G	2004	An Empirical Analysis of Online Auction Prices for Bordeaux Wine	Zeuthen Workshop 2004 - Working Paper				
Schamel G, Anderson K	2003	Wine quality and varietal, regional and winery reputations: Hedonic prices for Australia and New Zealand	Economic Record	79	246	357	369
Schamel G, Gastaldello G	2022	Exploring online community wine ratings: are more popular wines rated higher?	Book of Abstracts of First Conference of the EuAWE - European Association of Wine Economists, Vila Real, Portugal, May 2022	1	1	156	158
Schamel G, Ros A	2021	Indicators of Individual Wine Reputation for Friuli Venezia Giulia	Italian Economic Journal	7	2	323	339
Schiefer J, Fischer C	2008	The gap between wine expert ratings and consumer preferences: Measures, determinants and marketing implications	International Journal of Wine Business Research	20	4	335	+
Schnabel H, Storchmann K	2010	Prices as Quality Signals: Evidence from the Wine Market	Journal of Agricultural & Food Industrial Organization	8	1		
Shapin S	2016	A taste of science: Making the subjective objective in the California wine world	Social Studies of Science	46	3	436	460
Smith B	2019	Getting More Out of Wine: wine experts, wine apps and sensory science	Current Opinion in Food Science	27	1	123	129
Spence C, Wang QJ	2019	Wine expertise: perceptual learning in the chemical senses	Current Opinion in Food Science	27	1	49	56
Steinberger M	2008	Every One a Critic The Future of Wine Writing	World of Fine Wine	18	1	130	135
Stuen ET; Miller JR; Stone RW	2015	An Analysis of Wine Critic Consensus: A Study of Washington and California Wines	Journal of Wine Economics	10	1	47	61
Thode SF, Taylor LW, Maskulka JM	2002	Information Asymmetries in the Pricing of Fine Wines	International Journal of Wine Marketing	14	1	5-13	
Thompson GM, Mutkoski SA	2011	Reconsidering the 1855 Bordeaux Classification of the Medoc and Graves using Wine Ratings from 1970-2005	Journal of Wine Economics	6	1	15	36
Thrane C	2019	Expert reviews, peer recommendations and buying red wine: experimental evidence	Journal of Wine Research	30	2	166	177
Tiwari P, Bhardwaj P, Somin S, Parr WV, Harrison R, Kulasiri	2022	Understanding Quality of Pinot Noir Wine: Can Modelling and Machine Learning Pave the Way?	Foods	11	19		
Tsai CW	2014	The specialized wine language: Comparative study of tasting reviews	Revue Francaise De Linguistique Appliquee	19	1	116	130

Uniyal X, Barthwal P	2017	Wine Quality Evaluation Using Machine Learning Algorithms	Asia-pacific Journal of Convergent Research Interchange	3	4	1	9
Vaamonde A, Sanchez P, Vilarino F	2000	Discrepancies and consistencies in the subjective ratings of wine-tasting committees	Journal of Food Quality	23	4	363	372
Veale R	2008	Sensing or knowing?: Investigating the influence of knowledge and self-confidence on consumer beliefs regarding the effect of extrinsic cues on wine quality	International Journal of Wine Business Research	20	4	352	366
Veale R, Quester P.	2009	Tasting quality: the roles of intrinsic and extrinsic cues	Asia Pacific Journal of Marketing and Logistics	21	1	195	207
Vigar-Ellis D, Pitt L, Caruana A	2015	Does objective and subjective knowledge vary between opinion leaders and opinion seekers? Implications for wine marketing	Journal of Wine Research	26	4	304	318
Villas-Boas SB, Bonnet C, Hilger J	2021	Random Utility Models, Wine and Experts	American Journal of Agricultural Economics	103	2	663	681
Visalli M, Dubois M, Schlich P, Ric F, Cardebat JM, Georgantzis N	2023	A dataset on the sensory and affective perception of Bordeaux and Rioja red wines collected from French and Spanish consumers at home and international wine students in the lab	Data in Brief	46			
Visalli M, Mahieu M, Dubois M, Schlich P	2023	Hedonic valence of descriptive sensory terms as an indirect measure of liking: A preliminary study with red wines	Food Quality and Preference	108	104861		
Vogiatzis D, Pierrakos D, Paliouras G, Jenkyn-Jones S, Possen BJHHA	2012	Expert and community based style advice	Expert Systems with Applications	39	12	10647	10655
Ward DL	2012	A Graphical and Statistical Analysis of the Judgment of Princeton Wine Tasting	Journal of Wine Economics	7	2	155	168
Wei PS, Lu HP	2013	An examination of the celebrity endorsements and online customer reviews influence female consumers' shopping behavior	Computers in Human Behavior	29	1	193	201
Werdelmann T	2014	Quality and Value Creation on the Premium Wine Market	Journal of Applied Leadership and Management	3	1	47	72
Yang CY, Barth J, Katumullage D, Cao J	2022	Wine Review Descriptors as Quality Predictors: Evidence from Language Processing Techniques	Journal of Wine Economics	17	1	64	80
Zhao W, Zhou XG	2011	Status Inconsistency and Product Valuation in the California Wine Market	Organization Science	22	6	1435	1448

A1 Overview of all final papers within the scope of the integrative literature review

The literature illustrates the lingering importance of experts for wine consumer's choice. It also highlights an interesting fact: consumer demand for expert ratings is ambiguous and heterogenous. Multiple empirical studies concur that consumers are receptive to ratings because they reduce their search costs when looking for quality wines. However, only a tiny proportion of wine consumers subscribe to - or purchase - wine media. Wine experts could not survive financially without the support of the trade (e.g. free requested samples, advertising spending).

In the literature, wine quality is commonly split between two components, one subjective (sensory), linked to the nose of the beholder, and one objective (pedoclimatic), based on terroir (Cardebat et al., 2014). The impact of the subjective (sensory) component appears to be more significant than the objective one on wine prices (Combris et al., 1997; Ramirez, 2008). The increasing availability of ratings online mentioned in the introduction reduces the information asymmetry and search cost for wine consumers. But could the availability of the ratings have an impact on the use consumers make of other quality cues usually associated with wine such as Geographical Indication (GI) or the name of the producer (Brand)? We could intuitively expect less involved consumers to place importance on some GIs (e.g., Chablis, Bordeaux).

To assess the *ex ante* prevalence of expert ratings in comparison to other important information like Geographical Indication (GI) and the name of the producer (Brand) in Spain and France, we use an experimental approach. The following chapter, co-authored with Marco Costanigro, Azucena Gracia, and Jean-Marie Cardebat is currently under review in the *American Journal of Agricultural Economics*. This paper contributes to the existing literature by experimentally analyzing how wine consumers value *ex ante* experts' ratings in comparison to other quality cues.

Chapter II - The Information Content of Geographical Indications, Expert Reviews, and Brands: Experimental Evidence from Spain and France

Abstract

We study the effectiveness of Geographical Indications in serving as a signal of quality and facilitating consumer choices. We conduct laboratory experiments in Spain (N=148) and France (N=143) simulating a wine shopping experience in which participants choose between four wines in a limited information environment, and GI information, winery names, and expert review scores are “purchased” in a multiple price listing auction. Data analysis leverages the sequential nature of the auctions, experimental treatments, and a wine knowledge questionnaire to investigate the hierarchical structure and level of redundancy between alternative information sources, the role played by wine prices, and previously acquired expertise. We find that GI labeling generates a consumer surplus between EUR 0.33 (Spain) and EUR 0.37 (France) for each purchasing occasion, and expert reviews provide a similar level of information. These findings are consistent across different price segments (high: €13-€17 vs. low: €4-€7). Firm names have lower average information content but are more useful to high-knowledge consumers. The discussion is structured along three main thematic areas of contribution: the role of GIs as signals of quality, the extant literature studying how consumers interpret quality signals, and the contrast between our findings and the modeling assumption adopted in the GI theoretical literature.

Keywords: Expert ratings, Geographical Indications, Brands, Multiple Price List Auction, Willingness to pay

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2.1 Introduction and motivation

Geographical Indications (GIs) are designations of origin identifying value added food products that, in virtue of *where* and/or *how* they are produced, can stake a claim of both uniqueness and superior quality. The GI strategy constitutes a long-standing centerpiece of the European Union (EU) agricultural policy, and European policy makers invested heavily³⁹ to certify, regulate, promote, and protect designation of origins, emphasizing the instrumental role of GIs in pursuing three fundamental objectives: 1) foster rural development by leveraging cultural heritage; 2) facilitate trade and prevent imitation and fraud, and; 3) support the provision of high quality products and inform consumer choices (e.g. see regulations EC No479/2008 and EU No1151/2012 for agricultural products and foodstuff and 1308/2013 for wine). If one takes adoption and product sales as a measure of success, then the EU GI policies have triumphed. A recent study by the European Commission (2021) lists over 3,200 approved GIs⁴⁰ and sales totaling EUR 74.8 billion in 2017, which grew at a rate of 42% between 2010 and 2017.

Despite the impressive statistics, empirical evidence demonstrating that GIs are actually delivering the expected results remains scant, mixed (Chilla et al. 2020; Török et al. 2020) and largely confined to case studies and qualitative measures⁴¹, fueling a heated debate on theoretical and/or ideological grounds. Since the adoption of Trade-Related Intellectual Property Rights (TRIPS) Agreement by the World Trade Organisation (WTO) in 1994, the “Old World” vs. “New

³⁹ According to a proposal of the European Parliament and of the Council on EU GIs to amend Regulations (EU) No 1308/2013, (EU) 2017/1001 and (EU) 2019/787 and repealing Regulation (EU) No 1151/2012, the administrative cost of the GI public institution is €89.6 million, and the European Commission invested € 185.9 million in activities promoting high-quality, sustainable agri-food products in 2023.

⁴⁰ 1,634 for wine alone, according to eAmbrosia, the official register of GIs approved in the EU (<https://ec.europa.eu/info/e-ambrosia-database>)

⁴¹ Empirical studies on the effect of GIs on high-end agricultural products encompass economic, social, and environmental impacts. A number of case studies have been published on a variety of agricultural products (Vandecastelaere et al. 2020). For a review of the economic impact of GIs see Josling (2006); Cei, Defrancesco and Stefani (2018) and; Török et al. (2020). Recent studies review environmental sustainability (Milano and Cazella 2021) barriers and benefits of GI for producers (Cardoso et al. 2022), the effectiveness of GIs in increasing product quality (López-Bayón, Fernández-Barcala and González-Díaz 2020) and impact of GIs on consumer behavior (Glogoveţan et al. 2022).

World” struggle has generated a decade of discussion over the desirability of GI protection (Ilbert and Petit 2009; Monten 2005; Agdomar 2007; Frantz 2016; Goebel and Groeschl 2014; Song and Wang 2022; Addor and Grazioli 2002), with some authors even questioning whether GIs actually diminish consumer confusion (Raustiala and Munzer 2007).

Obvious challenges to quantifying generalizable and causal effects of GI policies include endogeneity of the adoption process, limited within data variation (once approved, GI status is never lost), and the difficulty of finding believable controls (GI designations are, by definition, unique). Exceptions include a few difference-in-difference studies such as Cei et al. (2018), who find a positive effect of GI adoption on agricultural value added, and Haeck et al. (2019), who show that wines prices increased in Champagne in the early nineteenth century after GI adoption but observe no similar impact in other wine regions. Curzi and Huysmans (2022) use a structural gravity model with fixed effects and find no evidence of trade boosting effects. This study provides a first assessment of the effectiveness of GIs as a quality signal, presenting empirical estimates of the consumer surplus generated by the certification system for the wine market. Based on laboratory experiments with EU consumers, we find that GI information generates a consumer surplus between EUR 0.33 (Spain) and EUR 0.37 (France) for each wine purchasing choice.

To say that no previous work evaluated the effectiveness of GIs at informing consumer choices may sound absurd. In fact, a vast hedonic literature (see Deselnicu et al., 2013 for an early meta-analysis) has long-established that many agricultural products from GI-protected areas extract a price premium, a finding that originated a literature on the role of GIs as vehicle for collective reputations (Winfree and McCluskey 2005; Costanigro, McCluskey and Goemans 2010; Castriota and Delmastro 2015). Evidence from demand studies, choice and laboratory experiments (e.g., Stasi et al. 2011; Menapace et al. 2011; Gustafson, Lybbert and Sumner 2016; Costanigro, Scozzafava and Casini 2019; Slade, Michler and Josephson 2019) similarly find that GI labels shift demand outward for several food products. However, while consumers’ reaction to GI labeling implies that designations of origin do matter, hedonic or WTP premia merely measure

the value that the market or consumers assign to perceived quality differences (between a given GI and non-GI product, or two GIs).

The *value* of an information source on the other hand is much harder to capture from observational data and can be conceptualized as how much a consumer would be willing to spend (or search, which is costly, see Stigler 1961) to obtain the information before purchasing a product of uncertain quality. As first pointed out in Klain et al. (2013) in a US study on country-of-origin labeling for beef, the value of information is an *ex-ante* concept that can be measured directly with experimental methods. Other recently proposed measures center on the idea of *terroir* (Ay, 2021), equating the information content of GIs to their ability to reveal differences in pedoclimatic conditions; however, we argue that ultimately any assessment of the value of this information needs to be filtered through the consumer judgement. Livat et al. (2019) analyzed the level of cointegration in prices across designation of origin in Bordeaux to assess whether GIs really drive product differentiation, but the challenge here is separating demand-driven effects from correlated supply shocks. To eliminate these confounding factors, we designed a laboratory experiment simulating a wine shopping experience in which participants choose between four wines in a limited information environment, and GI information could be “purchased” by participating in a multiple price listing auction (Andersen et al. 2006). In a pre-purchase scenario, the value of an information source is proportional to its ability to accurately reveal quality differences relevant for consumer choice and provides a direct measure of how much GIs facilitate consumer choices.

Our experiments were conducted with balanced panels of wine consumers in Spain (N=148) and France (N=143), two major wine producing/consuming EU countries. The wine market is an extremely relevant context for studying GIs for both historical (GIs originated with wine, see Meloni and Swinnen (2018)) and economic reasons (wine accounts for 51% of the value of the GI sales, European Commission (2021)); but, at the same time, wine is an extremely complex product, with prices ranging from the cost of a cup of coffee to the price of an airline ticket. In addition to GIs, quality cues driving consumer choices include the vintage, the winery,

the grape variety, the presence of awards and/or expert reviews scores (Sáenz-Navajas et al. 2013; Lockshin et al. 2006; Stanco, Lerro and Marotta 2020), implying that the role of GIs as an information vehicle cannot be studied in isolation from other factors. Accordingly, our experiments measure the relative information content of GIs, winery names, and expert reviews, examining the hierarchical structure or level of redundancy between alternative information sources; and the role played by wine prices and consumer wine knowledge and expertise.

The theoretical literature studying the welfare implication of GIs largely focuses on how designations of origin may incentivize the provision of high quality products (e.g. Zago and Pick 2004; Moschini, Menapace and Pick 2008; Menapace and Moschini 2012), avoiding the lemons outcomes typical of markets with asymmetric information (Akerlof 1970), or the intra-region producer dynamics induced by GIs or other reputation dynamics (Costanigro, Bond and McCluskey 2012; Yu, Bouamra-Mechemache and Zago 2018). Our experiments deliberately abstract from consumers' valuation of quality and its provision to focus on the value of the information signal of GIs as a labeling scheme. As such, we are not interested in testing the predictions of these models. Rather, our results provide an assessment of the behavioral assumptions at the foundation of this literature, especially as it pertains to consumers' interpretation of GIs as quality cues. In the following section we provide a summary of the relevant literature in industrial organization and wine economics, and present the hypotheses tested.

2.2 Conceptual framework and research hypotheses

The conceptual framework for our experiments (see Figure 12) lays its foundations in the broader literature on producer reputations.

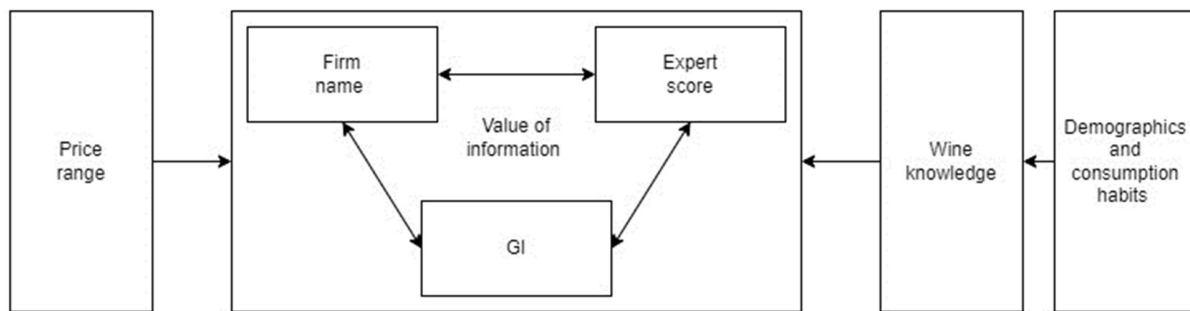


Figure 12 - Conceptual framework

Reputations play an essential role in markets for experience goods, such as wine, where quality is unknown to the consumer until after purchase and can be modeled as subjective quality expectations (Shapiro 1983) formed by consumers based on past product experiences, word of mouth/advertisement, or other third party sources of quality information. In the case of wine and many other food products nested reputations can arise (Costanigro et al. 2010), as consumers associate quality expectations with brand names (winery reputation, private), but also with the region of production (collective reputation, shared by many wineries see Winfree and McCluskey (2005)). Costanigro et al. (2010) noted how reputations could be categorized based on the accuracy of a quality expectation, which they refer to as the level of specificity, and the search costs necessary to form them. Quality expectations associated with regions of production can be formed with a relatively low search cost, but they tend to have low specificity because of product variability within a region of production. The reputation one associates with a winery is much more specific and will predict quality more accurately but requires greater search costs and expertise to form and use. Indeed, Gustafson et al. (2016) present experimental evidence of how wine knowledge moderates bid-updating in response to the provision of new wine label information.

Further complicating matters, technology is changing the ways in which consumers search for information. In addition to reputations, experts scores provide a source of quality information accessible from printed/online sources (Wine Spectator, Decanter) or mobile apps (e.g., CellarTracker, WineRatings+ by Wine Spectator, Robert Parker), and are often displayed at the

store alongside with price and other product information. Expert scores represent a source of quality information alternative to the classical reputation mechanisms and have been shown to shift demand (Villas-Boas, Bonnet and Hilger 2021; Hilger, Rafert and Villas-Boas 2010; Friberg and Grönqvist 2012). If a consumer trusts and conforms to the quality criteria of the reviewer, scoring systems can provide extremely specific quality information (up to the vintage of a particular wine from a particular winery). With the ubiquitous spread of mobile phones, the cost of acquiring information via expert reviews has decreased substantially, but it is not clear whether expert scores substitute or complement more traditional sources of information. If, at least for some consumers, expert reviews supersede the usefulness of the GI signal, the effectiveness of a marketing strategy based on GI may be diminished.

In addition to reputations and experts' reviews, product prices can play a pivotal role by modulating the incentive to search, in two fundamental ways: 1) as the price of an experience good grows larger, the incentive to collect information grows larger and 2) the cost of learning by direct experience increases, encouraging the collection of quality information via third-party expert opinions. Reputation dynamics will therefore differ across products in different price ranges. For example, cheaper agricultural products tend to develop only collective reputations linked to GIs, but no firm-specific brand reputations (Deselnicu et al. 2013).

The intuition we presented so far can be distilled in three broad sets of hypotheses, which were pre-registered before data collection⁴² as a general line of inquiry.

- I. On average, more specific information (expert scores) is valued more than less specific information (GIs).

⁴² The experiments were pre-registered on 2/28/22 on the aspredicted.org platform before starting experiments in Spain (#89414). The experimental framework was modified for France, after we observed a null result for the effect of price in Spain. "No plan survives first contact with the enemy" (Helmut Von Moltke)

- II. On average, valuation of a given source of information decreases as more information is available. The magnitude of this decrease depends on the order of information. We expect more specific information (e.g., expert scores) to trump less specific information (GIs).
- III. Moderating variables: Wine Knowledge and Price Range
- Consumer wine knowledge moderates the value of information for GIs, brands, and expert reviews. We expect that more knowledgeable consumers will value brand information more, while less experienced consumers may rely more on GIs or expert scores.
 - For a given source of information, the value of information increases when product prices are high.
 - Consumers will tend to prefer more specific information when buying expensive wines.

2.3 Experimental procedures

The experiments simulated a wine shopping experience in a limited information environment, where important quality cues (GI, expert reviews, winery) were made available only through the multiple price listing (MPL) auction process. All participants received a €20 endowment and were required to purchase one of four red wines for sale, all in a similar price range.

Experimental treatments

The two studies were comprised of 12 sessions of 12-15 participants, following the experimental design outlined in Table 9.

Location	Sess. #	Endowed Information	Price Level	First (Practice)	Second	Third	Fourth
Spain	1	Alc. %, Variety, Price	Low (<€8)	Juice	Firm	GI	Score
	2	Alc. %, Variety, Price	High (>€12)	Juice	Firm	GI	Score
	3	Alc. %, Variety, Price	Low (<€8)	Juice	Firm	Score	GI
	4	Alc. %, Variety, Price	High (>€12)	Juice	Firm	Score	GI
	5	Alc. %, Variety, Price	Low (<€8)	Juice	GI	Firm	Score
	6	Alc. %, Variety, Price	High (>€12)	Juice	GI	Firm	Score
	7	Alc. %, Variety, Price	Low (<€8)	Juice	Score	Firm	GI
	8	Alc. %, Variety, Price	High (>€12))	Juice	Score	Firm	GI
	9	Alc. %, Variety, Price	Low (<€8)	Juice	GI	Score	Firm
	10	Alc. %, Variety, Price	High (>€12)	Juice	GI	Score	Firm
	11	Alc. %, Variety, Price	Low (<€8)	Juice	Score	GI	Firm
	12	Alc. %, Variety, Price	High (>€12)	Juice	Score	GI	Firm

Location	Sess. #	Endowed Information	Price Level	First (Practice)	Second	Third	Fourth
France	1	Alc. %, Variety, Price	High (>€12)	Juice	Firm	GI	Score
	2	Alc. %, Variety, Price, Firm	High (>€12)	Juice	-	GI	Score
	3	Alc. %, Variety, Price	High (>€12)	Juice	Firm	Score	GI
	4	Alc. %, Variety, Price, Firm	High (>€12)	Juice	-	Score	GI
	5	Alc. %, Variety, Price	High (>€12)	Juice	GI	Firm	Score
	6	Alc. %, Variety, Price, GI	High (>€12)	Juice	-	Firm	Score
	7	Alc. %, Variety, Price	High (>€12)	Juice	Score	Firm	GI
	8	Alc. %, Variety, Price, Score	High (>€12)	Juice	-	Firm	GI
	9	Alc. %, Variety, Price	High (>€12)	Juice	GI	Score	Firm
	10	Alc. %, Variety, Price, GI	High (>€12)	Juice	-	Score	Firm
	11	Alc. %, Variety, Price	High (>€12)	Juice	Score	GI	Firm
	12	Alc. %, Variety, Price, Score	High (>€12)	Juice	-	GI	Firm

Table 9 - Experimental design

In Study I, two experimental treatments were administered in a between subject design: the order in which the information was auctioned (all 9 permutations), and the price range of the wine for sale (high: €13-€17 vs. low: €4-€7). Study II differed from study I in that the price level treatment was replaced by an exogenous (rather than bid-dependent) information treatment. Namely, in half of the sessions (6/12), the first auction was not conducted, and the corresponding information was awarded for free to all participants. This change in the protocol was driven by the fact that the price treatment in Study I produced a null result, and, rather than replicating this result, it was deemed more important to include a treatment in which the acquisition of information was exogenous, rather than linked to subjective valuation.

The wine purchased by each participant is not relevant *per se* to our study objectives, but the choice environment created by wines for sale is an important factor of the experimental design. In the real-world, consumers can choose among thousands of wines, with many options and possible combinations, creating a “dense” attribute space. The constraints of an experimental auction on the other hand create a “lumpy” space, and a poor choice of attributes could lead participants to a corner solution, where no wine is acceptable, or one of the wines is surely preferred regardless of any additional information. As such, the choice of the wines for sale (see table A1 in appendix) balanced logistical needs (availability in sufficient quantity, existence of

expert review scores) with an attempt to make our results as general as possible. Our wine selection aimed at creating an environment in which participants would engage in an evaluation of the tradeoffs implied by the characteristics of each wine, so that the auctioned information remained salient.

2.3.1 Experimental protocol

Figure 13 details the major steps and sequencing of the experimental protocol for Study I and II, which we briefly summarize here.

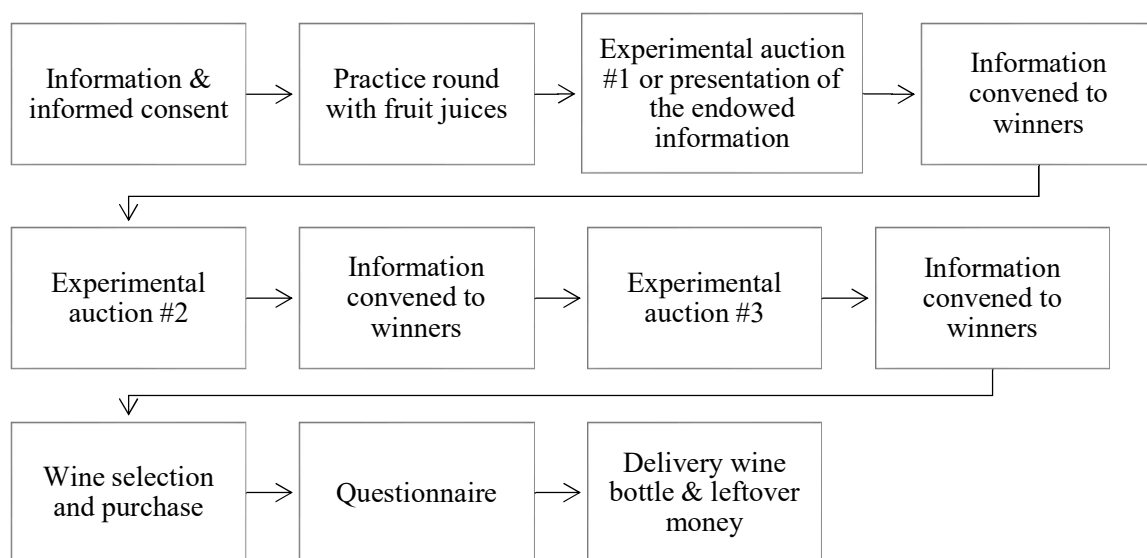


Figure 13 - Main steps of the experimental protocol for Study I and Study II

Study I received approval from the ethics committee of the Agrifood Center of Aragon (Zaragoza, Spain, reference CEISH_2022_1); while Study II received approval from the Burgundy School of Business (Dijon, France) Research Ethics Committee (reference: CERBSB2022-31). The participants were informed of the conditions for participating and validated an informed consent form. All sessions started with a practice round elucidating the MPL mechanism (Andersen et al. 2006).

In this practice auction participants selected between four fruit juices in a limited information environment: the nutritional information and price of each juice was made available,

but knowledge of the juice flavor (e.g., apple, grape, pineapple, orange) could only be “purchased” through the MPL auction. While the 20cl fruit juice was given for free in the practice round, it was made clear that in the wine experiments participants would have to use their own money to pay for the chosen wine and any information acquired through auction. No communication between participants was allowed for the duration of the experiment and no identifying data was collected, granting anonymity.

After the practice round, participants received their preferred fruit juice, and the wine information auction (geographical indication, brand name of the winery, expert reviews) were conducted according to the experimental design in Table 9. At the beginning of the first wine information auction, participants received a description of the four wines for sale (see figure A2 in appendix) which included market prices, grape variety, and alcohol content. Then, participants were made aware that additional information would be available for purchase in a series of three auctions. The nature of the information auctioned was revealed only at the beginning of each auction, to avoid any anticipatory effects. The monitor emphasized that all information revealed throughout the experiment was accurate, including wine prices, which reflected how much was paid by the authors to acquire the wines.

In all auctions, including the practice one, participants could state a WTP between €0 and €0.5, in increments of €0.05. At the end of each auction, a market price was randomly drawn, and the monitor identified participants reporting a willingness to pay higher than the market price. The market price was then subtracted from the individual’s money sheet, and the auctioned information (for all wines/juices) was delivered in a sealed envelope. At the end of the auctions, participants completed a demographics and objective wine knowledge⁴³/shopping behavior

⁴³ To measure objective wine knowledge, we adapted the questionnaire developed by Frøst and Noble (2002) and employed by Gustafson, Lybbert and Sumner (2016) to the Spanish and French wine market. See appendix, table A3

questionnaire and received their participation endowment of €20, net of all information and wine purchased.

2.3.2 Inclusion criteria, recruitment, and logistics

Study I was conducted in Zaragoza, Spain, in March-April 2022, and Study II in Dijon, France in July-September 2022. Both studies used local market research companies to organize the recruitment of the consumer panel and manage some logistics. In both studies, quotas on individual characteristics (e.g., age, gender, and education level) were established to obtain a representative and balanced panel of wine consumers. In Spain, experiments were conducted in multiple locations in Zaragoza including civic centers, consumer associations, and university classrooms (see figure A1 in appendix). In France, experiments were conducted at the sensory lab of the Burgundy School of Business (Dijon, France). Inclusion criteria required participants to (1) be 18 or older and, (2) declare themselves wine consumers. Pregnant women and underage participants were excluded from the study.

The protocol was first developed in Spanish for Study I and tested in a pilot session to check the experimental procedure, the duration of the sessions, and the appropriateness of the price range and increments included in the MPL. The protocol of study II was accordingly adapted to include the differences in experimental design; and the informed consent, information, instructions, and questionnaire of the experiment were translated into French before being back-translated into Spanish to ensure correspondence.

2.4 Modeling approach and estimation methods.

Multiple price listing auctions generate interval, right-censored WTP data⁴⁴. We adopt a panel setting to acknowledge the sequential nature of the auctions, and the most basic specification of our value of information model is:

⁴⁴ The minimum bid (€ 0) is discrete point data as negative WTP for information is not reasonable here.

$$(1) \quad Bid_{ijt} = \beta_1 (Juice_{jt}) + \beta_2 (Firm_{jt}) + \beta_3 (GI_{jt}) + \beta_4 (Score_{jt}) + \gamma_t + \alpha_i + \varepsilon_{ijt};$$

where $i = 1, 2, \dots, N$ indexes the individual, $j = 1, 2, \dots, 12$ the experimental session, and $t = 0, 1, 2, 3$ the auction number. Note that $t = 0$ always corresponds to the practice round auctioning information about fruit juices, which we include to provide a point of reference, and the model is fitted without a constant term. $Juice_{jt}$, $Firm_{jt}$, GI_{jt} , $Score_{jt}$ are binary variables indicating the type of information auctioned at time t in session j , according to the experimental design in Table 9. Therefore, β_k $k = 1, \dots, 4$ represent the average valuation of each information source. γ_t are intercepts netting out of the error term any learning or ordering effects, while the residual include individual-specific effects α_i , which can be thought of as an individual's tendency to bid high (or low) for any type of information, plus the idiosyncratic error term ε_{ijt} . Subscripts to distinguish the Spanish and French experiments are omitted for simplicity, while session-specific intercepts δ_j were only included in robustness checks and deemed unnecessary.

When measuring the effect of between-subject experimental treatments or subject-specific covariates we are interested in the average effect on all bids, and/or the label-specific effects. If x_{ijt} is such a variable, label-specific effects are captured via interaction terms, as in

$$(2) \quad Bid_{ijt} = \beta_2 (Firm_{jt}) + \beta_3 (GI_{jt}) + \beta_4 (Score_{jt}) + \beta_5 (x_{ijt} * Firm_{jt}) + \beta_6 (x_{ijt} * GI_{jt}) + \beta_7 (x_{ijt} * Score_{jt}) + \gamma_t + \alpha_i + \varepsilon_{ijt};$$

for $t = 1, 2, 3$, while an overall average effects can be measured by omitting the interaction terms in (2) and adding a main effect $\beta_5 x_{ijt}$. More complex models arise when considering multiple covariates, but the logic remains the same. One will note that equation (2) omits the estimates

(and data) from the $t=0$ practice auction, as all treatments and covariates of interest are ostensibly unrelated to the practice auction bids⁴⁵.

Owing to the interval nature of MPL data, regression models are typically estimated via random-effect interval regression (e.g Andersen et al. 2006; Asioli, Mignani and Alfnes 2021), a MLE estimator based on the assumption that α_i is i.i.d. $N(0, \sigma_\alpha^2)$, ε_{ijt} is i.i.d. $N(0, \sigma_\varepsilon^2)$, and the individual-specific effects are uncorrelated with the regressors. This assumption is certainly appropriate for model (1), and whenever x_{ijt} in model (2) captures elements randomized through the experimental design. This would include whether the wine auctioned were in the high vs. low price range (Study I, Spain) or the type of wine information awarded for free to a subset of participants (Study II, France).

However, estimating how information acquired through auctions affects subsequent bids, or the effect of subject-specific covariates such as wine knowledge is more problematic. For the case of previously acquired information, x_{ijt} is a dummy variable indicating whether individual i has “purchased” a specific kind of information in a previous auction. If we define bid_{jt}^* as the randomly drawn market price of the information auctioned in session j in round t then $x_{ij(t=2)} = I\{bid_{ij(t=1)} \geq bid_{j(t=1)}^*\}$ and $x_{ij(t=3)} = I\{bid_{ij(t=1)} \geq bid_{j(t=1)}^*\} + I\{bid_{ij(t=2)} \geq bid_{j(t=2)}^*\}$, where j includes only the sessions in which a specific label was auctioned in the given time period. For example, if one is interested in measuring the effect of having purchased firm information in Study I (Spain), then (see Table 9) $j = 1, 2, 3, 4$ for $I\{bid_{ij(t=1)} \geq bid_{j(t=1)}^*\}$ and $j = 5, 6, 7, 8$ for $I\{bid_{ij(t=2)} \geq bid_{j(t=2)}^*\}$.

⁴⁵ This only matters when measuring the average effect of $\beta_S x_{ijt}$, which would be biased towards zero if we included the juice data.

It is obvious that, owing to incentive-compatibility, individuals having a tendency to bid higher (have larger α_i) are more likely to receive the information, which makes access to information endogenous. Fixed-effects interval regression models based on the normal distribution suffer from the incidental parameter problem, and, to the best of our knowledge, alternative estimators have yet to be developed. One simple solution we adopt here is to treat the data as point rather than interval (e.g., only consider the lower bound of each interval), and then proceed with traditional within estimation. This will bias (downward) the estimates of the label-specific constants in equation (2), but will not otherwise influence interaction terms measuring *differences* in bids across auction rounds.

This approach is not available when studying the effect of wine knowledge, because $x_{ijt} = WineKnow_{ij}$ is a time-invariant subject-specific covariate. In this case, we want to determine whether high knowledge consumers tend to bid more (or less) for certain types of information. Individuals with larger α_i may be particularly keen to receive information before making any decision (including the fruit juice they will receive), or simply enjoy “winning” the auctioned information more than they care about (or understand) the monetary incentives in the auctions. The concern is that wine knowledge may correlate with α_i , positively or negatively, thereby biasing the estimates. Our solution here is to eliminate individual specific effects by subtracting each individuals’ bid for fruit juice information from the bids in the wine information.

Since $Bid_{ij(t=0)} = \beta_1 (Juice_{jt}) + \alpha_i + \varepsilon_{ijt}$, this generates the model:

$$(3) \quad \begin{aligned} (Bid_{ijt} - Bid_{ij(t=0)}) &= (\beta_2 - \beta_1)(Firm_{jt}) + (\beta_3 - \beta_1)(GI_{jt}) + (\beta_4 - \beta_1)(Score_{jt}) + \\ &+ \beta_5(x_{ijt} * Firm_{jt}) + \beta_6(x_{ijt} * GI_{jt}) + \beta_7(x_{ijt} * Score_{jt}) + \gamma_t + \eta_{ijt} \end{aligned}$$

for $t = 1, 2, 3$; where individual-specific effects have been removed, and $\eta_{ijt} = (\varepsilon_{ijt} - \varepsilon_{ij(t=0)})$, so that equation (3) can be estimated via interval regression.

2.5 Data and Estimation Results

Table 10 presents the sociodemographic descriptors for study 1 and 2, compared to the national averages, and descriptive statistics for the wine knowledge test.

	Spain		France	
	Population	Sample n=148	Population	Sample n=144
Female (%)	51.0 ¹	54.0	51.7 ³	52.8
Age (%)	Spain: [0.342 (0.843)] ^a France: [25.895 (<.001)] ^a			
18–34	20.8 ¹	25.7	19.7 ³	25.0
35–54	36.3 ¹	26.3	25.4 ³	38.9
≥ 55	42.9 ¹	48.0	33.7 ³	36.1
Education level (%)				
Primary	32.5 ²	16.3	17.5 ³	2.8
Secondary	27.7 ²	27.9	41.5 ³	22.9
Higher	39.7 ²	55.8	40.9 ³	74.3
Income level (%)				
≤ €1500 /month	N/A	33.3	N/A	11.1
€1501–€2500/month	N/A	26.5	N/A	29.2
€2501–€3500/month	N/A	19.7	N/A	24.3
> €3500/month	N/A	20.4	N/A	35.4
Household size	N/A	2.76	N/A	2.25
Wine Knowledge Score				
	Mean	N/A	N/A	8.6
	(s.e.)	N/A	N/A	(4.7)

Table 10 - Sociodemographic, economic characteristics, and objective wine knowledge by study

¹ INE (2021). <https://www.ine.es/jaxi/Tabla.htm?path=/t20/e245/p08/10/&file=02003.px&L=0>. Accessed 25.04.2022

² Eurostat 2021. Population aged 25-64 by educational attainment level, sex, and NUTS 2 regions (%). <https://appsso.eurostat.ec.europa.eu/nui/show.do>. Accessed 25.04.2022

³ INSEE (2021) - https://www.insee.fr/fr/statistiques/6024136#tableau-figure6_radio1 & <https://www.insee.fr/fr/statistiques/6535231?sommaire=6535307&q=%C3%A9ducation> Accessed 20.04.23

Both the Spanish and French samples are approximately balanced in terms of female/male representation. The French sample is somewhat more affluent and better educated than the Spanish sample. The main thing to note about the wine knowledge variable is the dispersion in test scores, which suggests significant variation in the sample. While the Spanish sample produced a higher average test score, the specific questions were different in each country (see table A2), so scores are cardinally comparable only within each study.

Table 11 presents the estimates of the average value of information for the Spanish and French data estimated via random effect interval regression, with standard errors based on asymptotic theory.

	Spain		France	
JuiceType	23.72	***	26.52	***
	-1.34		-1.67	
Firm	27.4	***	28.08	***
	-1.64		-2.47	
GI	33.32	***	36.94	***
	-1.67		-2.66	
Score	35.25	***	37.4	***
	-1.66		-2.67	
Gamma2	3.23	**	-3.53	
	-1.62		-2.47	
Gamma3	0.38		-0.62	
	-1.62		-2.5	
sigma_u	8.97	***	11.46	***
	-0.88		-1.16	
sigma_e	13.45	***	16	***
	-0.2		-0.24	
Rho	0.31		0.34	
	-0.04		-0.05	
Number of observations	592		503	

*** $p < .01$, ** $p < .05$, * $p < .1$

^a: a pairwise Wald test of equality of coefficients between Study I and Study II does not reject the null hypothesis. $\chi^2_{(4)} = 4.82$; $p = 0.31$

Table 11 - Value of information^a for juice type, winery name, GI, score

Confidence intervals are depicted in Figure 14.

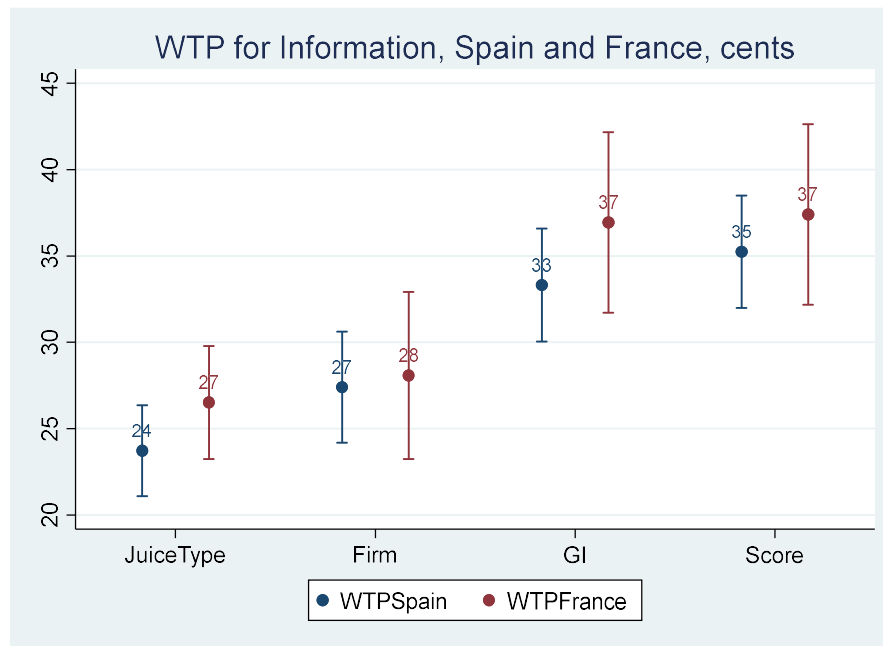


Figure 14 - Average value of information in Spain (blue) and France (red) with confidence intervals

WTP estimates are strikingly similar when comparing Study I and Study II: expert reviews is the most valued source of information (€35.2 in Spain vs €37.4 in France), followed by the geographical indications (€33.3 in Spain vs €36.9 in France), and the winery name (€27.4 in Spain vs €28 in France). A joint test of pairwise equality of parameters across Study I and II did not reject the null hypothesis $\chi^2_{(3)} = 0.95$, $p = 0.81$. Results also display logical coherence, in that valuation of the juice flavor was lowest in both samples (€23.7 in Spain vs €26.5 in France), as one would expect. The 95% confidence intervals in Figure 14 imply that, while point estimates differ, the valuations of GI and expert reviews information are not statistically different, and the same is true for winery name vs. juice information. In both samples, more than 30% of the panel variance can be attributed to the individual-specific effects.

Table 12 shows how the between-subject experimental treatments (price range in Study I, and free information in Study II), affect valuation for information. In both cases, estimates imply a null result. The first column of Table 11 shows that, on average, bids in higher wine price sessions are not statistically different from the lower price ones. When interacted with each label,

two of the coefficients are non-significant, while bids for score information were about €6 lower than in the high price sessions, possibly a type II error. In study II, neither specification shows any change in valuation when one of the information sources is endowed during the first auction.

	Study I: Price Range				Study II: Exogenous Info				
	Avg. Effect		By Label		Avg. Effect		By Label		
Firm	28.82	***	28.69	***	Firm	28.39	***	28.07	***
	-2.07		-2.27			-2.76		-2.75	
GI	34.8	***	33.36	***	GI	37.46	***	37.27	***
	-2.09		-2.28			-2.95		-2.95	
Score	36.93	***	38.7	***	Score	37.91	***	38.56	***
	-2.09		-2.33			-2.96		-2.96	
HighPrice	-2.74				InfoGiven	-0.19			
	-2.13					-2.93			
Firm*HighPrice			-2.38		FirmGiven			-3.64	
			-2.98					-4.16	
GI*HighPrice			0.56		ScoreGiven			5.88	
			-3.02					-4.28	
Score*HighPrice			-6.53	**	GIGiven			-2.37	
			-3.05					-4.13	
Gamma2	3.29	*	3.27	*	Gamma2	-3.68		-3.76	
	-1.86		-1.85			-2.79		-2.79	
Gamma3	0.37		0.27		Gamma3	-0.65		-0.76	
	-1.85		-1.84			-2.82		-2.82	
N	444		444		N	360		360	

*** p<.01, ** p<.05, * p<.1

Note: variance estimates omitted

Table 12 - Effect of varying price range (Study I, Spain) and exogenously provided information (Study II, France).

The estimates in Table 13 pertain to models investigating the moderating effect of wine knowledge/expertise on the perceived value of each information source. For each study we present selected estimates from the random effect model (RE) and the transformed dependent variable, fixed effect-type (FE) approach presented in equation (3). While the absence of α_i suggests estimation via pooled interval regression (with cluster-robust standard errors), for the sake of comparison we present estimates for the random effect estimator, which remains

consistent and equivalent to pooled regression under the null hypothesis of no individual-specific effects. Additionally, we present estimates for two alternative measures of objective wine knowledge: in the upper panel we use the (standardized) wine knowledge score of each participant, a specification assuming a constant, linear effect. In the lower panel, we estimate a contrast between the individuals in the top quartile of the wine knowledge distribution and the rest of the sample, thereby allowing for nonlinearities.

	RE Spain		FE Spain ^b		RE France		FE_France ^b	
(STD.W.Know)*Firm	2.41	*	2.78	**	1.09		-0.28	
	-1.28		-1.2		-1.72		-1.63	
(STD.W.Know)*GI	2.22	*	2.67	**	0.24		-1.7	
	-1.29		-1.21		-1.77		-1.68	
(STD.W.Know)*Score	-1.34		-0.99		-1.94		-3.57	**
	-1.31		-1.23		-1.78		-1.69	
sigma_u	8.99	***	4.64	***	11.47	***	6.66	***
	-0.87		-0.92		-1.17		-1.18	
sigma_e	13.38	***	13.56	***	16	***	16.34	***
	-0.2		-0.29		-0.24		-0.33	
N	592		592		503		503	
(High Knowledge)*Firm	1.43		1.57		3.86		2.8	
	-3.31		-3.09		-5.34		-5.15	
(High Knowledge)*GI	6.48	*	6.7	**	5.15		3.35	
	-3.4		-3.19		-5.72		-5.56	
(High Knowledge)*Score	-2.95		-3.05		-13.36	**	-13.45	***
	-3.39		-3.18		-5.26		-5.01	
sigma_u	8.98	***	4.71	***	11.5	***	6.94	***
	-0.88		-0.92		-1.16		-1.16	
sigma_e	13.44	***	13.62	***	15.85	***	16.21	***
	-0.2		-0.27		-0.24		-0.33	
N	592		592		503		503	

*** p<.01, ** p<.05, * p<.1

^a: estimates for the label-specific intercepts and auction number dummies omitted.

^b: Wald test of equality of parameters between Study I (Sp_2) and Study II (Fr_2): $\chi^2_{(3)} = 9.35$, p=0.02; $\chi^2_{(3)} = 7.03$, p=0.07

Table 13^a - Effect of objective wine knowledge on WTP for Firm, GI, Score in study I (Spain), and study II (France)

First, we draw attention to the differences between the random effect vs. transformed dependent variable estimates. If one considers the panel-level estimates of the variance (σ_u), they will note that, while not fully eliminated, subtracting the practice round bid from the wine information auctions bids consistently diminished (by about half) the noise variation attributable to the individual-specific effects. However, differences between the estimates from the two models are small, suggesting that perhaps endogeneity and correlation with other omitted determinants of the value of information may not be a significant concern for the case of objective wine knowledge. Notably, standard errors tend to be smaller for the transformed dependent variable model, so we interpret the corresponding results.

A comparison of the estimates from study I (Spain) and study II (France) shows that, while the estimates differ across locations, their logic and interpretation remain consistent. In Spain, we find that a one-standard-deviation increase in wine knowledge corresponds to an increase in bids of about € 2.5 for GI and firm information, and no significant effect for score information. Results from France show no increase in bids for GI and firm information, but a significant decrease in the valuation for score information (€3.5). When considering the top quartile in knowledge (vs. the rest), we measure an increase of €6.7 for GI information in Spain, and a sizable €13.5 discount for score information in France.

Table 14 shows how information acquired through the MPL auction process changes bids in later auctions. Even though we found no evidence that endowing information changes bidding behavior (see right side of Table 14), to avoid any confounding effects we exclude from this analysis all participants who received endowed information, thereby halving the sample size for study II. The table includes the sample percentage who, at the beginning of each auction, had purchased an information type. For example, in the Spanish experiment no one possessed information about winery names at the beginning of the first wine auction (by design). At the beginning of the second auction, 12 percent of participants received such information, and the

percentage increased to 25 percent before the last auction. We present random effect and fixed (within) effect estimates for the model in equation (2) in the right side of the table.

	Spain					
	% Sample by Auction #			Estimates by model		
	1	2	3	Random Effect	Fixed Effects	
Purchased Firm Info	0%	12%	25%	-9.67 ***	-14.08 ***	
				-2.69	-2.44	
Purchased GI Info	0%	11%	28%	0.6	-1.54	
				-2.62	-2.45	
Purchased Score Info	0%	32%	56%	-1.78	-8.37 ***	
				-2.5	-2.37	
Gamma2	-	-	-	4.89 ***	7.5 ***	
				-1.87	-1.61	
Gamma3	-	-	-	3.46	8.72 ***	
				-2.42	-2.14	
Number of observations				592	592	
	France					
	% Sample by Auction #			Estimates by model		
	1	2	3	Random Effect	Fixed Effects	
Purchased Firm Info	0%	27%	30%	-4.31	-9.9 **	
				-4.34	-3.97	
Purchased GI Info	0%	23%	50%	-7.61	-14.26 ***	
				-4.69	-4.18	
Purchased Score Info	0%	22%	39%	-1.87	-10.67 ***	
				-4.66	-4.09	
Gamma2	-	-	-	-0.2	5.96 **	
				-3.67	-2.94	
Gamma3	-	-	-	4.54	13.7 ***	
				-4.95	-3.96	
Number of observations				296	296	

*** p<.01, ** p<.05, * p<.1

^a: estimates for the label-specific intercepts omitted.

Table 14^a - Percent of sample who purchased information and its average effect on subsequent bids.

A first observation is that, by the last auction about a quarter of participants in study I (Spain) received firm and GI information, while more than half received expert reviews. In study II

(France), about a third of participants stated their last bid having received firm and expert reviews, while a full half had purchased GI information. This is consistent with the results in Table 11, showing slightly higher valuations in France. A comparison of the random and fixed effects estimates suggests that, as we anticipated, endogeneity is a problem in this case, biasing the random effect estimates towards zero in both experiments. Accordingly, we focus the interpretation on the fixed effect estimates. It is also worth pointing out how the standard errors tend to be larger in study II, owing to the smaller sample size.

Results from both studies show that, on average, people who purchase information in earlier auctions tend to decrease their bidding in the following ones. The auction number estimates (γ_2 , γ_3) on the other hand imply that, holding constant the information received, participants tend to increase bids in later auctions. The observed reduction in bids after receiving a certain type of information can be interpreted as a measure of redundancy between information sources, and more useful information sources will make other signals redundant or not needed. In study I (Spain), those who received firm information reduced their subsequent bids the most ($-\phi 14$), followed by expert reviews ($-\phi 8$), while the estimate for GI is non-significant (a test of equality of coefficients rejects the null $\chi^2_{(2)} = 12.58$ $p = 0.002$). In France, GI information is associated with the largest average reduction ($-\phi 14$), followed by expert reviews ($-\phi 10.6$) and winery names ($-\phi 9.9$), but the confidence intervals are large and overlapping ($\chi^2_{(2)} = 0.6$ $p = 0.74$). We also estimate a more detailed model of the (3x2) label-specific effects (e.g., the effect of firm information on GI or score valuation). Results show some interesting patterns, but the inference is limited by low statistical power, so we relegate these estimates to table A3 in the appendix.

2.6 Discussion and Conclusions

We conducted laboratory experiments simulating a wine shopping experience to measure the effectiveness of geographical indications, expert reviews, and winery names in conveying quality

information. The *ex ante* value of each information source was elicited in multiple price listing auctions conducted with wine consumers in Spain and France. Experimental treatments include the order in which information was auctioned (France and Spain), the price range of the wines for sale (Spain), and the exogenous (non bid-dependent) release of one out of three sources of information (France). Average WTP for information sources is estimated via random effect interval regression, while fixed effects (within) regression is used to measure how purchasing one information source in an early MPL auction changes the perceived value of other cues. We also present a simple and, to the best of our knowledge, novel way of estimating marginal effects for observational, potentially endogenous time-invariant subject characteristics (i.e., wine knowledge) leveraging practice auctions to eliminate, or at least attenuate, the influence of individual-specific unobserved heterogeneity.

The discussion is structured along three main thematic areas of contribution. First, we address the motivating question of this article, and elaborate on the effectiveness of GIs in informing consumer choices by using our experimental results to generate a first, if tentative, estimate of the consumers surplus generated by the information carried by the GI labeling scheme. Then, we summarize and assess the experimental findings against the backdrop of the original research hypotheses, discussing the implications for how consumers interpret quality cues in markets for highly differentiated experience goods. Then, we contrast the resulting picture against the typical behavioral assumptions adopted in the large body of theory studying GIs, identify possible constraints, and offer some suggestions for future advancements.

Our first result relates to how consumers in France and Spain value access to GI information when purchasing wine, and the consumer surplus generated by GI labels. We offer three interpretations, which accord varying degrees of faith into the external validity of laboratory experiments. The first interpretation is literal: since GI information in the real world is provided to consumers at no additional cost over the market price, participants' bids provide a direct measure of the consumer surplus generated by the labeling scheme at each purchasing occasion. We

reiterate that the relevant counterfactual here is not a world without GIs (which may provide lower average quality), but rather a world where GIs exist, but an evil genie has erased the information from all bottles. According to 2020 Kantar data⁴⁶, the average French consumers purchased bottled still wine 13 times per year (43.6 bottles/year, 3.4 bottles/shopping trip), implying a yearly surplus of € 4.81 per consumer. Estimates for Spain could be calculated using analogous statistics, which we are unable to find at the time of writing.⁴⁷ These estimates are useful in that they provide a direct measure of the ability of GIs to inform consumers, a main policy objective, and we do so within a realistic setting with multiple competing signals. On the other hand, the important question regarding the effectiveness of GIs in supporting the provision of high-quality goods remains open.

The cardinal interpretation of experimental estimates is also subject to the standard caveats: MPL auctions are susceptible to framing effects (Andersen et al. 2006), and our samples, while representative in term of demographics, are quite small compared to the consumer population. In our opinion, the most prominent issue is that, while auctions are incentive compatible, they are necessarily single-shot games, whereas life is generally a repeated game. A consumer may agree to spend 30 cents once to access GI information at an experimental auction, but that does not mean they would do the same every time they purchase a bottle of wine. Be that as it may, one can use the experimental estimates to draw comparative inference. Villas-Boas et al. (2021) conducted an in-store experiment in 2006 to measure the causal effect of expert reviews on U.S. consumer demand, estimating a surplus of \$2.03 (\$2.88 in 2022 dollars) per consumer associated with the value of information. Our results show that the valuation of expert reviews in France or Spain is not statistically different from the valuation for GIs, so the

⁴⁶ Source : FranceAgriMer. Ventes et achats de vins tranquilles- Bilan 201. Edition Juillet 2022.

⁴⁷ According to the Ministry of Agriculture, Fishing and Alimentation GIs represent 51.5% in volume and 80.3% in value of wines consumed in the country in 2022, but no data is available on the number of bottles purchased nor purchasing frequency - [Informe del consumo alimentario en España 2022 \(mapa.gob.es\)](https://www.mapa.gob.es/informacion-consumo/indicadores-y-estadisticas/indicadores-de-consumo)

main leap of faith in using this same value for GIs is extrapolating from Californian to European consumers. For those who remain skeptical, there is one more interpretation, which is both allegorical and alcohol free. How important are GIs as a source of information? We find that, for both Spanish and French wine consumers, buying a wine without knowing GIs is much worse (about 1.5 times) than having to drink a fruit juice without choosing its flavor.

Turning now the attention to the original research hypotheses and what can be learned from our experiments about consumer behavior, our results show that GIs and expert reviews have, on average, similar information content, and are more valuable than winery names. This pattern is consistent across Spanish and French consumers, suggesting that the reputation and information dynamics are quite robust, and are likely to hold in other markets where wine consumption is common. The implication is that, even though firm names and expert reviews offer much more specific cues than the collective reputation mechanism behind GIs, signal complexity, trustworthiness, and consumers' ability to understand quality cues are important factors to consider.

Somewhat surprisingly, we find only mixed evidence of decreasing marginal returns to additional information sources. In the French experiments, providing the first envelope of wine information for free to all participants did not affect bids in the subsequent auctions. On the other hand, fixed effects estimates tell us that, *for those who purchased information through the auction process*, the value of subsequent information diminishes. The italics here emphasize that there is a strong element of self-selection, and we know that consumers are heterogeneous in their understanding of the labels. The magnitude of this decreasing marginal effect is sizable, averaging about 10 cents, but there is no clear pattern to say which source of information supersedes the others, as relative effect sizes are inconsistent across the two studies.

As we expected, wine expertise plays an important role in determining consumers' ability to use quality cues, and not all information sources are created equal. Expert reviews are more useful to unexperienced consumers, while knowledgeable consumers can extract more

information from winery names. As there are many more firm names than GIs, we expected that designations of origin would fall somewhere in-between, but instead we find that the role of expertise in moderating GIs effectiveness resembles much more the case of firm names than that of expert reviews. This result should not be overstated, as the effect of knowledge is relatively small compared to the total value of GI information, but it does grant some support to those (e.g., Livat et al., 2019) who lament the excessive number and intricacies of GI schemes. To summarize, our results suggest that expert reviews, GIs, and firm names are only imperfect substitutes of each other, and may communicate to different consumer populations.

Contrary to our expectations, increasing the price of the wines offered for sale didn't increase the value of accessing information sources, neither in absolute nor in relative terms. Thus, prices do not appear to influence the value of information, or at least not within the limits of the price differences we considered. In addition to accepting the null result at face value, two possible alternative explanations come to mind, one linked to the experimental environment, and one more general. A first possibility is that the endowed money was seen by participants as a budget constraint. This budget was the same for high and low prices sessions, so participants in high price sessions may have perceived to have a lower disposable income, thereby offsetting the increase in the value of information. However, the participation money was calibrated to always exceed any required payments, and therefore was never binding. An additional interpretation is offered by the possible quality-signaling effect of price, which has been reported in both theory (Bagwell and Riordan 1991) and applied settings (Schnabel and Storckmann 2010). We did not consider this mechanism *a priori* because price signaling is stronger when consumers are uninformed and no other information is available (Zeithaml 1988; Lockshin et al. 2006), which is not the case in our setting. However, it is still possible that participants in the high-price treatment considered all the wines for sale a safe bet and, despite the larger expenditure, they did not feel a greater need for information than those in the low-price sessions.

Our results also have implications for the large body of economic theory studying the effects of GIs. An excellent survey of the literature on quality labels by Bonroy and Constantatos (2014) highlights how seemingly conflicting results are often due to different modeling assumptions, so it is useful to contrast our empirical findings with the behavioral assumptions at the foundation of these models. In the following paragraphs we offer some reflections, with the tacit understanding that abstracting from the intricacies of the real world to isolate a single issue is an uncontested prerogative of theory work.

Taken together, our results confirm that early seminal work (e.g., Zago and Pick 2004; Moschini et al. 2008) studying the GI quality signal in isolation from other cues may be overly simplistic. This has been already recognized, and a few contributions examined the interactions between collective reputations linked to GIs and firm reputations (Menapace and Moschini 2012; Costanigro et al. 2012; Yu et al. 2018). Our results also present empirical evidence in support of the idea that some labels are “imperfect”, in the sense that some are most suited to convey information to sophisticated consumers, while others speak to less experienced ones (Bonroy and Constantatos 2008). As assumed in Yu et al. (2018), we thought of GIs as an easy-to-understand signal, while firm names are for the sophisticated. However, our results show that expert reviews are a better example of a signal for unexperienced consumers because, unlike GIs, their information content is uncorrelated with previous knowledge. Related to this, what still seems to be missing in the extant body of theory is an explicit, endogenous treatment of the consumers’ learning process in the original spirit of Stigler (1961) and Nelson (1970), which is dynamic in nature, and crucially different when considering alternative sources of information.

The fact that GIs, firm names, and expert reviews are rather imperfect substitutes of each other also seems to imply that the representation of quality as a unidimensional ordinal concept (*à la* Mussa and Rosen, 1978) may hold for intra-GI quality tiers (see Costanigro et al. 2019) but may be less congruent when studying consumer choices between GIs. Either quality is multidimensional (as in Steenkamp 1990), and different cues inform different quality dimensions;

or designations of origin convey elements of both horizontal and vertical differentiation, which would be fitting with the idea of *sui generis* goods. This, paired with consumer variety seeking behavior and interest in new experiences (as in Zeithammer and Thomadsen 2013) may justify the staggering proliferation of GIs, which remains unexplained by theory.

Disclosure Statement

No potential competing interest was reported by the authors.

Appendices

	Wine	Price (€)	Region	Variety	Vintage	Alc %	Winery	GI	Score
Study I - Spain			Low Price						
A	Borsao	4.75	Aragón	Grenache red Syrah Tempranillo	2020	14.5	Borsao	Campo de Borja	91 Suckling
B	Zorzal	6.75	Navarra	Grenache red	2020	13.5	Zorzal	Navarra	91 Peñin 92 Parker
C	Protia	6.90	Castilla-León	Tempranillo	2019	14.0	Portia	Ribera del Duero	
D	Viña Real	7.45	Rioja	Tempranillo, Grenache red, Graciano, Mazuela	2018	13.5	Viña Real	Rioja	93 Suckling 89 Decanter
Study I - Spain			High Price						
A	Zorzal Malayeto	13.90	Navarra	Grenache red	2020	14.0	Zorzal	Navarra	94 Parker 94 Peñin
B	Borsao Tres Picos	13.80	Aragón	Grenache red	2019	15.0	Borsao	Campo de Borja	90 Suckling 92 Peñin
C	Protos Crianza	17.73	Castilla-León	Tempranillo	2017	15.0	Protos	Ribera del Duero	91 Suckling 92 Peñin 89 Wine spectator
D	Viña Real Reserva	14.10	Rioja	Tempranillo, Grenache red, Graciano, Mazuela	2016	14.0	Viña Real	Rioja	93 Parker 91 Peñin
Study II – France									
A	Morgon - Corcelette	12.65	Beaujolais	Gamay	2019	13.0	Domaine des Marrans	Morgon AOC	92 Parker 92 Suckling 92 Vinous
B	Arcane XV le Diable	14.77	Rhône	Mourvèdre	2015	15.0	Xavier Vignon	Vin de France	94 Parker
C	Kaleidoscope	12.07	Alsace	Pinot Noir	2020	13.0	Domaine Julien Schaal	Alsace AOC	90 Wine enthusiast
D	Rivesaltes Primage	13.72	Languedoc - Roussillon	Grenache	2015	15.5	Chateau les Pins	Rivesaltes AOC	88 Parker

Table A1: wines for sale in Study I (Spain) and Study II (France)

Question	Country	Options	Question level, correct answer & scoring key
Most beers contain between 3% and 5% alcohol by volume. Wines usually contain Select only one answer, mark it with an X	France & Spain	3-5% alcohol by volume 5-9% alcohol by volume 9-14% alcohol by volume 14-17% alcohol by volume 17-21% alcohol by volume Over 21% alcohol by volume	Basic question : C=1
Which of these grape varieties are used to produce red wines? Mark with an X all those you select	France & Spain	Cabernet Sauvignon Riesling Merlot Pinot Noir Chardonnay Gewurztraminer	Basic question: A, C, D each = 1, -2 for others
Which of these grape varieties are used to produce white wines? Mark with an X all those you select	France	Muscat Syrah Gamay Grenache Chenin Chardonnay	Basic question: A, E, F each = 1, -2 for others
Which of these grape varieties are used to produce white wines? Mark with an X all those you select	Spain	Verdejo Syrah Monastrell Garnacha Albariño Chardonnay	Basic question: A, E, F each = 1, -2 for others
Which of the following areas have an Appellation d'Origine Contrôlée (AOC) for wine? Mark with an X all those you select	France	Ajaccio Nyons Haute Provence Nîmes Bordeaux	Harder question: A+E=5, A or E alone = 2, all others = -1
Which of the following areas have a Protected Designation of Origin for wines? Mark with an X all those you select	Spain	Calatayud Moncayo Borja Siurana Rioja	Harder question: A, C, E each=1, -2 for others
Which of the following variety or combinations of varieties are used to produce AOC Bourgogne? Select only one answer, mark it with an X	France	Syrah, Grenache, Cabernet Sauvignon Cinsault, Carignan, Merlot Chardonnay, Pinot Noir, Aligoté Cabernet Franc, Cabernet Sauvignon, Malbec, Petit Verdot, Merlot Gamay, Chenin, Grenache Sauvignon Blanc, Sémillon	Basic question: C = 1, -2 for others

<p>Which of the following grape variety or combinations of varieties are used to make Rioja PDO red wines? Select only one answer, mark it with an X</p>	<p>Spain</p>	<p>Garnacha, Monastrell, Pedro Ximénez, y Mazuelo Tempranillo, Viura, y Malvasia Macabeo Tempranillo, Garnacha, Mazuelo, y Graciano Malvasia y Tempranillo Tarragona y Graciano</p>	<p>Basic question: A=1, D=5, 0 for others</p>
<p>Which of the following variety or combinations of varieties are used to produce AOC Côtes du Jura? Select only one answer, mark it with an X</p>	<p>France</p>	<p>Riesling, Muscat, Sylvaner Chardonnay, Savagnin, Pinot Noir, Poulsard, Trousseau Ugni Blanc Syrah, Grenache, Viognier Sauvignon Blanc, Sémillon Cabernet Franc, Malbec</p>	<p>Harder question: B=5, 0 for others</p>
<p>Which of the following grape variety or combinations of varieties are used to make red wines from the Cariñena PDO? Select only one answer, mark it with an X</p>	<p>Spain</p>	<p>Tempranillo, Monastrell, Pedro Ximénez, y Mazuelo Tempranillo, Garnacha, Mazuelo, y Cabernet Sauvignon Monastrell Tempranillo, Garnacha, Mazuelo, y Graciano Viura y Tempranillo Merlot y Pinot noir</p>	<p>Harder question: A=1, B=5, 0 for others</p>
<p>Which of the following variety or combinations of varieties are used in the production of AOC Cahors? Select only one answer.</p>	<p>France</p>	<p>Cot, Merlot, Tannat, Jurançon Poulsard, Mourvèdre Chardonnay, Sauvignon blanc Cabernet Sauvignon, Malbec, Colombard Grenache, Cabernet Franc, Muscat Pinot Noir</p>	<p>Harder question: A=5, 0 for others</p>
<p>Which of the following grape variety or combinations of varieties are used to produce white wines from the Somontano PDO? Select only one answer, mark it with an X</p>	<p>Spain</p>	<p>Verdejo y Viura Chardonnay y Moscatel Chardonnay y Sauvignon blanc Moscatel, Verdejo y Alcañón Garnacha blanca, Sauvignon blanc y Viura Parraleta</p>	<p>Harder question: C=5, 0 for others</p>

Table A2: Objective wine knowledge questionnaire & scoring keys

	SpFE1	FrFE1
(Purchased Firm Info)*GI	-15.00 *** (2.93)	-13.08 *** (4.89)
(Purchased Firm Info)*Score	-11.67 *** (3.28)	-8.58 * (4.79)
(Purchased GI Info)*Firm	3.39 (3.35)	-14.41 *** (5.20)
(Purchased GI Info)*Score	-5.86 ** (2.92)	-14.86 *** (4.71)
(Purchased Score Info)*Firm	-12.74 *** (2.80)	-6.23 (5.18)
(Purchased Score Info)*GI	-4.79 * (2.69)	-14.19 *** (4.73)
Gamma2	7.99 *** (1.61)	6.34 ** (3.00)
Gamma3	8.97 *** (2.13)	13.71 *** (4.02)
Number of observations	592	296

*** p<.01, ** p<.05, * p<.1

^a: estimates for the label-specific intercepts omitted.

Table A3^a: Label-specific effect of purchased information on subsequent bids



Figure A1 – Experimental setting in Spain (left) and France (right)

			
4,75 € A	6,75 € B	7,40 € C	7,45 € D
Garnacha Tinta Syrah Tempranillo	Garnacha Tinta	Tempranillo	Tempranillo Garnacha Tinta Mazuela Graciano
Alc 14,5% vol.	Alc 13,5% vol.	Alc 14% vol.	Alc 13,5% vol.
			
12,65 € A	14,77 € B	12,07 € C	13,72 € D
Gamay	Mourvèdre	Pinot Noir	<u>Grenache</u>
<u>Alc 13% vol.</u>	<u>Alc 15% vol.</u>	<u>Alc 13% vol.</u>	<u>Alc 15.5% vol.</u>

Figure A2: Endowed information sample sheets for Spain (up) and France (down)

The evaluative intermediation of experts helps to overcome the information inefficiencies of the wine market, more specifically, their ratings, just as GIs reduce information asymmetry. The experiment presented in the previous chapter highlights the value of expert ratings for wine consumers: expert ratings generate a consumer surplus between EUR 0.35 (Spain) and EUR 0.37 (France) for each purchasing occasion. Comparatively, the consumer surplus generated by GIs is similar in France and slightly inferior in Spain. More involved consumers value higher the informational content of GIs, when novices favor experts' ratings.

However, the emergence and expansion of a new source of evaluation (peers, through online review aggregators) mentioned in the first chapter is reshuffling the deck. For industry professionals who have financially supported the existence of experts, the emergence and expansion of this new source of information is an opportunity to question their strategy. Should they continue to invest in advertising in wine guides and magazines, to send their wines to competitions, or should they target their investments to promote their wines on marketplaces acting as online review aggregators? Knowing which source of information has the greatest influence on demand is a crucial question for the industry. The next chapter, co-authored with Stephen Bazen and Jean-Marie Cardebat, has been published in *Applied Economics* in September 2023⁴⁸. It aims at determining the relative influence of expert and Vivino community ratings on wine prices.

⁴⁸ <https://doi.org/10.1080/00036846.2023.2257036>

Chapter III - The Role of Customer and Expert Ratings in a Hedonic Analysis of French Red Wine Prices: from Gurus to Geeks?

Abstract

Wine experts' ratings provide concise quality information and reduce the information asymmetry for the consumer. We hypothesize that consumers' ratings will come to dominate expert ratings in the wine expertise market. We employ a hedonic regression framework on the attributes of 36,970 French red wines to determine the relative impacts of expert and Vivino community ratings on wine prices. Average consumer ratings are found to have a larger effect on price than expert scores. These results are found to be robust to outliers and the general conclusion that peers matter more than experts holds when we exclude the top-end wines.

Keywords: Hedonic analysis, Wine experts, Peer rating, Wine prices, Quality evaluation

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3.1 Introduction

Wine is an experience good: its quality is only known with certainty at the moment that it is consumed. The absence of complete information about the product means that purchasing an experience good entail taking a risk for the consumer. Producers, on the other hand, know more about the quality of the product and this asymmetry can give rise to the kind of situation in which there is a threat to the existence of a market of the type analyzed by Akerlof (1970). Since the supply of a given wine vintage is perfectly inelastic, shifts in demand as a result of a lack of reliable information about quality will affect its price.

In the case of wine, there are extrinsic sources of information available from the bottle itself. The front and back labels can include information on region of production, appellation, vintage, producer, brand, alcohol content, grape varieties used, and other wine characteristics. There are also aspects of the appearance of the product including the label design, the seal (cork or screw top, use of wax) as well as the shape and weight of the bottle, which the customer can find reassuring (Cardebat et al., 2017). These elements constitute objective information available to the consumer prior to purchase. However, the quality of a wine is not fully represented by these different attributes. Publicity campaigns by representatives of the wine trade and marketing organizations aim to diffuse producers' own views on the quality of their wines, but an information asymmetry remains.

One consequence of this asymmetry for consumers has been the prominence given to expert evaluations (e.g., the scores given by 'wine gurus' such as Robert Parker and Jancis Robinson). These ratings are based on tasting the wine while it is young and often considering previous vintages of the wine. There is a large literature showing that expert ratings influence wine prices (Ali et al., 2005; Ali & Nauges, 2007; Bentzen & Smith, 2008; Cardebat et al., 2014; P. Dubois & Nauges, 2010; Gibbs et al., 2009; Jones & Storchmann, 2001; Landon & Smith, 1997; Lecocq & Visser, 2006; Oczkowski, 1994; Schamel, 2003). Wine prices do not depend solely on production costs but are also determined by collective and individual reputations (Cardebat & Figuet, 2009; Landon & Smith, 1997; Ling & Lockshin, 2003; Olivesi, 2018; Schamel, 2000). The reputation that a wine and a wine producer acquire over time is a strong

determinant of its price (Benfratello et al., 2009). Consumer sensitivity to reputation is higher for premium, super-premium, and iconic wines (Castriota & Delmastro, 2015). According to Bicknell & MacDonald (2012, p. 173) most studies “support the hypothesis that the relationship between the price of wine and quality as judged by leading wine critics is statistically significant and consistently positive”. Oczkowski (2018), for example, studied the lagged impact of quality on prices of Australian premium wines and estimated that a one-point increase in the quality rating had an impact of over 10% on the price over six years. Nevertheless, not all ratings have an equal impact on prices (Cavicchi et al., 2013). For an extensive literature review on wine price determinants and hedonic price functions, see Outreville & Le Fur (2020).

Alternative sources of information about wine quality are available from consumer evaluations. Traditionally these included wine clubs and word-of-mouth and gave rise to herd-like behavior and the emergence of so-called ‘wine snobs’ (as caricatured by Niles and Frasier Crane in the TV series ‘Frasier’). However, with the development of online forums and platforms, consumer opinions about wine quality have become increasingly formalized – and characterized as electronic word-of-mouth (eWOM). This has also occurred for other experience goods such as hospitality and gastronomy with Trip Advisor and Zagat, where there has been increasing reliance on peer ratings rather than experts’ opinions. In the case of wine appreciation, the use of applications and websites such as Vivino has given prominence to particularly well-informed individuals for whom the pursuit of knowledge about the product has become more than a simple hobby (‘wine geeks’), as opposed to online bloggers and influencers for whom there is financial gain.

The emergence of wine applications and platforms such as Vivino has permitted the formalization of peer (i.e., consumer) ratings of wines. This additional, significant source of information on a wine’s quality has become more important for consumers for several reasons. The first is a ‘push’ factor which is not confined to purchases of wine and is due to technological advances and almost universal internet access. This has enabled consumers to express themselves in a costless and straightforward manner and allowed their peers to have free access in real-time to their evaluations. The second is a ‘pull’ factor: the role of experts is

diminishing. There is evidence of reduced confidence in experts in many markets (Reuter & Zitzewitz, 2006; Sharkey et al., 2022), especially so for wine where there are many small producers with limited resources for advertising (Orth et al., 2007; Reuter, 2009). This reduced confidence is due to a number of developments in the last ten years such as the retirement of one of the main players (Robert Parker) in 2015. Furthermore, a lack of consistency and consensus has been identified among experts before Parker's retirement (see Ali et al., 2010). Expert reviews have been criticized for being subjective and relying on solicited samples (Cardebat et al., 2014; Castriota et al., 2013; Steinberger, 2008). Furthermore, there is evidence of opportunistic behavior on the part of certain experts in terms of grade (rating) inflation and censorship of negative reviews (Bessy & Chauvin, 2013; Gans & Kaplan, 2017; Reuter, 2009). It is, therefore, appropriate to inquire whether prospective consumers place more trust in peer reviews on online platforms and information on cell phone applications than in expert ratings.

In this paper, we compare the effect of expert opinions and peer ratings on French red wine prices. We concur with Parsons & Thompson (2009), who state that there is still a need for researchers to consider sources of recommendations when building models of consumer choice. While there have been many studies of the impact of expert opinions on wine prices (Ali et al., 2005; Ali & Nauges, 2007; Bentzen & Smith, 2008; Cardebat et al., 2014; Dubois & Nauges, 2010; Gibbs et al., 2009; Jones & Storchmann, 2001; Kwak et al., 2021; Landon & Smith, 1997; Lecocq & Visser, 2006; Oczkowski, 1994; Schamel, 2003), there are very few papers to our knowledge that take into account consumer ratings – three experimental (Buonanno et al., 2008; Parsons & Thompson, 2009; Thrane, 2019) and two empirical (Gokcekus & Nottebaum, 2011; Oczkowski & Pawsey, 2019) – to compare the relative importance of the two forms of quality evaluation of wines.

In a pilot experiment, Buonanno et al. (2008) subject 30 non-experts to two wine treatments. The participants taste 3 samples of wine, rate them out of 100 and express their willingness to pay in absence of external information. They then receive either the average

rating given by the other participants (peer treatment n=15) or ratings from experts⁴⁹ (experts treatment n=15) for the 3 wines. In the third stage, they are offered the opportunity to modify their ratings. This pilot experiment concludes that in contrast to experts' ratings, peers' evaluations have no significant influence on wine tasting.

Parsons & Thompson (2009), after conducting an exploratory survey (n=28), undertake a laboratory experiment (n=144) based on rating fictional wines in a hypothetical scenario. The participants in the survey are instructed to imagine that they are purchasing a bottle of wine for an evening dinner with close friends. Half of the group is informed that they are shopping at a specialized wine retailer, while the other half is told that they are shopping at a regular supermarket. Wine recommendations from different sources are provided to all respondents. The participants are asked to allocate a total of 100 points among the recommendations to indicate the weight they would place on each recommendation when choosing a bottle of wine. The participants in the lab experiment are allocated either to a supermarket or to a specialist wine retailer treatment group. They are presented with three different sources of information: expert judges (experts), staff choice, and bestsellers (peers). While the influence of expert information is not affected by where the wine is being purchased, peer information has a greater influence in supermarkets than in specialist wine merchants. The study highlights the importance of understanding how credibility is perceived in different settings and how it can affect consumer behavior.

Thrane (2019) presents results from an online study involving 441 Norwegian wine consumers based on a fictional red wine in a hypothetical scenario. The researcher presents participants with different types of information about a wine they were interested in at a wine store. He uses a 2 x 2 factorial design to vary the information presented to participants, including information about experts' reviews of the wine and a recommendation from a knowledgeable peer. He finds that for highly-priced red wines, positive expert quality reviews

⁴⁹ from Associazione Italiana Sommelier AIS, Seminario Veronelli, Gambero Rosso-Slow Food, and L'Espresso wine guides

have a significant impact on buying intentions while peer recommendations have no effect. For medium-price wines, both sources of information have a statistically significant positive effect, but in quantitative terms, the impact of a positive expert review is larger.

Gokcekus & Nottebaum (2011) compare the ratings of three experts (including Robert Parker) with those of users of the CellarTracker website for a sample of 120 Bordeaux wines from the 2005 vintage. CellarTracker is a cellar management tool that has developed as a social network for wine consumers. Their results are mainly descriptive and show that median consumer ratings are more highly correlated with wine prices than expert ratings. In another paper, again using data from the CellarTracker website, they also show that peer ratings are influenced more by other consumers than they are by experts (Gokcekus et al., 2018).

Oczkowski & Pawsey (2019) assess the relative impact of expert and consumers' ratings on prices for a sample of Australian wines. Comparing the effect of expert ratings (taken from Halliday, 2017) with that of ratings provided by consumers on the Vivino platform, they conclude that: "wine prices are better explained by the use of online community rating scores than by expert ratings" (Oczkowski & Pawsey, 2019, p. 37).

Our large sample of 36,970 French red wines enables us to take this emerging literature on the influence of peer recommendations on consumers' decisions to purchase wine a step further. For it is not obvious why the hypothesis that 'consumer ratings matter more than expert evaluations' would apply to French red wines, which have traditionally been the bastion of experts. French red wines are widely known internationally and are purchased by consumers throughout the world, so there is less of a home-bias effect in their evaluation by consumers. French red wines are historically among the most prestigious and traded wines worldwide and are therefore rated by a larger number of experts than is the case with most other wine-producing countries. Furthermore, the way in which Bordeaux and Burgundy (Bourgogne)⁵⁰

⁵⁰ Bourgogne is the only wine region in France whose name is translated into different languages, the Bourgogne wine board (BIVB) recommends not to translate the word "Bourgogne" to ensure coherence between the wine labels and the name of the region where the wines were created. Source: <https://www.bourgogne-wines.com>

wines are priced and commercialized has created a close historical connection with wine experts. They are invited to taste Bordeaux wines *en primeur* before these are marketed (and even before the wine is bottled). The same practice of early tastings exists for Bourgogne wines. Yet our findings are clear-cut consumer ratings on the Vivino platform have a larger effect on the prices of French red wines than expert ratings. This remains true when attention is confined to wines from the Bordeaux and Burgundy regions and to the prestigious classified wines. This last result is particularly interesting because the fine wines of Bordeaux and Burgundy represent a real bastion for experts. Their influence in this segment of the market and in these regions dates back to the 1970s and a large literature has demonstrated that their ratings have a strong impact on wine prices (for a recent review of this literature, see Dubois, 2021). Demonstrating that their role is now dominated by peer ratings is therefore an important new result, which, given the size of the sample used here is firmly established. This marks a paradigm shift in the prescribing process in the wine market and the implications in terms of marketing and in the way in which wines are sold are therefore very significant.

The rest of the paper is organized as follows: we begin by describing the Vivino platform and present the basic features of the data set that we use in the first section. We then proceed to a descriptive comparison of the expert ratings and consumer ratings of 36,970 French red wines. In the third section we present our hedonic price analysis. Several robustness checks are then undertaken in section four before concluding.

3.2 The Vivino dataset

3.2.1 The Vivino platform

Vivino is an application for cell phones as well as an internet site (www.vivino.com) launched in 2010. It is presented as a marketplace for wines that serves a community of 64 million wine enthusiasts. It has entries for more than 16 million references and is the largest online marketplace for wines. For each of the wines referenced by the application, there is a page showing a photograph of the bottle along with the lowest price found among online vendors. There is information about the product including appellation, the main grape variety used, where available one or more opinions and numerical ratings from experts, and in all cases the

average 'star' ratings given by peers who use the application. There is also the number of consumers who have rated the product. Further details concerning each of these elements of information can be obtained by clicking on the item: other more expensive vendors are listed, more expert ratings are sometimes available and there is additional information about the appellation, the wine region, and the wine itself. There are also details of consumers' evaluations including how many chose each of the star ratings (one to five) together with verbal comments which are provided along with the pseudonym or name of the consumer.

The first study to use this data source was Kotonya et al. (2018) who 'scraped' Vivino and collected data on wines from a large number of countries for the period November 2016 to March 2017, to assess consumers' appreciations of wines. The analysis undertaken was based not only on the numerical ratings but also on consumer reviews, using textual analysis and user biographies. They use regression and classification methods to predict consumer wine ratings and preferences. Among their main conclusions, they find that Vivino users have a similar degree of knowledge to professional experts and in contrast to experts, consumers ratings are not influenced by prices.

In the above-mentioned study by Oczkowski & Pawsey (2019), the authors combine Vivino consumer ratings with expert ratings for a sample of Australian wines to quantify the relative importance of the two types of quality evaluation in determining wine prices in a hedonic price equation. They use the consumer ratings given in Vivino in two ways: the average rating for the wine in question at the date the sample was taken, and the mean of the average ratings of the four previous vintages, which they argue measures a wine's 'reputation'. These two variables are included separately in hedonic price regressions which include controls for vintage, cellar potential, producer size, winery reputation, grape variety, and region. It is found that the reputation rating (based on previous vintages) has twice the impact of the average consumer rating for a wine (of a specific vintage) in the market price of a wine. These effects are slightly higher than the price effect of expert rating and the equivalent expert rating-based reputation variable (taken from Halliday (2017)). Including both consumer ratings and expert ratings together produces results that vary according to whether the variables are

entered as the simple average evaluation or as averages for past vintages (reputation). But overall, they find that peer ratings have a larger impact on price than expert ratings. There are also recent unpublished conference presentations that have used data from the Vivino application to analyze the determinants of consumer ratings (Kopsacheilis et al., 2023; Mazzoli & Palumbo, 2022; Schamel & Gastaldello, 2022).

3.2.2 The Vivino data used

The current study uses a snapshot of the data on the Vivino platform for November 1st, 2021⁵¹. This data set contains only those wines with at least one expert review and 10 peer ratings. The consumer ratings of a wine are the average rating out of five. Ratings made by various experts such as Robert Parker, Jancis Robinson, James Suckling, Tim Atkin, Jeb Dunnuck, and others are also available for most of the wines. Although Parker himself retired and stopped rating wines in 2015, his trademark *Wine Advocate* was sold, and ratings continue to be issued under this name. The price of the wine in the data set is the median price of purchases of that wine made via the platform. In addition to the name of the wine, the data set provides the name of the producer, the region of origin, the alcohol content, and the vintage. While information about the grape variety and tasting notes are available to prospective customers on the platform, this information is absent from the data set used here.

3.3. Expert score and peer ratings

In the current study, we examine the relative importance of expert ratings and consumer ratings in determining the price of French red wines. The initial data set provided by Vivino (n=42,118) included only wines with at least ten customer reviews and one expert rating. Wines with prices below 3 euros (41 cases) and above 1,500 euros (465 cases) are excluded. We also exclude vintages prior to the year 2000 since the prices of those wines are likely to be affected by rarity

⁵¹ The data upon which the findings of this study are based were obtained from Vivino. Restrictions apply to the availability of these data, which were used under license for this study. Data are available on www.vivino.com with the permission of Vivino.

(4310 cases). Finally, four wine-producing areas (Auvergne, Champagne, Lorraine, and Savoie) are excluded since they only produce a small number of red wines (332 cases). The resulting sample consists of 36,970 wines and descriptive statistics are provided in Appendix Table A1.

3.3.1 Descriptive statistics

The average and median prices of the wines in the sample are 68.61 euros and 34 euros, respectively. The distribution of prices is positively skewed with a very long tail (see Figure 15).

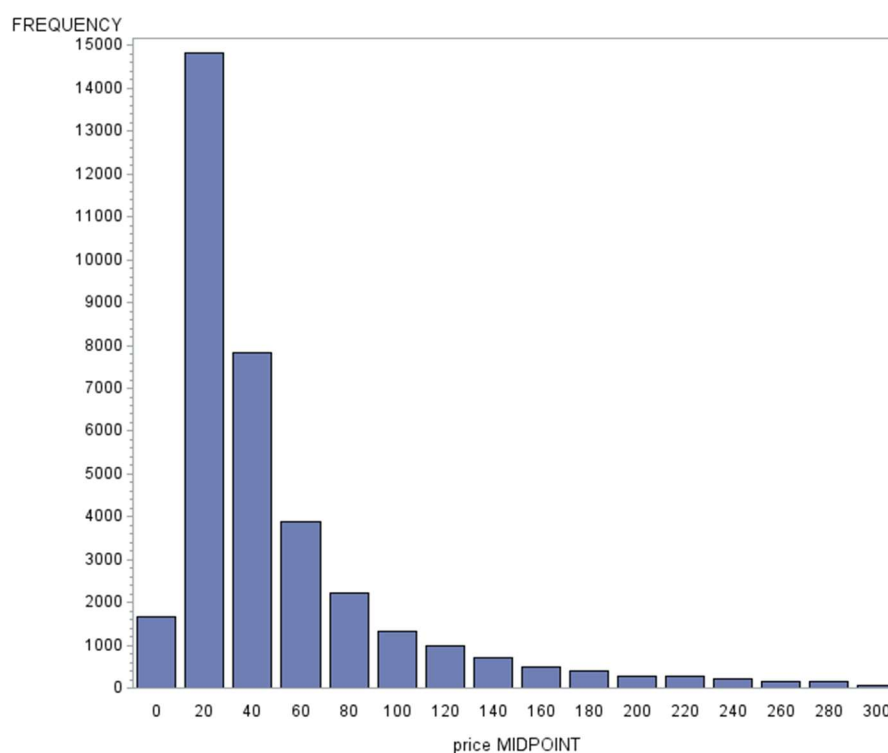


Figure 15 - Distribution of prices⁵²

Expert scores have been normalized to range from 50 to 100. In practice in the sample used they are in the range [70,100] (see Figure 16).

⁵² The distribution of prices is positively skewed with a very long tail (maximum price in the sample: 1,500 euros). For purposes of presentation, the graph has been truncated at 300 euros.

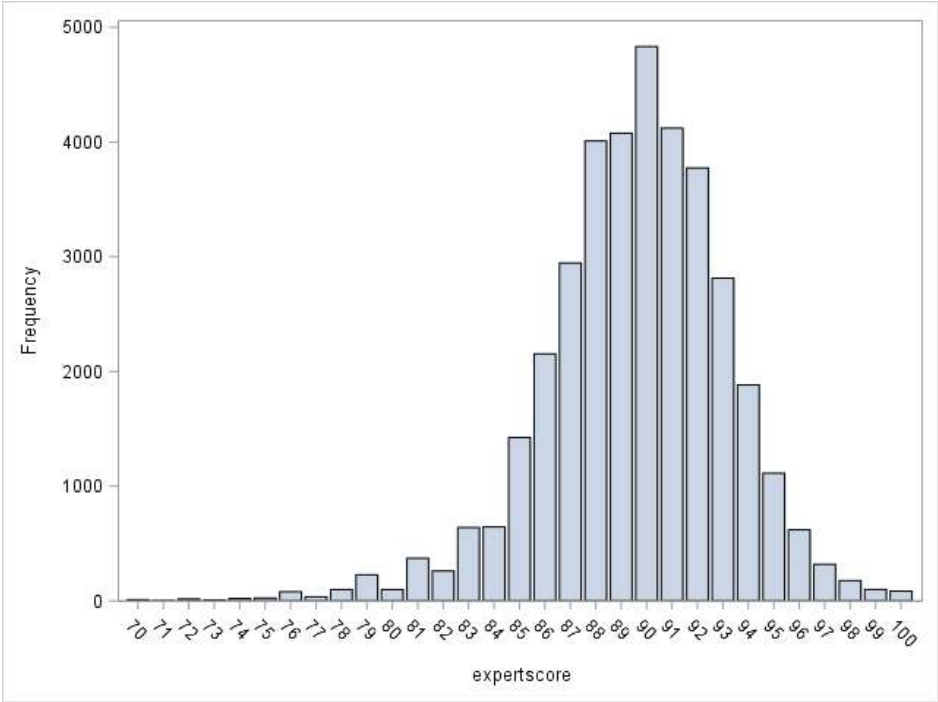


Figure 16 - Distribution of expert scores

The distribution of scores is slightly negatively skewed and the average and median overall expert scores are both 89. The number of experts providing scores is shown in Figure 17 (we only use wines that have at least one expert evaluation).

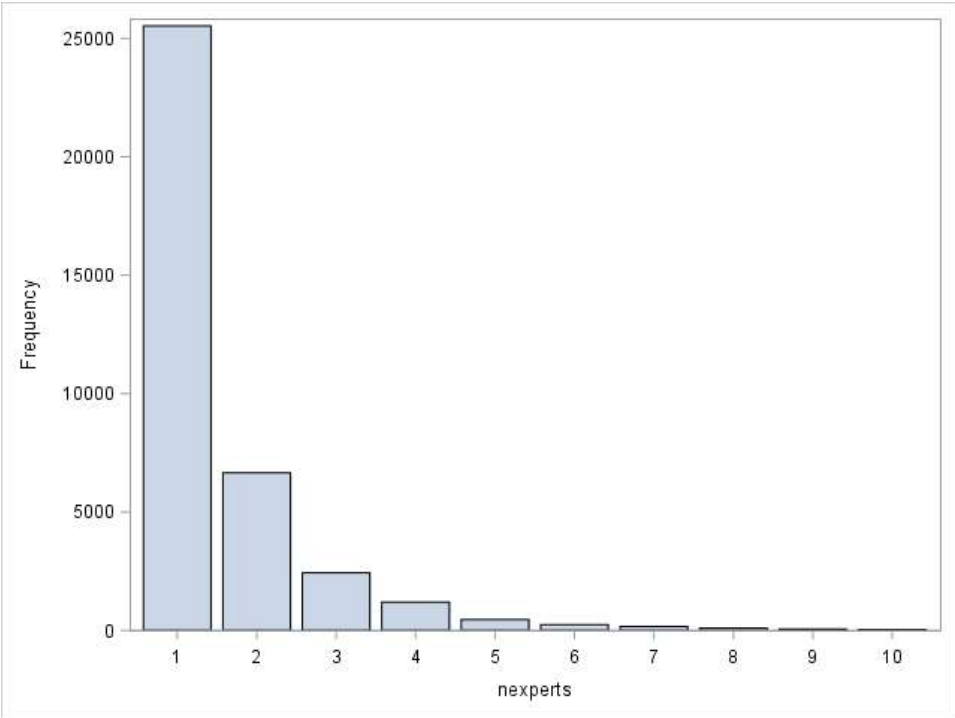


Figure 17 - Number of expert evaluations per wine

For more than two thirds of the references, there is only one expert rating and only 10% have three or more. There is little evidence of a monotonic relation between the number of experts and the average scores (see Figure 18).

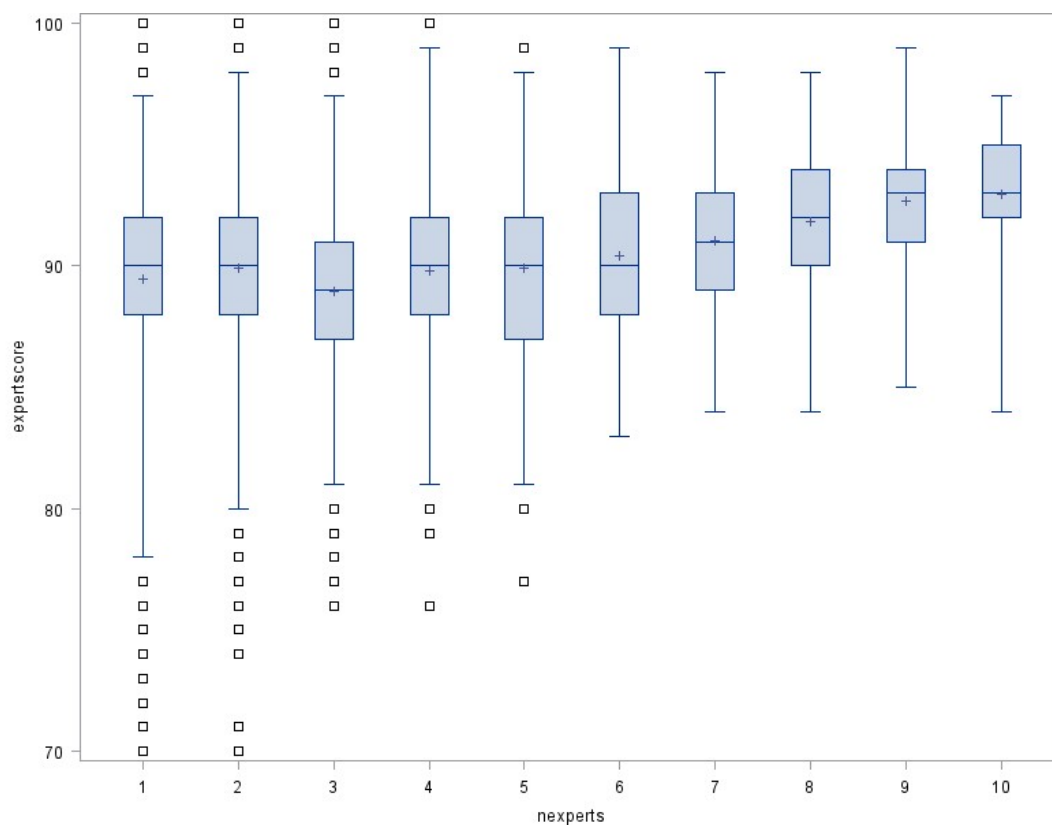


Figure 18 - Dispersion of expert scores by number of experts

The box-and-whiskers plot (covering 98% of the range of scores) indicates that when there are three or more expert evaluations the lowest score is around 75. Lower scores than this are only found for wines with one or two expert ratings. When there are more than five expert evaluations the scores tend to be higher on average and slightly less dispersed, although it should be noted that experts do not seek to taste the whole range of wines and usually concentrate on the top end of the market.

Consumer evaluations are made using a five-star rating system – one star being the lowest. On average a wine gets less than 1% of one star ratings, but for at least one wine 32% of the peer ratings are one star (see Table 15).

	Mean	Median	Mode	Maximum rating for a single wine
Average consumer rating	3.978	3.989	4	4.96 (minimum: 2.38)

	Mean (%)	Median (%)	Mode (%)	Maximum proportion of consumers rating the relevant rating for a single wine
One star	0.9	0	0	31.8
Two stars	2.9	0.02	0.04	46.2
Three stars	24.8	14.1	14.8	85.7
Four stars	55.4	83.6	82.5	100
Five stars	16.0	2.3	2.8	92.9

Table 15 - Consumer ratings of wines

The modal rating for a wine is a four star rating. Only 16% of peer ratings are five stars, but for at least one wine 93% of the peer ratings were five stars. The overall average score for a French red wine is 3.98 stars.

3.3.2 Harmonization of the scale for expert scores and consumer ratings

Since most experts rate out of 100 and generally do not publish ratings below 70 (scores start at 50, but in the sample we use, the lowest score is 70) we follow the practice of aligning the consumer ratings with the scale of expert scores based on the ranking of the wine using the equipercentile equating procedure (see Kolen & Brennan, 2014; Oczkowski & Pawsey, 2019)). This involves matching each consumer rating to the expert rating corresponding to the same percentile rank. For example, if the wine with the lowest consumer rating has an average rating of 2.1 it will be converted to 70 if that is the lowest rating given by experts. Table 16 provides an idea of what the conversion entails.

Average five star rating	Normalised rating
3.59	85
3.72	87
3.81	88
3.90	89
3.99	90
4.15	91
4.24	92
4.37	94
4.48	95

Table 16 - An example of our conversion of five-star rating to a comparable normalized rating

The average consumer rating for a wine is a continuous variable, whereas expert scores are usually integers and for the vast majority of wines, the average score is also an integer. This conversion has two important consequences. First, a wine rated 4.2 by consumers is no longer rated as being twice as good as one which scores 2.1, because the expert scale runs from 70 to 100. Second, a wine that has a consumer rating of 2.1 (and 70 after conversion) will not necessarily be rated as badly by experts. In fact, the correlation coefficient between consumer and expert evaluations is between 0.4 and 0.5 in the sample used here. However, the resulting scales for consumer and expert scores are ordinally equivalent with equal means and medians.

3.4. Hedonic price equations

The convention in the hedonic wine price literature is to express the price in logarithms – see Oczkowski & Doucouliagos, (2015) and Outreville & Le Fur (2020) for recent surveys. This has the consequence of rendering the relation between actual price and continuous explanatory variables nonlinear. In the case of expert scores and consumer ratings, the interpretation of their coefficients is as follows: a one point increase in the expert score (peer rating) say from 89 to 90 will have approximately a 100 x coefficient percent effect on price. This is the form of relation used by Oczkowski & Pawsey (2019) for example. A large number of studies convert the scores and ratings into logarithms as well as the price. In this case, the coefficients are the elasticities of price with respect to the expert score or consumer rating.

In what follows we present estimates of these coefficients using three different estimation methods: standard least squares, instrumental variables, and quantile regression. The first is the usual approach to estimation in hedonic price analysis. Since consumer evaluations of a wine may be affected by the bottle price, instrumental variables estimates enable the possible endogeneity of consumer ratings to be taken into account in hedonic price regressions. Finally, regression estimates provide an estimate of the average relation between wine prices and the explanatory variables. Quantile regression enables the effect of the explanatory variables to be assessed at different points (percentiles) in the distribution of prices.

3.4.1 Regression estimates

In order to set a benchmark, following Oczkowski & Pawsey (2019), both the log-linear and log-log regression specifications are estimated in which expert and consumer evaluations are entered separately and together. Additional explanatory variables are the wine region and vintage. Bordeaux, Bourgogne, and Saint Emilion grand, premier, and classified crus are represented by separate dummies from the wine area.

Each type of quality evaluation is found to be highly statistically significant when entered individually and alongside the other. In the log-linear specification containing the two forms of evaluations, holding the other evaluation and other factors constant, a *one point increase* in the average expert rating for a wine, from 90 to 91 say, increases its price by 6.6% and by around 11.4% for an equivalent increase in the average consumer rating. In the corresponding log-log specification, the ceteris paribus effect of a *one per cent increase* in the same variables would lead to an increase in price of 5.7% in the case of expert scores and 9.7% for consumer ratings. In the log-linear formulation, the implied elasticities at the mean values are nearly identical to those obtained in the log-log specification (5.6 and 9.4). In both specifications therefore it is clear that changes in consumer ratings have a more marked effect on prices. The hypothesis that the two effects are identical in magnitude is rejected in both specifications. From here on, the log-log model is retained as the reference since the relationship between price and consumer and expert evaluations is clearly nonlinear, and in this specification, the coefficients of these variables are estimated elasticities. Use therefore of this model as the reference specification enables one to read off the elasticities directly from the tables of results and will facilitate comparisons across estimation methods – we use instrumental variables and quantile regression as well as OLS – and across the different samples used in the robustness checks.

These overall effects cover wines ranging from table wines to the most prestigious wines in Bordeaux and Burgundy. Figure 19 and Figure 20 present the coefficient estimates for wine area and vintage respectively.

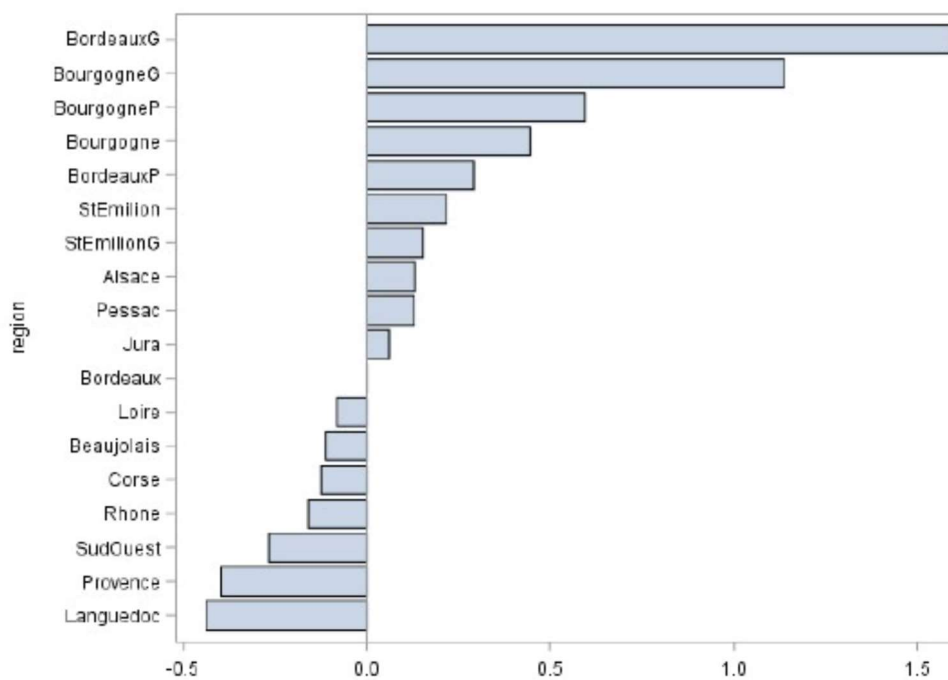


Figure 19 - The effect of wine area on price

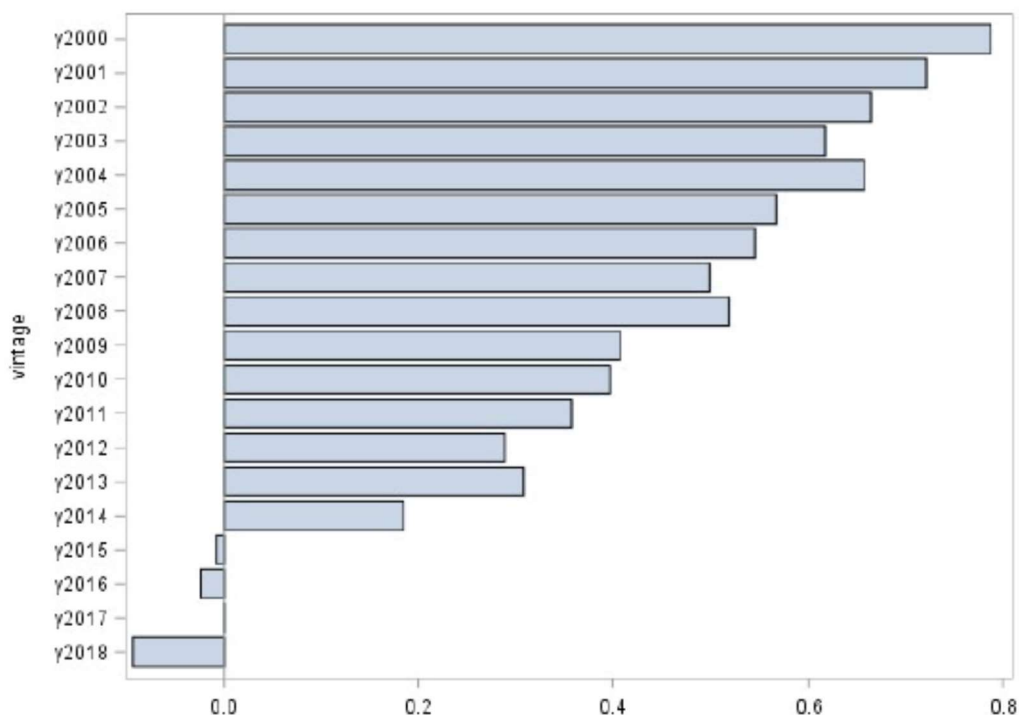


Figure 20 - The effect of vintage on price

The coefficient measures the effect of wine area relative to non-classified Bordeaux wines. The largest coefficient is for the top 5 Bordeaux reds from the 1855 classification (Premiers Crus), followed by Bourgogne Grand cru, Premier cru, and non-classified wines (village and

regional appellation). Provence and Languedoc wines have much lower prices than Bordeaux non-classified. The plot of the vintage effects relative to 2017 follows a clear pattern. The more recent the vintage, the lower the price, other things being equal. According to these results, the average annual return on a French red wine between 2000 and 2018 would be 4.5%. This is the gross rate. To arrive at the net rate of return the cost of storage and insurance should be deducted. Note, however, that this rate is perfectly in line with the study by Dimson et al. (2015) who found a net annual rate of return of 4.1% between 1900 and 2012 for Bordeaux red Grand Cru Classé wines.

3.4.2 Instrumental Variable Estimates

It is possible that consumer ratings include a value-for-money factor meaning that the score includes both price and quality elements. The customary approach to dealing with an explanatory variable that is potentially endogenous is to use an instrumental variables approach. Such a procedure requires that there exists (usually contained in the database) one or more variables correlated with potentially endogenous explanatory variable and uncorrelated with the error term, which captures unobserved factors that influence the price of wine. Sometimes it is possible to add in such a variable from an outside source as in the Oczkowski & Pawsey (2019) who used data on weather conditions.

In the database used here, apart from the names of the wine and producer, various geographic definitions, the vintage and alcohol content, the only contenders will be related to consumer ratings and expert scores and their names. One variable that may have the desired properties is the number of consumers who have posted an evaluation. The first step of a two stage least squares procedure suggests that the logarithm of the number of ratings is significantly and positively correlated with the logarithm of the average consumer rating. The weak instruments test F statistic is around 250 and well above the critical values usually applied. The estimated effect of consumer ratings is lower (7.85) than the ordinary least squares estimate, but still dominates the effect of expert scores (coefficient estimate: 6.17) and the hypothesis that the two are equal is categorically rejected ($p < 0.001$). However, a Hausman test suggests that the resulting instrumental variable (IV) estimates are not

significantly different from the least squares regression estimates at conventional significance levels (p value = 0.13). This implies that the ordinary least squares are consistent and more efficient. While with instrumental variables estimation it is not possible to establish unambiguously that consumer ratings are not affected by value for money considerations (and therefore price), on the basis of the Hausman test, our conclusion is that the least squares estimates do capture the overall effect of consumers' assessments of quality on prices.

This conclusion is fully in line with the results of two other studies that have used data from Vivino. Oczkowski & Pawsey (2019), using data on Australian wines, undertook an endogeneity test using as instrumental variables growing season temperature, solar exposure, and rainfall during the harvest. They conclude that: "the endogeneity of ratings appears to be statistically unimportant" (p.34). An earlier study by Kotonya et al. (2018) using data which were obtained by 'crawling' the Vivino platform, found that "Vivino users' ratings do not seem to be heavily affected by wine prices" (p. 1). These conclusions provide additional support for the results presented above.

3.4.3 Quantile regression estimates

A quantile regression analysis enables the effect of consumer and expert evaluations to be quantified at different points in the distribution of prices. The quantile coefficient estimates for the log-log specification are presented in Appendix table A2, along with the results of tests of the equality of the coefficients of the consumer and expert scores. A clearer idea of the quantile process can be seen in Figure 21 which confirms that consumer ratings are always quantitatively larger effect on price than expert scores.

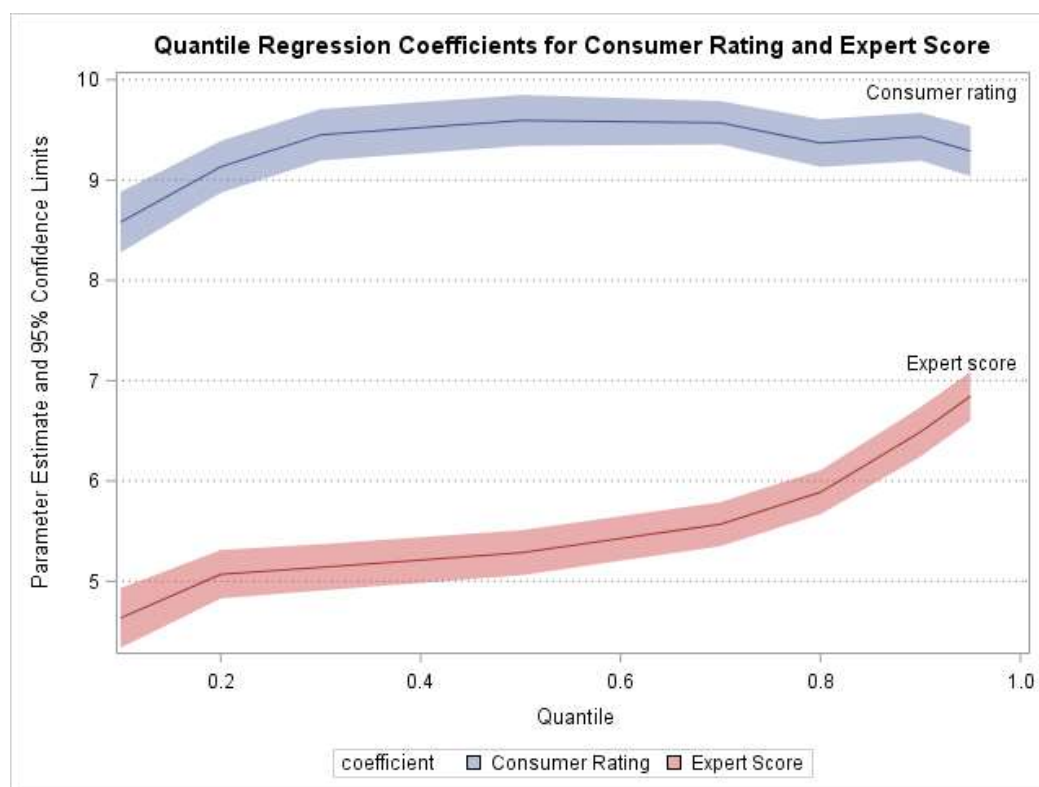


Figure 21 - Quantile regression coefficients

However, their relative importance is smaller for higher priced wines. In fact, the effect on price of expert evaluations increases with price especially for wines priced above the median, while the role of consumer ratings remains roughly constant from the first quartile upwards.

There are several possible reasons for this quantile profile. First, due to risk aversion, an expert evaluation of highly-priced wine may reduce the risk of buying a disappointing wine, as underlined by Cardebat and Livat (2016). Second, if top-end wines are purchased as an investment good, markets tend to look at expert ratings as a factor to justify the higher price (see for example Le Fur & Outreville (2019)). While we have no information on consumer characteristics in our data set, the age profile of consumers may be such that older and comfortably off consumers traditionally put their faith more in expert evaluations with which they are more accustomed, as argued by Bauman et al. (2019).

3.5 Robustness checks

The dominance of the price effect of consumer ratings appears to be well-established. Although the quantile regression results suggest the effect of expert scores is higher for top-end wines, it does not dominate effect of peer ratings. In what follows we undertake a number

of robustness checks in order to see whether this conclusion holds up. The results in Table 17, column 6 are the relevant benchmark.

	Semilog specification			Log-log specification			IV estimates
Expert rating	0.105 (0.001)	-	0.064 (0.001)	9.03 (0.01)	-	5.60 (0.08)	6.17 (0.39)
Consumer rating	-	0.132 (0.001)	0.108 (0.001)	-	11.39 (0.08)	9.41 (0.08)	7.85 (1.04)
R ²	0.59	0.66	0.697	0.59	0.65	0.698	0.653
Test of equality of coefficients			27.9 [p < 0.001]			27.2 [p < 0.001]	27.3 [p < 0.001]
Hausman test							-1.53 [p = 0.13]

Note: Standard errors in parentheses, p values in square brackets. Included regressors: wine region and vintage.

Table 17 - Regression estimates for the sample of French red wines

One possible omitted factor is differences in the effect of aging on the taste of the wine. Some wines need to age a number of years before they ready to drink while others may be too old and are past their best. Robert Parker provides a number of maturity indicators in his *Wine Advocate* Vintage Guide for the main wine-producing regions (<https://www.robertparker.com/resources/vintage-chart>). For each region and vintage covered, the maturity is rated as 'ready to drink', 'youthful', 'irregular', 'too old' or 'early maturing and accessible'. Since some regions in the sample do not appear in the chart, we re-estimate the log-log price specification over a reduced sample including dummy variables for these indicators (Table 18, column 1).

	Include drinking criteria	Use maximum expert score	Exclude Grand, Classified and Premier Crus	Exclude all Bordeaux and Bourgogne	Bordeaux and Bourgogne only
Expert score	5.84 (0.09)	5.56 (0.08)	5.16 (0.10)	6.32 (0.13)	5.20 (0.11)
Consumer rating	9.43 (0.09)	9.19 (0.08)	9.13 (0.09)	8.20 (0.11)	10.52 (0.13)
R ²	0.69	0.69	0.55	0.56	0.68
Test of equality of coefficients	24.45 (p < 0.001)	26.58 (p < 0.001)	25.87 (p < 0.001)	10.63 (p < 0.001)	26.57 (p < 0.001)
number of observations	34,909	36,970	27,444	16,904	20,066

* Wines with at least one expert score. Included regressors: wine region and vintage. Standard errors in parentheses.

Table 18 - Robustness checks

While maturity is found to have a statistically significant effect on price, the inclusion of these additional variables does not alter the magnitudes of the effects of consumer and expert evaluations. A second check involves replacing the average expert score by the maximum score given by the different experts. Sellers sometimes only feature the highest expert score and this is referred to as the 'marketing effect' by Cardebat et al., (2014). If experts disagree, the effect of the average score may be smaller. When the model is re-estimated using the whole sample (Table 18, column 2), there is no discernible difference compared the estimated coefficients compared to the initial findings.

The quantile regression estimates suggest that expert scores have a greater impact in both absolute and relative terms in the upper half of the price scale. It is possible that expert opinion counts more for high reputation, top quality wines found in the Bordeaux and Burgundy regions. In what follows we examine the relative importance of consumer and expert evaluations on wine prices by including and excluding wines from these regions. When the Grand, Classified and Premier crus from both regions are excluded which reduces the sample size by a quarter, the magnitude of the price effect of both consumer ratings and expert scores are slightly smaller (Table 18, column 3) with respective elasticities of 9.15 and 5.13 Excluding all wines from the Bordeaux and Burgundy regions (as per the definition in table A1) involves removing more than 20,000 wines from the sample (a 45% reduction). The coefficient estimates indicate that the average expert score has a much larger impact on price (with an elasticity of 6.2) with consumer ratings have a slightly smaller effect (Table 18, column 4). Finally, in column 5 the sample is confined solely to Bordeaux and Bourgogne wines. The estimated coefficients suggest that the effect of consumer ratings is even more pronounced than for red wine in general. The clear conclusion that emerges from these results is that consumer ratings have larger effect on wine prices than expert scores.

3.6 Conclusions and implications

This paper is part of an emerging literature documenting the beginning of a shift in the way consumers inform themselves about the quality of an experience good. It is the first paper to use such an extensive database from the Vivino application. It is also the first to find such

strong, significant, and robust effects between experts and peers. The impact of the information provided by peers on the Vivino application on the prices of the 36,970 French red wines in the sample is almost twice as high as the impact of the evaluations made by traditional experts. Since the supply of wine is inelastic, this impact on price directly reflects the upstream impact on demand. Consumers' opinions increase sales of French red wine more than experts' opinions do.

This result leads us to conclude that a paradigm shift is underway in the wine information market. Dominated since the 1970s by experts who were sometimes elevated to the rank of stars or gurus, such as Robert Parker, the digitization of the market for information brings customer reviews to the fore. A similar trend is already present in the hospitality information market. One of the advantages with consumers is their ability to collectively taste and rate an almost unlimited number of wines. For an experience good such as wine, the increase in the number of wines receiving ratings should lead to greater market efficiency.

This paradigm shift will strongly impact the way in which wine is marketed. For sellers, it becomes more advantageous to communicate a Vivino rating than an expert score. While there is no scientific basis for these assertions, informal discussions with wine export professionals have confirmed this trend: French exporters and US importers have told us that a 4.0 Vivino rating (or better) is the new reference in the same way that studies and wine professionals had highlighted the '90/100 Parker' benchmark (Gibbs et al., 2009).

Further research could extend to medals awarded in competitions organized by agricultural shows or specialized magazines and guides, which also have an important role to play in the prices of mid-range and low-end wines. Beyond that, other sources of information, such as bloggers, friends, and family may also be relevant. However, all these sources of information seem to be less important as a platform and application with more than sixty-four million users where no less than sixteen million wines are rated.

Several issues merit further research based on the data available on Vivino. For example, who are the peers who influence others and what is their level of activity on the site? Is there a form of path dependency whereby the first evaluations and ratings published

influence subsequent ones as suggested by Gokcekus et al. (2018) using data from the CellarTracker site? What are the profiles and geographical origins of the people who post the most ratings? To address these questions, more detailed longitudinal data from the Vivino platform would be required.

Disclosure Statement

No potential competing interest was reported by the authors.

Appendices

	Mean	Standard Deviation
price	68.61	118.63
log(price)	3.652	0.957
consumer rating	3.978	0.309
expert rating	89.53	3.56
Region		
Alsace	0.004	0.067
Beaujolais	0.046	0.209
Bordeaux (non-classified)	0.169	0.374
Bordeaux Top 5 in 1855 classification	0.002	0.047
Bordeaux Other 1855 classified	0.027	0.163
Bourgogne	0.096	0.295
Bourgogne Grand Cru	0.053	0.224
Bourgogne Premier Cru	0.104	0.306
Corsica	0.001	0.034
Jura	0.002	0.051
Languedoc	0.096	0.294
Loire	0.011	0.104
Provence	0.013	0.116
Rhone	0.276	0.447
St Emilion	0.001	0.036
St Emilion Grand Cru	0.069	0.254
South West	0.005	0.072
Pessac-Leognan	0.019	0.138

	Mean	Standard Deviation
Vintage		
2000	0.018	0.135
2001	0.019	0.138
2002	0.015	0.123
2003	0.021	0.143
2004	0.02	0.142
2005	0.041	0.201
2006	0.041	0.199
2007	0.041	0.199
2008	0.045	0.209
2009	0.067	0.25
2010	0.069	0.253
2011	0.074	0.263
2012	0.098	0.297
2013	0.087	0.282
2014	0.096	0.295
2015	0.104	0.305
2016	0.075	0.264
2017	0.043	0.204
2018	0.016	0.125
2019	0.001	0.022

Table A1 - Sample means and standard deviations

Quantile	0.1	0.25	0.5	0.75	0.9
Expert score	4.58 (0.17)	5.03 (0.12)	5.23 (0.11)	5.69 (0.12)	6.31 (0.14)
Consumer rating	8.50 (0.18)	9.32 (0.12)	9.55 (0.12)	9.40 (0.11)	9.22 (0.13)
Test of equality of coefficients	14.39 ($p < 0.001$)	21.64 ($p < 0.001$)	23.87 ($p < 0.001$)	20.60 ($p < 0.001$)	13.77 ($p < 0.001$)

n = 36,970

Standard errors in parentheses.

Table A2 - Quantile regression estimates: log-log specification

Experts' ratings are used by consumers to infer the likely quality of the wines prior to purchase. The first chapter prospectively proposes that experts could be challenged by prosumer communities when it comes to rating wines. In the second chapter, we elicited the *ex ante* value of experts' ratings, brands and GIs in experimental auctions conducted with wine consumers in Spain and France. The results suggest a prevalence of expert ratings in comparison to the other quality cues. Expert ratings generate a consumer surplus of €0.35 in Spain and €0.37 (similar for GIs) in France for each purchasing occasion. The third chapter's findings support the hypothesis of the first chapter. To measure the consumer surplus of experts' ratings in comparison to other quality cues in pre-purchase situations, we use a hedonic regression method and suggest that peers have more impact on French red wines prices (i.e., demand) than experts. Interestingly, the results are robust even when we exclude the top-end wines.

So far, we have studied the role of experts in comparison with other quality cues available to wine consumers: peers' ratings, GIs, and Brand. We elicited the role of experts in market dynamics, the *ex ante* value of their ratings and their impact on prices. In order to complete this analysis, the following chapter aims at eliciting the *ex post* value of experts' ratings in comparison to peers ratings. To do so, we develop a no-contact non-hypothetical multimethod design experiment and we run it in a home-use test setting with wine consumers in Spain and France. The last chapter of this thesis is co-authored with Jean-Marie Cardebat, François Ric, Michel Visalli and Effrosyni Vasileiou. It will be sent to *Research Policy*.

The corresponding data paper *A dataset on the sensory and affective perception of Bordeaux and Rioja red wines collected from French and Spanish consumers at home and international wine students in the lab* has been published in *Data in Brief*. It has been reproduced in appendix A. *Using Free-Comment to investigate expertise and cultural differences in wine sensory description*, another joint work with Michel Visalli, Pascal Schlich, François Ric, Jean-Marie Cardebat and Nikolaos Georgantzis has been published in *Food Quality and Preference*. It is reproduced in appendix B.

Chapter IV – How to Use (or Not to Use) No-Contact Home Use Test (HUT) to Elicit Consumer Preferences

Abstract

The recent Covid-19 crisis has created a challenging environment for usual Central Location Test (CLT) studies aimed at eliciting consumers' preferences for wine. An obvious alternative to CLT is presented here; No-Contact Home-Use Test (N-HUT). The paper reports challenges and benefits associated with such N-HUT for preference elicitation. We designed a "maximal" experiment, including several stated and revealed preferences elicitation methods under different information conditions (control, peers or experts ratings). Our aim is to determine how much we can and how much we need to know to address the main challenges of preference-oriented research when contact with the consumer is difficult or impossible. We used a panel selection agency to recruit and screen 660 French and Spanish consumers and selected 300 of them to receive four 2cl wine samples at home and participate in the online incentive-compatible experiment. We assessed the isolated and combined effectiveness of the evaluation methods. Many of the tests were successfully implemented, offering extensive and heterogeneous information on the participants' reactions to the wine tasting experience under different conditions regarding information on expert and peer ratings of the wines. Video recording and automated emotion recognition software worked poorly, mainly due to noncompliance of the participants with instructions. Only stated liking (SL) matters in the explanation of consumers' willingness to pay.

Keywords: Incentive compatible experiment, no-contact home use test, willingness to pay, stated and revealed preferences, quality perception

Funding

This experiment has been funded by ECO department (Université de Bordeaux), Chaire Vins & Spiritueux INSEEC U. (Bordeaux, France) and Burgundy School of Business (Dijon, France).

4.1 Introduction

Preference-oriented research is of great use to policy makers and enterprises. In fact, understanding the preferences of consumers towards complex and uncertain quality products is the subject of many policy-oriented and marketing studies. A challenging domain where preference elicitation is pervasive and heterogeneously available is that of wine. The Covid-19 crisis has posed a further limitation to preference-oriented research. Consequently, the usual strategy of learning from consumers through Central Location Test (CLT) sessions has been compromised for about two years. The challenges posed by the pandemic affected a large number of disciplines usually relying on CLT and contact with the subjects of their studies (see Shore et al., 2023). In this context, effective experimental approaches to preference elicitation have become difficult if not impossible, raising questions on 1) whether we can still learn from consumer tasting experiences without CLT, 2) how much we learn, and 3) how much we need to know to respond to the main questions usually addressed through preference-oriented research. In this study, we address these three general questions, obtaining a positive answer to the first and a rather positive answer to the second, although the extent of information obtained is inversely related to the number of participants responding. With respect to the third question, we show that a small subset of all the information obtained is useful to inform pricing decisions.

The wine tasting sector responding to either commercial or educational needs has reacted to the pandemic restrictions with numerous online tasting initiatives⁵³. However, the research aspects of wine tasting, including measurements aimed at preference elicitation have not been addressed by any of these initiatives. Most preference elicitation studies focus on few methods of preference elicitation, aiming at comparisons across contexts (O'Donnell & Evers, 2019). Several detailed models exist predicting consumer preference based on large numbers of variables associated with the physicochemical properties of the wine (Cortez et al., 2009;

⁵³ See [The Best Virtual Wine Tastings To Join During Coronavirus Lockdown | HuffPost Life](#) for some examples (accessed 22.10.2023)

Legin et al., 2003). Here we assume that a parsimonious approach is necessary when information is costly and obtaining more information may lead to attrition. Furthermore, we assume that the experiment is aimed at understanding the determinants of the consumer's willingness to pay (WTP).

The unprecedented situation has been a source of inspiration for the development of methods and research protocols that would not have been used otherwise (e.g., Dinnella et al., 2022). For example, sensory tasting in Home Use Test (HUT) has been combined with an online auction (Vickrey second-price) to elicit willingness to pay (WTP) for food using a small (n=50) convenience sample in the United States (Garrido et al., 2021). Park et al. (2023) has developed a no-contact HUT (N-HUT)⁵⁴ with coffee in Korea. No-Contact HUT is a further development of HUT, where participants are never in physical contact with the lab: they receive the samples at their home address, perform the experiment online and receive electronic compensation. However, some products are more challenging than others to use in HUT than others, mainly for logistical reasons. One such product is wine. For products such as wine, HUT has historically often been hybridized with face-to-face contact at the lab, at least for sampling. The logistics (and cost) of sending wine bottles by post mail are a real challenge. This may explain why no fully remote hedonic test under HUT conditions has ever been conducted for wine. The validation of a no-contact N-HUT proof of concept would open the field of possible wine experimentation in economics.

4.2 Protocol, sample, data collection and challenges

We designed a “maximal” experiment, using a (1) between-subjects with a control group, (2) incentive-compatible, (3) No-Contact Home-Use-Test experimental design including several stated and revealed preferences elicitation methods. The protocol has been approved by the ethics committee of the Burgundy School of Business Research Ethics Committee (Dijon,

France)⁵⁵. The complexity of combining N-HUT, video recording and experimental auction with resolution is reflected on the cost of the experiment (see Table 19).

Category	Service	Total Budget (in Euros)
Sampling & logistics	Wine (4 references x 12 bottles)	739
	Bottling in 2cl samples + shipment France	4,603
	Postal services (rewards France)	160
	Postal services (shipment Spain + rewards Spain)	487
Recruitment & incentives	Recruitment Screening phase	3,636
	Incentives Experiment	3,894
	Rewards	226
	Total	13,745

Table 19 - Cost of the experiment

A detailed description of the protocol can be found in the data paper “A dataset on the sensory and affective perception of Bordeaux and Rioja red wines collected from French and Spanish consumers at home and international wine students in the lab.” (Visalli et al., 2023) in Appendix A. Below is a summary of this protocol focusing on the methodological lessons drawn from this experiment.

The participants connect to the Timesens web application and read the informed consent. If they agree to participate, they first must validate a checklist mentioning all the conditions that should be arranged to optimize the video recording. Once validated they go through video calibration. After video calibration, they are asked about their expected liking of each of the four wines. Next, they participate in a practice round with water. Then for each of the four wines the tasting phase is video recorded. They must evaluate their familiarity with the wine, state their liking, describe with free-text comments⁵⁶ their perception, evaluate the overall wine’s quality and finally participate in an experimental auction. Once they have tasted the four wines, they rank them. They answer questions on their product category involvement, opinion-seeking behavior, subjective wine knowledge, purchasing and consumption patterns, before the auction resolution. The auction winners receive the bottle they purchased by mail post. No

⁵⁵ Protocol number CERBSB2022-9

⁵⁶ Free comments are exploited in (Visalli et al., 2023b)

physical contact is established with the researchers, neither for sampling nor for reward or compensation.

4.2.1 Wine samples

To test the impact of information (peers' and experts' ratings) on consumer preferences, we chose four wines that were: (1) all red wines (2) of the same vintage, (3) all from famous wine regions, (4) rated by at least one expert, and (5) rated by at least 10 Vivino prosumers. Although this information is not communicated to the participants, all four wines are also in a similar price range (around €15). By using the same price range and same vintage for the wines, we tried to limit as much as possible the variations of the wines' characteristics that could have influenced participants' preferences. Each pair of wines received one higher and one lower rating from peers and experts (W1 and W3: low, W2 and W4: high)⁵⁷. The selection of the four wines was made so that the ranking of the wines (1st, 2nd, 3rd, 4th) differs between peers and experts, allowing us to control for endogeneity. The specifications of the four wines are displayed in Table 20.

Code	Country	Wine region	Expert rating	Expert Ranking	Community rating	Community Ranking
W1	France	Bordeaux	85/100	4	3.76/5 (383 ratings)	3
W2	France	Bordeaux	94/100	1	4.07/5 (84 ratings)	2
W3	Spain	Rioja	88/100	3	3.21/5 (16 ratings)	4
W4	Spain	Rioja	90/100	2	4.10/5 (135 ratings)	1

Table 20 - Wine samples specifications

Most of the HUT studies use blind tasting when studying the preference of consumers for food and beverages (e.g., Boutrolle et al., 2007). However, in real-life conditions, consumers seldom taste products without disposing of any information. Most of the HUT tests performed

⁵⁷ The relatively modest differences between the wines' ratings are due to experts' censorship of low ratings: ratings below 80 are usually not published.

are therefore a mere transposition of the tasting place, from central location to home, but this change of setting does not guarantee any external validity improvement. To avoid this bias and to increase the external validity of our study, we opted to provide participants with all the legal information usually available on wine labels. To increase the ecological validity of the study, we also favored the use of their own glassware for the tasting (see Singh & Seo, 2023)

To allow a fully remote setting (no contact), shipping one 75cl bottle per wine was unimaginable, mainly due to cost and transport risks. The four wines have therefore been sampled in 2cl samples⁵⁸ labelled with standardized legal information (name of the wine, name of the producer, alcohol %, geographical indication, vintage) and shipped by mail to the participants. Since red wine can usually be consumed at room temperature, it has been selected to avoid needlessly complicating the HUT with service temperature. Anticipating possible dropouts, we sent ten 75cl bottles of each of the four wines to the bottling supplier and received in return 360 2cl samples (180 for each country) of each wine. Precautions were taken in order to assure the best shipping conditions: (i) the experiment was postponed to avoid summer (hot) period, (ii) express shipment was favored, (iii) the experiment was launched at least a week after the shipment to give the wine the time to rest, and (iv) a sommelier tasted each bottle to make sure they were in perfect condition (not corked, not spoiled) before Vinovae turned them into 2cl samples. To avoid order bias, the wine order presentation for each participant was randomized using a Latin square – Williams's design directly inserted in Timesens web app. Though the use of 2cl samples offers rich perspectives to conduct no-contact experiments across borders, the following elements should be taken into consideration; (1) the sampling of the selected wines in 2cl bottles is subject to production schedule of the bottling service provider; slots should be booked in advance, (2) the experiment

⁵⁸ Kim et al. (2016) estimate for one mouthful volume in a single swallow and average volume per swallow (AVS). Similarly, Oman et al., (2003) recommend the same volume for cup sipping (the equivalent of one swallow). It also responds to the motor artifact control stemming from oral processing of the sample (Danner et al., 2014). Combris et al (2009) use this same volume in their experiment. Serving size has also been determined to ensure that the total intake of alcohol during the research session is inferior to the one of a standard drink (< 10 g pure alcohol) (Jaeger et al., 2019).

dates should be planned considering the short shelf life of the samples (two months). (3) We recommend avoiding shipping the samples when and where the temperature could spoil the wine. (4) The minimum order for bottling 2cl Vinottes is 18 bottles.

4.2.2 Recruitment

Target population (screening survey)

We estimated a sample size in the range of 100-150 persons in each country for most tolerable levels of risk. Since Arechar et al. (2018) identified participant dropout as the major challenge of online interactive experiments, we anticipated possible dropouts by selecting the upper range of our estimate (n=150) as a recruitment target. Despite the additional costs, we made the choice of performing the recruitment in two steps (1) screening questionnaire and (2) inclusion in the study based on the accuracy of the screening questionnaire answers. Our decision to compensate the participants two times (see Table 19) was motivated by the literature that showed that asking participants for personal information or to engage in complex tasks (here video recording) significantly increases the attrition rate (e.g. Galesic, 2006; O'Neil & Penrod, 2001). Both the elevated cost to acquire any additional data point and the difficulty in recruiting participants willing to provide postal address and to be video recorded prevented us from offering a bigger sample. We first created a screening survey on Qualtrics to select adult wine consumers that would agree to provide their postal address and to be video recorded. We then remunerated Qualtrics to recruit 660 untrained wine consumers representative of the French and Spanish wine drinking population following pre-established quotas (60 during the soft launch and 600 after validation). Following the recommendation of Castiglioni et al. (2008) we opted for conditional monetary incentives (final payment) in both phases to maximize the completion rate. Following the recommendations by Plott & Zeiler (2005) we also rolled out a set of controls to eliminate subject misconceptions: we guarantee anonymity, provide the participants with a practice round (with water), and engage them with a binding outcome.

We identify the main barriers to recruitment to be (1) participants' reluctance to provide their real postal address and (2) the difficulty to recruit certain segments of the wine-drinking

population (females and the elderly in particular). The presence of a remote video recording appears as an obstacle for participants, despite the guarantees offered both by the prestigious image of the University of Bordeaux and the ethical guarantees mentioned in the informed consent (e.g., previous validation by the ethics committee and anonymization guarantee).

We recommend caution with the screening of the potential participants for N-HUT. Though we used a panel agency, we detected several duplicated participants, and a significant number of the post addresses provided by the participants were incomplete, multiple, or fictitious (especially in Spain). Though Zhang et al. (2020) did not detect a higher rate of low-quality responses from professional respondents than from novices, we share the concern of Malter et al. (2020) about the quality of the data and generalizability of responses from an evolving, seemingly conditioned “professional” cohort of online respondents. Even though we only recorded videos for the purpose of using them for emotion recognition, we hypothesize that video recording could be used as a tool for HUT researchers to identify professional respondents duplicating accounts.

Operational population (sampled participants)

The use of no-contact protocol allowed us to recruit participants from all over France and Spain (including Canary Islands and rural areas) reinforcing the external validity of our findings. We selected the participants based on the accuracy of the address provided during the screening questionnaire and completeness of the information provided. We sent unique links to 320 participants in France and Spain. Participants that provided fictitious or erroneous mail addresses were replaced. We shipped the wine samples and received back more than twenty samples of participants who provided incorrect postal addresses.

Table 21 presents a summary of the attrition rate and missing data (video related) at each phase of the experiment. The difference between the first and the second screening phase is due to the selection of participants by the researchers. French respondents to the screening questionnaire have been more prone to provide a seemingly correct address. Attrition rate is comparable between France and Spain with minor differences in the various phases.

Phase	Description	France	Remaining from the initial sample (in %)	Spain	Remaining from the initial sample (in %)
Screening I	Complete responses to the screening questionnaire	330	100	330	100
Screening II	Full postal address	226	68	172	52
Sampling I	Samples sent	162	100	162	100
Sampling II	Sampled delivered	150	93	150	94
Experiment I	Started the experiment	111	69	109	68
Experiment II	Completed the experiment	106	66	98	61
Video I	Connected their webcam	94	59	92	58
Video II	Complied with the instructions	74	46	70	44
Video III	Usable videos	36	23	40	25

Table 21 - Attrition and missing data

Complying with instructions has been a major issue for video recording. Despite the implementation of (1) a screening questionnaire, (2) clear instructions and (3) a mandatory checklist with all the elements to ensure a good quality video recording, we did not obtain better results than De Wijk et al. (2019). More than half of our panel failed to follow the provided instructions, resulting in unusable videos. Incentives do not compensate for the poor performance of respondents in the video phases of the experiment. Only a minority of the respondents (23% in France and 25% in Spain) did comply with the instructions and produced usable video. Therefore, despite the subsequent investment of time and energy it represents, and building on prior suggestions (e.g. Castiglioni et al., 2008) we recommend to proceed to a video briefing with the participants prior to the experiment. We also recommend implementing attention checks, especially when delivering the information to the groups with treatments.

In total, we sent samples to 324 operational participants of which 220 started the experiment on Timesens web app, 204 completed it. To provide policy makers with useful information concerning the propensity of respondents to comply with the instructions and provide a usable video, we proceed with a T-Test of the participants individual characteristics against their capacity to comply with the instructions. Table 22 shows that age is the only predictor of completion since level of studies and income level are not significantly different for

participants that completed the task than for those who did not. The group of participants that completed the experiment is significantly older than the group of participants that dropped out.

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Age	Equal variances assumed	7.056	0.008	-2.784	323	0.003	0.006	-0.440	0.158	-0.752	-0.129
	Equal variances not assumed			-2.854	271.681	0.002	0.005	-0.440	0.154	-0.744	-0.137
Studies	Equal variances assumed	4.214	0.041	-2.028	322	0.022	0.043	-0.283	0.140	-0.558	-0.009
	Equal variances not assumed			-2.077	271.171	0.019	0.039	-0.283	0.136	-0.552	-0.015
Income	Equal variances assumed	0.501	0.480	1.700	323	0.045	0.090	0.141	0.083	-0.022	0.304
	Equal variances not assumed			1.712	257.967	0.044	0.088	0.141	0.082	-0.021	0.303

Table 22 - T-Test Completion Age Studies Income

No individual characteristics of the participants could be used as predictors of the quality of the video. The only study using automated emotion recognition software in HUT setting fails to report descriptive statistics about the eighteen participants finally retained in their study (De Wijk et al., 2019). Trying to use automated emotion recognition software in a HUT context led to a significant complexification of the recruitment process, important attrition resulting in a substantial cost increase for this experiment. We recommend limiting the use of automated emotion recognition software to CLT settings. CLT would enable to control the definition of the webcam, of light, of prior briefing. We will now present the descriptive statistics of the sample that completed the experiment.

Characteristics of the participants

To measure the effect of information on stated and revealed preferences, we used an inter-group design. The first group is the control group, the second (treatment 1) is exposed to expert ratings, and the third one (treatment 2) to community ratings. The participants are randomly

assigned to one of three groups to ensure that the baseline participant characteristics are comparable across the groups. In total, 106 participants in France and 98 in Spain completed the experiment. The characteristics of the participants that completed the survey appears in Table 23.

		France		Spain		Total	
		N	%	N	%	N	%
Gender	Male	52	49.10	47	48.00	99	48.50
	Female	54	50.90	51	52.00	105	51.50
Age	18-29	11	10.40	7	7.10	18	8.80
	30-40	19	17.90	31	31.60	50	24.50
	41-50	21	19.80	26	26.50	47	23.00
	51-60	16	15.10	18	18.40	34	16.70
	61-70	29	27.40	15	15.30	44	21.60
	70+	10	9.40	1	1.00	11	5.40
Sociodemographic characteristics	Student	5	4.70	2	2.00	7	3.40
	Employed	61	57.50	75	76.50	136	66.70
	Unemployed	4	3.80	11	11.20	15	7.40
	Retired	32	30.20	7	7.10	39	19.10
	Other	4	3.80	3	3.10	7	3.40
Household income	Living comfortably	21	19.80	43	43.90	64	31.40
	Coping	67	63.20	45	45.90	112	54.90
	Finding it difficult	15	14.20	6	6.10	21	10.30
	Finding it very difficult	2	1.90	3	3.10	5	2.50
	Prefer not to answer	1	0.90	1	1.00	2	1.00
Number of observations		106		98		204	

Table 23 – Socioeconomic characteristics of the sample

Participant attrition can affect the assumption of random assignment, especially for online survey (Zhang et al., 2020). The Chi2 performed on the individual characteristics of the respondents confirms the absence of significant differences between the three groups, discarding the suspicion of any selection bias due to attrition. The purchasing and consumption patterns of the respondents appear in Table 24. The proportion of respondents who purchase wine online or that consume wine daily at home is almost twice as important in Spain than it is in France. Spanish respondents are also much more likely to regularly consume wine on premise than French respondents.

		France		Spain		Total	
		N	%	N	%	N	%
Wine consumption frequency at home	Daily	16	15.10	29	29.60	45	22.10
	At least once a week	60	56.60	59	60.20	119	58.30
	At least once a month	27	25.50	7	7.10	34	16.70
	Less than once a month	1	0.90	1	1.00	2	1.00
	Never	2	1.90	2	2.00	4	2.00
Wine consumption frequency outside from home	Daily	2	1.90	4	4.10	6	2.90
	At least once a week	41	38.70	64	65.30	105	51.50
	At least once a month	47	44.30	24	24.50	71	34.80
	Less than once a month	12	11.30	6	6.10	18	8.80
	Never	4	3.80	0	0.00	4	2.00
Wine purchasing place ⁵⁹	I don't buy wine	2	0.80	1	0.40	3	0.60
	Supermarket	77	29.80	67	29.90	144	29.90
	Wine store	72	27.90	65	29.00	137	28.40
	Online	17	6.60	27	12.10	44	9.10
	Directly from the winemaker	63	24.40	42	18.80	105	21.80
	Restaurant and bars	19	7.40	22	9.80	41	8.50
	Other	8	3.10	0	0.00	8	1.70
Average spending for informal drinking (75cl)	Don't buy wine	2	1.90	1	1.00	3	1.50
	Less than €5	14	13.20	29	29.60	43	21.10
	€5 to €10	59	55.70	41	41.80	100	49.00
	€11 to €20	28	26.40	22	22.40	50	24.50
	€21 to €30	2	1.90	3	3.10	5	2.50
	€30 and more	1	0.90	2	2.00	3	1.50
Average spending for formal occasion or gift (75cl)	Don't buy wine	1	0.90	1	1.00	2	1.00
	Less than €5	0	0.00	2	2.00	2	1.00
	€5 to €10	15	14.20	20	20.40	35	17.20
	€11 to €20	55	51.90	43	43.90	98	48.00
	€21 to €30	25	23.60	22	22.40	47	23.00
	€30 and more	10	9.40	10	10.20	20	9.80
Monthly household spending on wine	€ 0	3	2.80	2	2.00	5	2.50
	€50 or less	66	62.30	51	52.00	117	57.40
	€51 to €100	25	23.60	35	35.70	60	29.40
	€101 and more	12	11.30	10	10.20	22	10.80
Nb of observations		106		98		204	

Table 24 - Purchasing and consumption pattern of the respondents

⁵⁹ Multiple responses allowed

In line with the research topic, several questions about participants' valuation behavior, trust towards external information sources, and use of that information during the purchasing process have also been included in the study (see Table 25). Participants reported relying more on vendor-supplied information (experts' ratings and medals), than on information that requires a search effort (use of apps, for example). According to a prior study, the number of respondents possessing a wine app accounted for 22% in Spain and 42% in France (Dubois et al., 2021). Our study suggests meanwhile that the use of the wine app in the purchasing decision is more generalized in Spain than in France. Conversely, the use of expert ratings and medals is more generalized for French than for Spanish respondents, completing the results of a previous study performed in both countries (Sáenz-Navajas et al., 2014). That might be due to the proliferation of the wine competitions in France when compared with Spain; in France the awards of no less than 125 different wine competitions may legally medals be included in the labelling of wines produced in France⁶⁰. The proportion of respondents that often seek advice from other people before purchasing wine is twice as important in France than in Spain. In both countries the proportion of respondents that do not tend to seek advice in their prepurchase phase remains limited (less than 12% of the respondents overall). More than half of the respondents declared trusting their own taste when selecting wine. At an interpersonal level, friends and family members remain a trustworthy source of advice, as mentioned in the literature (e.g., Atkin & Thach, 2012; Bernabéu et al., 2012; Castellini & Samoggia, 2018; Corduas et al., 2013), for both French and Spanish respondents. Despite the impossibility of generalizing due to the limited number of responses, these questions shed light on the sample's quality assessment profile.

⁶⁰ Source: https://www.economie.gouv.fr/files/files/directions_services/dgccrf/boccrf/2022/22_04/liste-concours-vinicoles-03-2022.pdf (consulted 20.10.2023)

		France		Spain		Total	
		N	%	N	%	N	%
Use of wine apps for purchasing decision	Never	58	54.70	43	43.90	101	49.50
	Once in a while	36	34.00	42	42.90	78	38.20
	Often	10	9.40	13	13.30	23	11.30
	Always	2	1.90	0	0.00	2	1.00
Use of expert ratings and medals for purchasing decision	Never	20	18.90	12	12.20	32	15.70
	Once in a while	46	43.40	54	55.10	100	49.00
	Often	34	32.10	23	23.50	57	27.90
	Always	6	5.70	9	9.20	15	7.40
		France		Spain		Total	
		N	%	N	%	N	%
Often seek advice from other people before purchasing a wine	Strongly disagree	4	3.80	3	3.10	7	3.40
	Disagree	10	9.40	8	8.20	18	8.80
	Neither agree nor disagree	26	24.50	35	35.70	61	29.90
	Agree	51	48.10	45	45.90	96	47.10
	Strongly agree	15	14.20	7	7.10	22	10.80
Highest recommendation trust ⁶¹	Friends	54	17.40	50	19.90	104	18.50
	Family members	62	20.00	41	16.30	103	18.40
	Colleagues	12	3.90	5	2.00	17	3.00
	Sommeliers	58	18.70	33	13.10	91	16.20
	Professional wine experts	35	11.30	34	13.50	69	12.30
	Wine bloggers or influencers	26	8.40	27	10.80	53	9.40
	Wine guides or magazines	3	1.00	7	2.80	10	1.80
Only my own	60	19.40	54	21.50	114	20.30	

Table 25 - Valuation behavior of the participants

4.3 How much do we need to know to elicit consumers preferences

Consumers vary in how they perceive and analyze extrinsic quality. For each wine, we therefore control for product familiarity. We also collect valuation behavior, product category involvement, subjective wine knowledge, opinion-seeking behavior as well as consumption and purchasing patterns of all the participants⁶². The measurement of expected liking (How

⁶¹ Multiple responses allowed

⁶² for more details see Visalli et al., 2023 in appendix A)

much do you think you will like this wine?) establishes a baseline of consumers' pre-consumption attitudes towards the four wines. It allows us to test whether expected liking shapes subsequent product evaluations and to detect shifts in perception post-exposure, unveiling the transformative effects of product and quality information interaction. At the beginning of the experiment, the participants are asked to state their Expected Liking (EL) for each wine prior to tasting, looking only at the extrinsic information provided (standardized labels with legal information; name of the wine, name of the producer, GI, alcohol content). Table 26 presents the mean and standard deviation of expected liking (EL) for each of the four wines.

Treatment		EL1-W1	EL1-W2	EL1-W3	EL1-W4
0	Mean	5.39	5.45	5.06	5.06
	N	64	64	64	64
	Std. Deviation	1.107	1.097	1.220	1.233
1	Mean	5.51	5.56	5.22	5.15
	N	72	72	72	72
	Std. Deviation	1.113	1.086	1.129	1.122
2	Mean	5.21	5.34	5.22	5.18
	N	68	68	68	68
	Std. Deviation	1.241	1.128	1.049	0.945

Table 26 - Expected liking (EL) means and standard deviation

A one-way ANOVA is performed to determine if three different treatment groups differ in their EL. It reveals that there is no statistically significant difference in EL between the three groups ($F(2,201) = 1.254, p = .288$), ensuring that all groups are comparable at the start of a study. This result is consistent across wines. We can therefore exclude the hypothesis of a group influence on expected liking. A two-sample t-test was performed to compare Expected Liking (EL) in France and Spain. There was no significant difference in EL between France ($M = 5.188, SD = 0.811$) and Spain ($M = 5.383, SD = 0.988$); $t(202) = -1.525, p = 0.129$. This result is consistent across wines.

In consumer and sensory research, the explicit emotional response to food intake has been included in studies using self-reported responses (Meiselman, 2021). For a systematic review of both implicit and explicit methods of measurements of food-elicited emotions, see Lagast et al. (2017). To predict more accurately food choice, sensory scientists recommend a

combination of liking and emotion monitoring, since the latter adds value beyond liking in predicting food choices (Gutjar et al., 2015; Mojet et al., 2015). Conversely to declarative measurements, experimental auctions elicit the relative importance of internal and external quality cues in a situation like a purchase situation (Barber & Taylor, 2013; Lange et al., 2015). To capture as much information as possible and determine which information is more explicative of wine consumers' willingness to pay, we developed a "maximal" experimental design. Table 27 presents the Spearman correlation matrix among all the variables obtained. All the preferences measurements are significantly correlated. The strongest correlation appears between quality evaluation (I think this wine is high quality) and social acceptability (I think most people would like this wine), suggesting that respondents deem their perception of quality generalizable to other wine consumers; others should like what they recognize as being a high-quality wine. Their stated liking (How much did you like this wine?) also correlates strongly with both social acceptability and quality evaluation.

		Expected Liking	Stated Liking	Willingness to Pay	Quality Evaluation	Social acceptability	Emotion
Expected Liking	Correlation Coefficient	1.000	,317**	,178**	,268**	,179**	-0.051
	Sig. (2-tailed)		0.000	0.002	0.000	0.002	0.372
Stated Liking	Correlation Coefficient	,317**	1.000	,491**	,720**	,705**	0.020
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.731
Willingness to Pay	Correlation Coefficient	,178**	,491**	1.000	,468**	,423**	0.102
	Sig. (2-tailed)	0.002	0.000		0.000	0.000	0.076
Quality Evaluation	Correlation Coefficient	,268**	,720**	,468**	1.000	,744**	0.019
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.746
Social acceptability	Correlation Coefficient	,179**	,705**	,423**	,744**	1.000	0.017
	Sig. (2-tailed)	0.002	0.000	0.000	0.000		0.766
Emotion	Correlation Coefficient	-0.051	0.020	0.102	0.019	0.017	1.000
	Sig. (2-tailed)	0.372	0.731	0.076	0.746	0.766	

** . Correlation is significant at the 0.01 level (2-tailed).

Table 27 - Correlation between preferences measurements

Despite the significant correlation of all the measurements, the correlations are never very strong, suggesting that the measurements reflect different dimensions of consumers' preference. Almost all pairs of variables appear correlated, but the question arises how many

of them, and which, are useful to predict the consumers WTP for wine. Figure 22 displays the distribution of the mean WTP for the wines in this experiment.

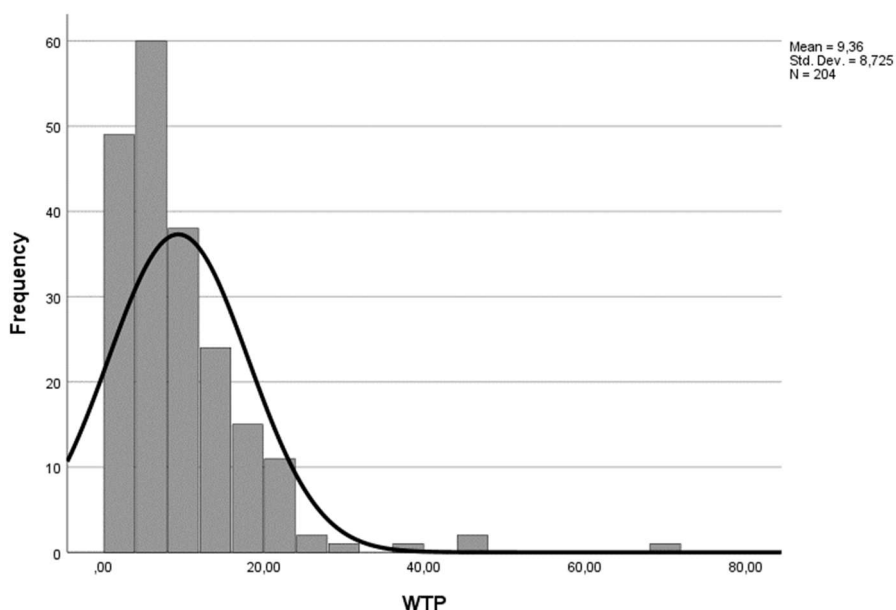


Figure 22 - Distribution of the WTP

It is well known that more information does not always lead to better decisions (Zheng et al. 2020). Using the hypothetical case of a decision maker who wants to understand the factors associated with a consumer's WTP, we included all the measurements presented in Table 28 into a Tobit regression to determine how many variables can be included to adequately predict the willingness to pay of the consumers. Table 28 present the results.

	Coefficient	Std. Error	z Value	Sig.
(Intercept)	-11.201	4.285	-2.614	.009
SL	3.517	1.131	3.110	.002
QE1	.894	1.495	.598	.550
QE2	1.401	1.469	.954	.340
EL	-1.151	.759	-1.516	.129
Log(scale)	2.140	.053	40.334	<.001

Lower bound: 0, Upper bound: None
 tobit(formula = WTP ~ SL+QE1+QE2+EL, left = 0, right = Inf, dist = "gaussian", data = dta, na.action = na.exclude)

Scale: 8.4960

Residual d.f.: 198

Log likelihood: -674.368 D.f.: 6

Wald statistic: 45.888 D.f.: 4

Table 28 - Tobit regression of the variables measuring preference

From all the remaining information, none seem to have any explanatory power. For example, automated emotion recognition software data did not provide any useful information associated with any of the measurements obtained. Nevertheless, it was linked to attrition, and generated a bias. Moreover, considering the deficient attention paid to the instructions, we could wonder if the participants did see the provided information (experts' or peers' ratings). With intervention studies, we therefore advise our successors to introduce a measure to confirm that participants have seen the information provided. Pioneering research does not go without pitfalls, but we are conscious that this exploratory experiment opens the way to the development of no-contact preference elicitation methods for wine.

4.4 Discussion and conclusion

It has been extensively argued that wine is an experience good. Thus, wine tasting is often part of preference elicitation studies because it helps the consumer to know better the product, offering researchers, marketers, and winemakers the possibility of knowing the attitude of consumers towards the product after a tasting experience. However, the recruitment of participants for CLT tasting is costly and following the recent Covid-19 crisis often difficult or impossible to implement.

We have run an online tasting experiment in which we have aimed at collecting as much information as possible on several variables related to the consumer's attitudes, reactions and eventually willingness to pay for the product. Hypothetical, attitudinal and incentive compatible measurements have been obtained. Specifically, liking, quality evaluation, guesses of others' evaluations, emotional reactions, and incentive compatible willingness to pay have been elicited. Findings concern both the challenges related to the elicitation of a large number of measurements and the ability to learn from a reasonably small number of tests about the determinants of the consumer's acceptance of the product. With respect to the challenges faced as a consequence of the No-contact protocol, we have observed a decrease in the sample of participants and valid responses, as the number and complexity of the information concerned is increased. Large attrition rates have been observed for face reading. Inconsistent responses have also been received at high rates as the number

of stages of the survey increased. However, the sample of abandoning participants does not seem to be different from that of remaining ones, implying that the results finally obtained are not biased due to the attrition rates.

Assuming that the researcher or the firm interested in the survey would like to build an explanatory model of the consumer's willingness to pay, we have shown that the only variable that matters is the stated liking. Therefore, a rather small set of variables is sufficient for the study of the consumer's attitude towards the wine, and especially their willingness to pay for it, which after all provide the sufficient and necessary information for the optimal pricing and private (market) value of the product. Furthermore, the informational treatments tested in this study did not lead to significant differences, suggesting that the methods used here are robust to several conditions regarding the consumer's sources of information.

Further research could provide further insights on the best methodology to use for preference elicitation. For example, a control for hypothetical versus incentive compatible evaluations could lead, in the case of no significant differences, to more efficient design with substantially lower organizational costs and less logistics.

Rather than the definitive response to our inquiry on the challenges of and benefits from online wine tasting methodologies, this study will hopefully inspire more research on how much can be learnt and how much is needed for specific uses of online preference elicitation experiments.

Disclosure Statement

No potential competing interest was reported by the authors.

General discussion and conclusions

This thesis tackles the key economic question of quality signaling for experience goods. The presence of significant information inefficiencies in the wine market makes it particularly well-suited for the study of this question. Hence the two questions that drove the research: (1) How does quality signaling from experts improve the information efficiency of the wine market? (2) How is the role of experts likely to evolve in the future with changing market dynamics? To answer those two questions and offer a holistic view of the role of experts in the wine market considering recent market developments, this thesis embraces both economic and marketing perspectives.

Information economics

This thesis addresses core issues in information economics. It studies the impact of information on competition, consumer choice, prices, information asymmetry, market efficiency, and consumer behavior, with a focus on the multidimensional role of wine experts. I use different methods to answer the research questions, including integrative literature review, lab experiments, in-home experiments, and hedonic analysis using online data.

The information inefficiencies identified in the introduction (information asymmetry, complexity, and information overload) generate a need for quality signaling in the wine market. Wine producers have been the first to try to bridge this informational gap. They developed GIs to better signal quality to wine consumers and highlight the collective reputation of wines from a particular area. However, globalization has increased complexity in the wine market and overloaded consumers with choices. Along with the proliferation of GIs, this complexity has created the conditions for the emergence of professional experts. Wine experts act as information intermediaries between sellers and buyers. They reduce information asymmetry offering concise, immediate, specific measures of comparative quality. Scoring systems provide a more accessible entry point for consumers than GIs. The emergence of expert information intermediaries marks a paradigm shift between product-oriented (terroir) quality signaling and consumer-oriented (sensory) quality signaling. My research illustrates that the informational value of experts' ratings can overshadow the informational value of GIs,

especially for wine consumers with low involvement. Meanwhile, the growth of the internet has extended the reach of interpersonal (informal) word of mouth. In other experience goods markets, crowd-sourced experiential information has become more important than expert-generated content. Consumers are increasingly turning to online platforms for wine information and purchases.

In the past five decades, wine experts have helped consumers make more informed purchases by guiding them away from “lemons” (low-quality wines masked as high-quality ones). While filling a structural hole (Burt, 1992), they have contributed to greater informational efficiency in the market. They also have benefited from positive network externalities and contributed to shape consumer preferences towards fine wines. Their active role is fundamental to a dominant market convention (100-point rating scales) in the sense of Orlean (2014). They are simultaneously educators, gatekeepers, and trendsetters.

The first core economic question tackled in this thesis is: what is the role of information intermediaries in the wine market? Wine is an experience good, and consumers face a bewildering number of options with pre-purchase uncertainty over the sensory characteristics of each. The role of wine experts is to inform consumer choice and allow consumers to make easier purchasing decisions. Experts themselves claim this role: *Wine Advocate*'s “Writers’ ethics” states: “Irrefutably, the target audience is the wine consumer, not the wine trade.”⁶³ However, my literature review highlights that they could not fulfill their role without the financial support of the trade. Without free samples, the business model that sustains *Wine Advocate* would not hold. The lines between quality evaluators and the trade are blurred. The two-sided strategy used by most wine media and by online review aggregators complicates the evaluation of the business value of wine ratings and reviews. The best option to measure it remains focusing on the measurement of consumer susceptibility to informational influence.

⁶³ <https://www.robertparker.com/writers-ethics> (consulted february 2020)

The second core economic question raised in this thesis is: what is the signaling mechanism in a market where quality is uncertain? Our hedonic regression contributes to the economics literature on wine quality assessments and price-quality relationships in the wine market. Wines with higher expert ratings consistently fetch higher prices, illustrating the signaling mechanism. Selling prices of wines in prestigious regions (e.g., Bourgogne) have reached historic highs. Such prices are often disconnected from production and distribution costs. Are wine experts responsible for rising prices in premium segments? With their ratings, experts have driven consumers toward more expensive wines and away from unrated wines. However, the relationship between price and expert ratings raises an endogeneity question: do high ratings lead to higher prices, or does the intrinsic quality of the wine (often associated with renowned GIs) command both a higher price and a higher rating? When it comes to crowd-sourced consumer (peer) ratings, do higher prices encourage prosumers (peers) to rate wines more positively? According to our results wines with higher community ratings also command higher prices. This raises another question: will online review aggregators now increase demand (and potentially prices) for less expensive wines that have never been rated by experts?

The emergence of online review aggregators is a paradigm shift. Ratings from wine experts are available everywhere online. Some online stores also display consumer ratings. However, very often, they fail to incentivize enough of their customers, and the number of ratings is very limited. It has been shown that the credibility of consumer ratings depends in part on the number of ratings (e.g. Park et al., 2007). It would therefore be reasonable to think that the more consumer ratings a marketplace or online sales site can offer, the greater its credibility as a source of information. Vivino is the site with the most consumer ratings for wines globally. Launched as a ratings platform, it has transformed itself into a wine marketplace that has a decisive competitive advantage over its rivals because of its vast ratings database. Its dominant position and the importance of same-side and cross-side network effects mentioned earlier are clear obstacles to new competitors willing to enter the market. While experts have interest in seeing their scores distributed through as many channels as possible, Vivino has

only recently (teaming up with Sainsbury in 2021⁶⁴) shown interest in seeing its aggregated scores used by other wine sellers.

Finally, this thesis tackles adaptation to changing market dynamics for wine. The introduction posed the following question: Are community and expert ratings complements or substitutes? This question is relevant to economists because it involves signal theory. For marketers, however, knowing how consumers would react to conflicting peers and experts' reviews may be of limited use. According to our findings, neither experts nor online review aggregators would be sustainable if they were not commercially supported by the wine trade, which needs reviews as a marketing tool. Sales outlets provide ratings free of charge to consumers at the point of sale, whether in-store or online, because the ratings provide influential information and stimulate sales. If they do not actively look for information, it is unlikely that potential consumers will be exposed to conflicting reviews in traditional point-of-sale situations, as marketers will always select and showcase the most favorable review sources.

Marketing, business, and management

In this thesis I have drawn on historical context to analyze contemporary market dynamics and used consumer behavior theory to answer the two main research questions, the first about information intermediaries and the second about quality signaling. This thesis highlights the enduring value of experts' opinions despite the growing importance of community ratings. The current situation is both a challenge and an opportunity for marketers. They should design strategies to cater to the diversity of consumer preferences for different information sources.

The degree of importance placed on peers' (informal) and experts' (formal) opinions varies according to the consumer segment. This is why we propose that marketers should segment their customer base according to their information source preference. The thesis provides marketers with some useful segmentation hints: for instance, high-involvement

⁶⁴ <https://www.thedrinksbusiness.com/2021/08/sainsburys-teams-up-with-wine-rating-app-vivino-in-new-trial/>

consumers rely more on GIs, while lower-involvement consumers rely more on expert ratings. A brand's marketing strategy should thus be highly tailored to its particular consumer base.

Even fine wine marketers who traditionally rely on experts' ratings should not underestimate the potential of online review aggregators in their communication mix. Online review aggregators are already a primary source of information for wine consumers. Marketers should consider that only 11% of the wines scanned by Vivino users are then rated by users, and less than 4% are commented⁶⁵. This means that only a minority of Vivino users are prosumers. The vast majority of Vivino users are not generating content; they use Vivino as a source of information. Marketers should design digital marketing strategies to increase engagement with the online wine community and expand their reach through e-commerce channels in the years to come. In situations of uncertainty, consumers rely on the opinions of peers to make decisions ("social proof"). To capitalize on social proof and bandwagon effects, another key element of digital marketing should be to incentivize satisfied consumers to rate and review the wines online. Moreover, since ratings and reviews are influenced by the overall wine-buying experience, developing wine tourism could be a way, among others, of creating memorable and engaging experiences for consumers.

This thesis also questions the traditional distinction between experts and peers. The distance between wine experts and community ratings as information sources is narrowing over time. In July 2022, fulfilling a request from their prosumers, Vivino launched a more precise rating system, enabling its users to use decimals in their 5-star ratings⁶⁶. The company backs up this decision saying it aims at improving both the accuracy of their recommendations as well as the trust of other users in the ratings. This innovation brings Vivino ratings a little closer to expert ratings. It essentially converts a five-point rating scale into a fifty-point rating scale, like the one commonly used by experts (from 50 to 100). Likewise, the evolution of market dynamics is prompting experts to diversify their revenue streams. We are already

⁶⁵ <https://www.vivino.com/about> (consulted October 2023)

⁶⁶ <https://www.vivino.com/wine-news/decimal-rating-update> (consulted January 2023)

observing a transition to educational or event-based offerings (e.g., Gault & Millau Tasting, Wine Spectator Grand Tour). Current market dynamics call into question the traditional distinctions between experts and peers: today's prosumer could be tomorrow's expert.

The role of social media influencers is likely to be under the spotlight in the coming years. eWOM has multiplied the power of influencers. In the days before social media, wine aficionados (except a few widely read experts) tended to have an interpersonal impact on only a limited circle of other consumers. The relatable lifestyle narrative of today's influencers differs greatly both from the detailed analysis of experts and from the quick recommendations of online review aggregators. Thanks to the reach and relatability of social media, influencers are now reaching a significant audience. This audience is becoming critical. Where the wine trade has traditionally subsidized wine experts because they were useful to activate sales, the trade might now refocus some investment on social media influencers. But marketers must first conduct research to identify the search strategy of their target audience: where are they getting their information from? Which source do they trust the most? These insights will allow them to adjust their marketing strategies and invest resources optimally. The development of a multi-channel marketing strategy including proactive engagement with online community will likely become more important in the future. For marketers, this means also developing a strategy to reach aficionados and influencers. And marketers must look beyond wine influencers for the endorsement of lifestyle and gastronomy influencers to reach a broader (and younger) audience.

Future research perspectives

This paper addresses core economic issues such as the impact of information on market dynamics, its economic value and adaptation to changing market dynamics. It also raises several questions and research opportunities. For instance, with a larger budget, the experiment in Chapter I could be expanded to include peer ratings among the information sources. This would enable us to compare the value of the quality signals coming from two different sources, experts, and peers. Despite not being able to carry out this analysis, the fourth chapter of this thesis has made it possible to answer a number of questions by

comparing consumers' reactions to peer and expert ratings. Another natural future research direction would be to replicate of the hedonic price analysis of Chapter III using Spanish wines instead of French wines. This analysis would allow us to further generalize our findings. Beyond direct expansion on the experimental work presented in this thesis, more advanced research projects may build on the questions raised by the thesis. Below, I conclude with some preliminary thoughts and steps towards the implementation of further research inspired by this thesis.

Do awards reflect consumers' taste?⁶⁷

According to academic literature, wine consumers use awards as a quality indicator. Their presence on bottles has a positive effect on product sales. But do they reflect consumer tastes? In a blind tasting of six different wines, would consumers be able to discriminate between the wines that have been awarded a gold medal and the wines that have not been selected by the jury in a wine competition? Several papers have investigated the differences and similarities between experts and novices at the sensory level. Schiefer and Fischer (2008) investigate the gap between expert wine ratings and consumer preferences, but they do not base their analysis on actual awards from real wine competitions. Along with Jean-Marie Cardebat, Michel Visalli, Juliette Passebois-Ducros, and Yilong Liang from the University of Bordeaux, we designed an experimental protocol to test whether awards reflect consumer taste. We received the support of one of the world's major wine competitions. A panel of 120 participants has been recruited in Dijon (France) by a panel recruitment agency for a blind tasting in a lab including free-comment, willingness-to-pay elicitation, rating, and hedonic evaluation of the wines. This experiment will allow us to test the correlation between consumers' ratings and sensory perceptions of wine characteristics and wine awards determined by a jury of experts.

⁶⁷ This experiment has been approved by the ethics committee of Burgundy School of Business (CERBSB2023-54) and has received financial support from ECO department (University of Bordeaux). The pilot of this experiment has been conducted in July 2023 in Bordeaux. We will run the experiment in November 2023.

User-generated reviews, gamification, and engagement on digital platforms

Since less than 5% of the wines receive a review, prosumers are a minority in Vivino community. Different users have different ways of using Vivino. Some may use the website or app purely as a source of information from other consumers. Others may use it more as a way of remembering their own experiences of wines they've tried, for future reference (cognitive offloading). As highlighted in the literature review, even though several studies about review aggregators in the wine market have been presented in recent conferences⁶⁸, few have been published in peer-reviewed journals (e.g. Bazen et al., 2023). There is a need for research in that field, especially in understanding the motives behind the use of apps like Vivino and the profile of the users.

Numerous questions arise: Who are the users generating content? Are they aficionados that scan, rate, and comment on the wines but also interact with other users, liking and commenting on their publications? How many users are unbiased observers versus wine marketers rating their own wines? (the so-called "astroturfing" problem has been well documented in sites such as Amazon, Google Local, and Yelp). What is the profile of the top Vivino users in each country? Do they have anything in common? Is gamification (users ranking per country) creating a community that meets in real life? Vivino does not allow any direct messaging between users; is this likely to change? Although we expect this project to be time-consuming, we plan to perform an exploratory qualitative study targeting top-profile Vivino users (ranked 1 to 10) in major wine consuming countries to better understand such users and their potential influence on the global and local wine market.

We acknowledge that there is a wide range of other research opportunities on this topic. The multiplication of wine competitions, for example, is a challenge for wine producers. They should set up a marketing budget and a strategy to determine to which competitions they should send their wines. Guides like La Tulipe Rouge (in France) now base their business

⁶⁸ EuAWE (European Association of Wine Economists), AAWE (American Association of Wine Economists), AWBR (Association of Wine Business Research)

model on the entry fee charged to each wine sent to be tasted by their critics (they do not accept advertisement and provide the reviews for free to consumers). It would be insightful to understand how they guide their choice of competition. Do they deduce the credibility of the competitions from the medals awarded to esteemed wine producers? Do they only rationalize the choice maximizing the probability of getting a medal in a competition? Do they measure the impact on sales?

I hope that this thesis will inspire future work and new collaborations between researchers in economics, marketing, sensory science, and psychology who see the unique potential of wine as a window onto consumer behavior.

References

- Adalja, A., Livat, F., Rickard, B., & Susskind, A. (2022). *Dissonant Opinions and the Home Bias: Consumer Response to Crowd Sourced Reviews for Wine*.
- Adams, J., Williams, A., Lancaster, N., & Foley, M. (2007). Advantages and uses of check-all-that-apply response compared to traditional scaling of attributes for salty snacks. *7th Pangborn Sensory Science Symposium. Minneapolis, USA, 12–16 August, 2007*.
- Akdim, K., Casaló, L. V., & Flavián, C. (2022). The role of utilitarian and hedonic aspects in the continuance intention to use social mobile apps. *Journal of Retailing and Consumer Services*, 66, 102888. <https://doi.org/10.1016/j.jretconser.2021.102888>
- Akerlof, G. A. (1970a). The Market for “Lemons”: Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics*, 84(3), 488–500. <https://doi.org/10.2307/1879431>
- Akerlof, G. A. (1970b). The Market for “Lemons”: Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics*, 84(3), 488–500.
- Albright, A., Pedroni, P., & Sheppard, S. (2018). *Uncorking Expert Reviews with Social Media: A Case Study Served with Wine*. 19.
- Ali, H. H., Lecocq, S., & Visser, M. (2005). *The impact of gurus: Parker grades and en primeur wine prices*. 118(529), F158–F173.
- Ali, H. H., Lecocq, S., & Visser, M. (2010). The Impact of Gurus: Parker Grades and en primeur Wine Prices*. *Journal of Wine Economics*, 5(1), 22–39. <https://doi.org/10.1017/S1931436100001358>
- Ali, H. H., & Nauges, C. (2007). The Pricing of Experience Goods: The Example of en primeur Wine. *American Journal of Agricultural Economics*, 89(1), 91–103. <https://doi.org/10.1111/j.1467-8276.2007.00965.x>
- Amerine, M. A. (Maynard A., & Roessler, E. B. (Edward B. (1976). *Wines, their sensory evaluation*. 230.
- Amerine, M., Roessler, E., & Filipello, F. (1959). Modern sensory methods of evaluating wine. *Hilgardia*, 28(18), 477–567.
- Andersen, S., Harrison, G. W., Lau, M. I., & Rutström, E. E. (2006). Elicitation using multiple price list formats. *Experimental Economics*, 9(4), 383–405. <https://doi.org/10.1007/s10683-006-7055-6>
- Anderson, K. (2004). *The World’s Wine Markets: Globalization at Work*. Edward Elgar Publishing.
- Anderson, K., Nelgen, S., & Pinilla, V. (2017). *Global wine markets, 1860 to 2016 | University of Adelaide Press | University of Adelaide*. <http://www.adelaide.edu.au/press/titles/global-wine-markets>
- Angulo, A. M., Gil, J. M., Gracia, A., & Sánchez, M. (2000). Hedonic prices for Spanish red quality wine. *British Food Journal*, 102(7), 481–493. <https://doi.org/10.1108/00070700010336445>
- Antal, A. B., Hutter, M., & Stark, D. (2015). *Moments of Valuation: Exploring Sites of Dissonance*. OUP Oxford.
- Arechar, A. A., Gächter, S., & Molleman, L. (2018). Conducting interactive experiments online. *Experimental Economics*, 21(1), 99–131. <https://doi.org/10.1007/s10683-017-9527-2>
- Ares, G. (2018). Methodological issues in cross-cultural sensory and consumer research. *Food Quality and Preference*, 64, 253–263. <https://doi.org/10.1016/J.FOODQUAL.2016.10.007>

- Ares, G., Alcaire, F., Antúnez, L., Vidal, L., Giménez, A., & Castura, J. C. (2017). Identification of drivers of (dis)liking based on dynamic sensory profiles: Comparison of Temporal Dominance of Sensations and Temporal Check-all-that-apply. *Food Research International*, 92, 79–87. <https://doi.org/10.1016/J.FOODRES.2016.12.016>
- Ares, G., Bruzzone, F., Vidal, L., Cadena, R. S., Giménez, A., Pineau, B., Hunter, D. C., Paisley, A. G., & Jaeger, S. R. (2014). Evaluation of a rating-based variant of check-all-that-apply questions: Rate-all-that-apply (RATA). *Food Quality and Preference*, 36, 87–95. <https://doi.org/10.1016/J.FOODQUAL.2014.03.006>
- Ares, G., Varela, P., Rado, G., & Giménez, A. (2011). Identifying ideal products using three different consumer profiling methodologies. Comparison with external preference mapping. *Food Quality and Preference*, 22(6), 581–591. <https://doi.org/10.1016/J.FOODQUAL.2011.04.004>
- Arora, P., & Vermeulen, F. (2012). The end of the art connoisseur? Experts and knowledge production in the visual arts in the digital age. *Information, Communication & Society*, 16(2), 194–214. <https://doi.org/10.1080/1369118X.2012.687392>
- Ashenfelter, O., Ashmore, D., & Lalonde, R. (1995). Bordeaux Wine Vintage Quality and the Weather. *CHANCE*, 8(4), 7–14. <https://doi.org/10.1080/09332480.1995.10542468>
- Ashenfelter, O., & Jones, G. V. (2013). The Demand for Expert Opinion: Bordeaux Wine. *Journal of Wine Economics*, 8(3), 285–293. <https://doi.org/10.1017/jwe.2013.22>
- Ashton, R. H. (2012). Reliability and Consensus of Experienced Wine Judges: Expertise Within and Between? *Journal of Wine Economics*, 7(1), 70–87. <https://doi.org/10.1017/jwe.2012.6>
- Ashton, R. H. (2017). Dimensions of Expertise in Wine Evaluation. *Journal of Wine Economics*, 12(1), 59–83. <https://doi.org/10.1017/jwe.2016.27>
- Asioli, D., Mignani, A., & Alfnes, F. (2021). Quick and easy? Respondent evaluations of the Becker–DeGroot–Marschak and multiple price list valuation mechanisms. *Agribusiness*, 37(2), 215–234. <https://doi.org/10.1002/agr.21668>
- Atkin, T., & Johnson, R. (2010). Appellation as an indicator of quality. *International Journal of Wine Business Research*, 22(1), 42–61. <https://doi.org/10.1108/17511061011035198>
- Atkin, T., & Thach, L. (2012). Millennial wine consumers: Risk perception and information search. *Wine Economics and Policy*, 1(1), 54–62. <https://doi.org/10.1016/j.wep.2012.08.002>
- Bagwell, K., & Riordan, M. H. (1991). High and Declining Prices Signal Product Quality. *The American Economic Review*, 81(1), 224–239.
- Barbe, P., & Durrieu, F. (2005). Evaluation of the Quality of the Great Bordeaux Wines: Are There Significant Differences Between Critics? *International Journal of Wine Marketing*, 17(3), 55–66. <https://doi.org/10.1108/eb008795>
- Barber, N. A., & Taylor, D. C. (2013). Experimental approach to assessing actual wine purchase behavior. *International Journal of Wine Business Research*, 25(3), 203–226. <https://doi.org/10.1108/IJWBR-2012-0013>
- Barber, N., Ismail, J., & Dodd, T. (2007). Purchase Attributes of Wine Consumers with Low Involvement. *Journal of Food Products Marketing*, 14(1), 69–86. https://doi.org/10.1300/J038v14n01_05
- Baritau, V., Aubert, M., Montaigne, E., & Remaud, H. (2006). Matchmakers in wine marketing channels: The case of French wine brokers. *Agribusiness*, 22(3), 375–390. <https://doi.org/10.1002/agr.20092>

- Barnett, J. M. (2018). The costs of free: Commoditization, bundling and concentration. *Journal of Institutional Economics*, 14(6), 1097–1120. <https://doi.org/10.1017/S1744137418000012>
- Barnett, M. L., & Pollock, T. G. (2012). *The Oxford Handbook of Corporate Reputation*. OUP Oxford.
- Bauman, M. J., Velikova, N., Dodd, T., & Blankenship, T. (2019). Generational differences in risk perception and situational uses of wine information sources. *International Journal of Wine Business Research*, 32(2), 247–265. <https://doi.org/10.1108/IJWBR-03-2019-0022>
- Bazen, S., Cardebat, J.-M., & Dubois, M. (2023). The role of customer and expert ratings in a hedonic analysis of French red wine prices: From gurus to geeks? *Applied Economics*, 0(0), 1–17. <https://doi.org/10.1080/00036846.2023.2257036>
- Becker, G. M., DeGroot, M. H., & Marschak, J. (1964). Measuring utility by a single-response sequential method. *Behavioral Science*, 9(3), 226–232. <https://doi.org/10.1002/BS.3830090304>
- Bécue-Bertaut, M., Álvarez-Esteban, R., & Pagès, J. (2008). Rating of products through scores and free-text assertions: Comparing and combining both. *Food Quality and Preference*, 19(1), 122–134. <https://doi.org/10.1016/J.FOODQUAL.2007.07.006>
- Bell, L., Vogt, J., Willemse, C., Routledge, T., Butler, L. T., & Sakaki, M. (2018). Beyond Self-Report: A Review of Physiological and Neuroscientific Methods to Investigate Consumer Behavior. *Frontiers in Psychology*, 9. <https://www.frontiersin.org/articles/10.3389/fpsyg.2018.01655>
- Ben Ameer, H., & Le Fur, E. (2020). Volatility transmission to the fine wine market. *Economic Modelling*, 85, 307–316. <https://doi.org/10.1016/j.econmod.2019.10.017>
- Benfratello, L., Piacenza, M., & Sacchetto, S. (2009). Taste or reputation: What drives market prices in the wine industry? Estimation of a hedonic model for Italian premium wines. *Applied Economics*, 41(17), 2197–2209. <https://doi.org/10.1080/00036840701222439>
- Benghozi, P.-J., & Paris, T. (2003). De l'intermédiation à la prescription: Le cas de la télévision. *Revue française de gestion*, no 142(1), 205–227.
- Beninger, S., Parent, M., Pitt, L., & Chan, A. (2014). A Content Analysis of Influential Wine Blogs. *International Journal of Wine Business Research*, 26. <https://doi.org/10.1108/IJWBR-09-2013-0036>
- Benjamin, B. A., & Podolny, J. M. (1999). Status, Quality, and Social Order in the California Wine Industry. *Administrative Science Quarterly*, 44(3), 563–589. <https://doi.org/10.2307/2666962>
- Bentzen, J., & Smith, V. (2008). Do expert ratings or economic models explain champagne prices? *International Journal of Wine Business Research*, 20(3), 230–243. <https://doi.org/10.1108/17511060810901046>
- Bernabéu, R., Díaz, M., Olivas, R., & Olmeda, M. (2012). Consumer preferences for wine applying best-worst scaling: A Spanish case study. *British Food Journal*, 114(9), 1228–1250. <https://doi.org/10.1108/00070701211258790>
- Bessy, C., & Chauvin, P.-M. (2013). The Power of Market Intermediaries: From Information to Valuation Processes. *Valuation Studies*, 1(1), 83–117. <https://doi.org/10.3384/vs.2001-5992.131183>
- Bettman, J. R., Luce, M. F., & Payne, J. W. (1998). Constructive Consumer Choice Processes. *Journal of consumer research*, 31.
- Beverland, M. B. (2004). An Exploration of the Luxury Wine Trade. *International Journal of Wine Marketing*, 16(3), 14–28. <https://doi.org/10.1108/eb008776>

- Bianchi, I., Branchini, E., Torquati, S., Fermani, A., Capitani, E., Barnaba, V., Savardi, U., & Burro, R. (2021). Non experts' understanding of terms frequently used by experts to describe the sensory properties of wine: An investigation based on opposites. *Food Quality and Preference*, 92, 104215. <https://doi.org/10.1016/J.FOODQUAL.2021.104215>
- Bicknell, K. B., & MacDonald, I. A. (2012). Regional reputation and expert opinion in the domestic market for New Zealand wine. *Journal of Wine Research*, 23(2), 172–184. <https://doi.org/10.1080/09571264.2012.676541>
- Bitter, C. (2017). Wine Competitions: Reevaluating the Gold Standard. *Journal of Wine Economics*, 12(4), 395–404. <https://doi.org/10.1017/jwe.2017.38>
- Boatto, V., Defrancesco, E., & Trestini, S. (2011). The price premium for wine quality signals: Does retailers' information provision matter? *British Food Journal*, 113(5), 669–679. <https://doi.org/10.1108/000707011111131764>
- Bodington, J. (2020). Rate the Raters: A Note on Wine Judge Consistency. *Journal of Wine Economics*, 15(4), 363–369. <https://doi.org/10.1017/jwe.2020.30>
- Bonroy, O., & Constantatos, C. (2008). On the use of labels in credence goods markets. *Journal of Regulatory Economics*, 33(3), 237–252. <https://doi.org/10.1007/s11149-008-9058-z>
- Bonroy, O., & Constantatos, C. (2014). On the Economics of Labels: How Their Introduction Affects the Functioning of Markets and the Welfare of All Participants. *American Journal of Agricultural Economics*, aau088. <https://doi.org/10.1093/ajae/aau088>
- Boulding, W., & Kirmani, A. (1993). A Consumer-Side Experimental Examination of Signaling Theory. *Journal of Consumer Research*, 20, 111–123. <https://doi.org/10.1086/209337>
- Boutrolle, I., Delarue, J., Arranz, D., Rogeaux, M., & Köster, E. P. (2007). Central location test vs. home use test: Contrasting results depending on product type. *Food Quality and Preference*, 18(3), 490–499. <https://doi.org/10.1016/j.foodqual.2006.06.003>
- Branco, F., Sun, M., & Villas-Boas, J. M. (2012). Optimal Search for Product Information. *Management Science*, 58(11), 2037–2056. <https://doi.org/10.1287/mnsc.1120.1535>
- Brard, M., & Lê, S. (2016). The Ideal Pair Method, an Alternative to the Ideal Profile Method Based on Pairwise Comparisons: Application to a Panel of Children. *Journal of Sensory Studies*, 31(4), 306–313. <https://doi.org/10.1111/JOSS.12214>
- Brien, C. j., May, P., & Mayo, O. (1987). Analysis of Judge Performance in Wine-Quality Evaluations. *Journal of Food Science*, 52(5), 1273–1279. <https://doi.org/10.1111/j.1365-2621.1987.tb14061.x>
- Broniarczyk, S. M., & Griffin, J. G. (2014). Decision Difficulty in the Age of Consumer Empowerment. *Journal of Consumer Psychology*, 24(4), 608–625. <https://doi.org/10.1016/j.jcps.2014.05.003>
- Bruner, D. M., Huth, W. L., McEvoy, D. M., & Morgan, O. A. (2011). Accounting for Taste: Consumer Valuations for Food-Safety Technologies. In *Working Papers* (11–09; Working Papers). Department of Economics, Appalachian State University. <https://ideas.repec.org/p/apl/wpaper/11-09.html>
- Bruwer, J., & Buller, C. (2013). Product involvement, brand loyalty, and country-of-origin brand preferences of Japanese wine consumers. *Http://Dx.Doi.Org/10.1080/09571264.2012.717221*, 24(1), 38–58. <https://doi.org/10.1080/09571264.2012.717221>
- Bruwer, J., Burrows, N., Chaumont, S., Li, E., & Saliba, A. (2014). Consumer involvement and associated behaviour in the UK high-end retail off-trade wine market.

- [Http://Dx.Doi.Org/10.1080/09593969.2013.839464](http://dx.doi.org/10.1080/09593969.2013.839464), 24(2), 145–165.
<https://doi.org/10.1080/09593969.2013.839464>
- Bruwer, J., Fong, M., & Saliba, A. (2013). Perceived risk, risk-reduction strategies (RRS) and consumption occasions: Roles in the wine consumer's purchase decision. *Asia Pacific Journal of Marketing and Logistics*, 25(3), 369–390. <https://doi.org/10.1108/APJML-06-2012-0048>
- Buonanno, P., Caggiano, G., Galizzi, M. M., Leonida, L., & Vanin, P. (2008). *Expert and Peer Pressure in Food and Wine Tasting: Evidence from a Pilot Experiment*. 18.
- Burnham, D., & Skilleas, O. M. (2012). *The Aesthetics of Wine* [Electronic resource]. John Wiley & Sons Ltd.
- Burt, R. S. (1992). *Structural Holes: The Social Structure of Competition*. Harvard University Press. <https://www.jstor.org/stable/j.ctv1kz4h78>
- Cadoret, M., & Husson, F. (2013). Construction and evaluation of confidence ellipses applied at sensory data. *Food Quality and Preference*, 28(1), 106–115. <https://doi.org/10.1016/J.FOODQUAL.2012.09.005>
- Candau, J., & Wathelet, O. (2011). The categories of odours are they real categories? *Langages*, 181(1). <https://doi.org/10.3917/LANG.181.0037>
- Caracciolo, F., D'Amico, M., Di Vita, G., Pomarici, E., Dal Bianco, A., & Cembalo, L. (Eds.). (2016). Private vs. Collective Wine Reputation. *International Food and Agribusiness Management Review*. <https://doi.org/10.22004/ag.econ.244704>
- Cardebat, J.-M. (2017). *Économie du vin*. La Découverte.
- Cardebat, J.-M., Faye, B., Fur, E. L., & Storchmann, K. (2017). The Law of One Price? Price Dispersion on the Auction Market for Fine Wine*. *Journal of Wine Economics*, 12(3), 302–331. <https://doi.org/10.1017/jwe.2017.32>
- Cardebat, J.-M., & Figuet, J.-M. (2009). Estimation of a hedonic price equation for Alsace, Beaujolais and Provence wines. *Applied Economics Letters*, 16(9), 921–927. <https://doi.org/10.1080/13504850701222145>
- Cardebat, J.-M., Figuet, J.-M., & Paroissien, E. (2014). Expert Opinion and Bordeaux Wine Prices: An Attempt to Correct Biases in Subjective Judgments. *Journal of Wine Economics*, 9(3), 282–303. <https://doi.org/10.1017/jwe.2014.23>
- Cardebat, J.-M., & Livat, F. (2016). Wine experts' rating: A matter of taste? *International Journal of Wine Business Research*, 28(1), 43–58. <https://doi.org/10.1108/IJWBR-04-2015-0011>
- Cardello, A. V. (1994). Consumer expectations and their role in food acceptance. *Measurement of Food Preferences*, 253–297. https://doi.org/10.1007/978-1-4615-2171-6_10
- Cardello, A. V. (2007). Measuring consumer expectations to improve food product development. *Consumer-Led Food Product Development*, 223–261. <https://doi.org/10.1533/9781845693381.2.223>
- Carroll, J. D. (1972). Individual differences and multidimensional scaling. *Multidimensional Scaling. Theory and Applications in the Behavioral Sciences, Theory*, 1, 101–155.
- Carsky, M. L., Dickinson, R. A., & Canedy, C. R. (1998). The Evolution of Quality in Consumer Goods. *Journal of Macromarketing*, 18(2), 132–144. <https://doi.org/10.1177/027614679801800205>
- Casini, L., Cavicchi, A., & Corsi, A. M. (2008). Trends in the British wine market and consumer confusion. *British Food Journal*, 110(6), 545–558. <https://doi.org/10.1108/00070700810877870>

- Castillo-Valero, J., & García-Cortijo, M. C. (2015). Price adjustment in world wine markets: A cointegration analysis. *Wine Economics and Policy*, 4(2), 128–135. <https://doi.org/10.1016/j.wep.2015.05.004>
- Castellini, A., & Samoggia, A. (2018). Millennial consumers' wine consumption and purchasing habits and attitude towards wine innovation. *Wine Economics and Policy*, 7(2), 128–139. <https://doi.org/10.1016/j.wep.2018.11.001>
- Castiglioni, L., Pforr, K., & Krieger, U. (2008). The Effect of Incentives on Response Rates and Panel Attrition: Results of a Controlled Experiment. *Survey Research Methods*, 2(3), Article 3. <https://doi.org/10.18148/srm/2008.v2i3.599>
- Castriota, S., Curzi, D., & Delmastro, M. (2013). Tasters' bias in wine guides' quality evaluations. *Applied Economics Letters*, 20(12), 1174–1177. <https://doi.org/10.1080/13504851.2013.797552>
- Castriota, S., & Delmastro, M. (2015). The Economics of Collective Reputation: Evidence from the Wine Industry. *American Journal of Agricultural Economics*, 97(2), 469–489. <https://doi.org/10.1093/ajae/aau107>
- Castura, J. C., Antúnez, L., Giménez, A., & Ares, G. (2016). Temporal Check-All-That-Apply (TCATA): A novel dynamic method for characterizing products. *Food Quality and Preference*, 47, 79–90.
- Cavicchi, A., Torquati, B., Taglioni, C., Seghieri, C., & Santini, C. (2013). Building Wine Reputation: An Explorative Study in Umbria. *Enometrika*, 6.
- Cawley, D. (2018). *The Power of Wine Language—Critics, Labels and Sexism*. <https://doi.org/10.21427/G5A7-X024>
- Chan, H., Zeng, K. J., & Yang, M. X. (2022). Review platforms as prosumer communities: Theory, practices and implications. *European Journal of Marketing*, 56(10), 2698–2720. <https://doi.org/10.1108/EJM-10-2021-0819>
- Chaney, I. M. (2001). Opinion leaders as a segment for marketing communications. *Marketing Intelligence & Planning*, 19(5), 302–308. <https://doi.org/10.1108/EUM0000000005647>
- Charters, S., & Pettigrew, S. (2007). The dimensions of wine quality. *Food Quality and Preference*, 18(7), 997–1007. <https://doi.org/10.1016/j.foodqual.2007.04.003>
- Chauvin, P.-M. (2010). *Le marché des réputations: Une sociologie du monde des Grands Crus de Bordeaux*. Féret.
- Chauvin, P.-M. (2013). The Social Fabric of Prices: Institutional Factors and Reputation Work in the Bordeaux Wine Futures Campaign. *Economic Sociology*, 15(1), 11.
- Chen, B., Velchev, V., Palmer, J., & Atkison, T. (2018). Wineinformatics: A Quantitative Analysis of Wine Reviewers. *Fermentation 2018, Vol. 4, Page 82*, 4(4), 82. <https://doi.org/10.3390/FERMENTATION4040082>
- Chen, Z., Gurdian, C., Sharma, C., Prinyawiwatkul, W., & Torrico, D. D. (2021). Exploring Text Mining for Recent Consumer and Sensory Studies about Alternative Proteins. *Foods 2021, Vol. 10, Page 2537*, 10(11), 2537. <https://doi.org/10.3390/FOODS10112537>
- Cheung, C. M. K., & Lee, M. K. O. (2012). What drives consumers to spread electronic word of mouth in online consumer-opinion platforms. *Decision Support Systems*, 53(1), 218–225. <https://doi.org/10.1016/j.dss.2012.01.015>
- Chivu-Draghia, C., & Antocea, A. O. (2016). *Consumer preferences regarding sources of information and use of technology for wine selection – a survey of millennials and generation x sample in romania*. 16(2), 10.
- Chocarro, R., & Cortiñas, M. (2013). The impact of expert opinion in consumer perception of wines. *International Journal of Wine Business Research*, 25(3), 227–248. <https://doi.org/10.1108/IJWBR-2012-0014>

- Choi, H., & Burnes, B. (2016). How consumers contribute to the development and continuity of a cultural market. *Consumption Markets & Culture*, 19(6), 576–596. <https://doi.org/10.1080/10253866.2016.1172214>
- Chossat, V., & Gergaud, O. (2003). Expert Opinion and Gastronomy: The Recipe for Success. *Journal of Cultural Economics*, 27(2), 127–141. <https://doi.org/10.1023/A:1023432502059>
- Cicchetti, D. (2009). Wine rating scales: Assessing their utility for producers, consumers, and oenologic researchers. *International Journal of Wine Research*, 73. <https://doi.org/10.2147/IJWR.S4703>
- Cicchetti, D. V. (2009). A Proposed System for Awarding Medals at a Major U.S. Wine Competition*. *Journal of Wine Economics*, 4(2), 242–247. <https://doi.org/10.1017/S1931436100000833>
- Clauzel, A., Delacour, H., & Liarte, S. (2019). When cuisine becomes less haute: The impact of expert ratings on consumers' legitimacy judgments. *Journal of Business Research*, 105, 395–404. <https://doi.org/10.1016/j.jbusres.2019.03.038>
- Cliff, M. A., & King, M. (1999). Use of principal component analysis for the evaluation of judge performance at wine competitions. *Journal of Wine Research*, 10(1), 25–32. <https://doi.org/10.1080/09571269908718155>
- Cohen, J. (2013). Statistical Power Analysis for the Behavioral Sciences. *Statistical Power Analysis for the Behavioral Sciences*. <https://doi.org/10.4324/9780203771587>
- Colman, T. (2008). *Wine Politics: How Governments, Environmentalists, Mobsters, and Critics Influence the Wines We Drink*. University of California Press.
- Combris, P., Bazoche, P., Giraud-Héraud, E., & Issanchou, S. (2009). Food choices: What do we learn from combining sensory and economic experiments? *Food Quality and Preference*, 20(8), 550–557. <https://doi.org/10.1016/j.foodqual.2009.05.003>
- Combris, P., Lecocq, S., & Visser, M. (1997). *ESTIMATION OF A HEDONIC PRICE EQUATION FOR BORDEAUX WINE: DOES QUALITY MATTER?*. 17.
- Compés-López, R., Font-Julian, C. I., & Orduna-Malea, E. (2018, July 12). Has Robert Parker lost his hegemony as a prescriptor in the wine World? A preliminar inquiry through Twitter. *Proceedings of the 2nd International Conference on Advanced Research Methods and Analytics (CARMA 2018)*. CARMA 2018 - 2nd International Conference on Advanced Research Methods and Analytics. <https://doi.org/10.4995/CARMA2018.2018.8320>
- Conca Messina, S. A., Le Bras, S., Tedeschi, P., & Vaquero Piñeiro, M. (2019). *A history of wine in Europe, 19th to 20th centuries. Volume I, Volume I,*.
- Corduas, M., Cinquanta, L., & Ievoli, C. (2013). The importance of wine attributes for purchase decisions: A study of Italian consumers' perception. *Food Quality and Preference*, 28(2), 407–418. <https://doi.org/10.1016/j.foodqual.2012.11.007>
- Cortez, P., Cerdeira, A., Almeida, F., Matos, T., & Reis, J. (2009). Modeling wine preferences by data mining from physicochemical properties. *Decision Support Systems*, 47(4), 547–553. <https://doi.org/10.1016/j.dss.2009.05.016>
- Corsi, A., & Ashenfelter, O. (2001). *Wine quality: experts' ratings and weather determinants*. 18.
- Cosenza, T. R., Solomon, M. R., & Kwon, W. (2015). Credibility in the blogosphere: A study of measurement and influence of wine blogs as an information source: Credibility first: the influence of wine blogs. *Journal of Consumer Behaviour*, 14(2), 71–91. <https://doi.org/10.1002/cb.1496>

- Costanigro, M., McCluskey, J. J., & Goemans, C. (2010). The Economics of Nested Names: Name Specificity, Reputations, and Price Premia. *American Journal of Agricultural Economics*, 92(5), 1339–1350. <https://doi.org/10.1093/ajae/aaq065>
- Costanigro, M., McCluskey, J. J., & Mittelhammer, R. C. (2018). Segmenting the Wine Market Based on Price: Hedonic Regression when Different Prices Mean Different Products. In *World Scientific Reference on Handbook of the Economics of Wine: Vol. Volume 6* (pp. 185–200). WORLD SCIENTIFIC. https://doi.org/10.1142/9789813232747_0008
- Costanigro, M., Scozzafava, G., & Casini, L. (2019). Vertical differentiation via multi-tier geographical indications and the consumer perception of quality: The case of Chianti wines. *Food Policy*, 83, 246–259. <https://doi.org/10.1016/j.foodpol.2019.01.008>
- Cotter, M., & Snyder, W. (1998). How Guide Books Affect Restaurant Behavior. *Journal of Restaurant & Foodservice Marketing*, 3(1), 69–75. https://doi.org/10.1300/J061v03n01_05
- Coulon-Leroy, C., Symoneaux, R., Lawrence, G., Mehinagic, E., & Maitre, I. (2017). Mixed Profiling: A new tool of sensory analysis in a professional context. Application to wines. *Food Quality and Preference*, 57, 8–16. <https://doi.org/10.1016/J.FOODQUAL.2016.11.005>
- Cox, J., & Kaimann, D. (2015). How do reviews from professional critics interact with other signals of product quality? Evidence from the video game industry: Interaction of professional critic reviews. *Journal of Consumer Behaviour*, 14(6), 366–377. <https://doi.org/10.1002/cb.1553>
- Croijmans, I., Hendrickx, I., Lefever, E., Majid, A., & van Den Bosch, A. (2019). Uncovering the language of wine experts. *Natural Language Engineering*, 26(5), 511–530. <https://doi.org/10.1017/S1351324919000500>
- Croijmans, I., & Majid, A. (2016). Not All Flavor Expertise Is Equal: The Language of Wine and Coffee Experts. *PLOS ONE*, 11(6), e0155845. <https://doi.org/10.1371/JOURNAL.PONE.0155845>
- Cuellar, S. S., & Claps, M. (2013). Differential effects of brand, ratings and region on willingness to pay: A hedonic price approach. *Journal of Wine Research*, 24(2), 138–155. <https://doi.org/10.1080/09571264.2013.766160>
- Cyr, D., Kwong, L., & Sun, L. (2019). Who Will Replace Parker? A Copula Function Analysis of Bordeaux En Primeur Wine Raters. *Journal of Wine Economics*, 14(2), 133–144. <https://doi.org/10.1017/jwe.2019.4>
- D'Alessandro, S., & Pecotich, A. (2013). Evaluation of wine by expert and novice consumers in the presence of variations in quality, brand and country of origin cues. *Food Quality and Preference*, 28(1), 287–303. <https://doi.org/10.1016/j.foodqual.2012.10.002>
- Danner, L., Johnson, T. E., Ristic, R., Meiselman, H. L., & Bastian, S. E. P. (2017). “I like the sound of that!” Wine descriptions influence consumers’ expectations, liking, emotions and willingness to pay for Australian white wines. *Food Research International*, 99, 263–274. <https://doi.org/10.1016/j.foodres.2017.05.019>
- Danner, L., Johnson, T. E., Ristic, R., Meiselman, H. L., & Bastian, S. E. P. (2020). Consumption Context Effects on Fine Wine Consumer Segments’ Liking and Emotions. *Foods*, 9(12). <https://doi.org/10.3390/FOODS9121798>
- Danner, L., Ristic, R., Johnson, T. E., Meiselman, H. L., Hoek, A. C., Jeffery, D. W., & Bastian, S. E. P. (2016). Context and wine quality effects on consumers’ mood, emotions, liking and willingness to pay for Australian Shiraz wines. *Food Research International*, 89, 254–265. <https://doi.org/10.1016/j.foodres.2016.08.006>

- Darby, M. R., & Karni, E. (1973). Free Competition and the Optimal Amount of Fraud. *The Journal of Law & Economics*, 16(1), 67–88. JSTOR.
- De Wijk, R. A., Kaneko, D., Dijksterhuis, G. B., van Zoggel, M., Schiona, I., Visalli, M., & Zandstra, E. H. (2019). Food perception and emotion measured over time in-lab and in-home. *Food Quality and Preference*, 75, 170–178. <https://doi.org/10.1016/j.foodqual.2019.02.019>
- Deng, Z. H., Luo, K. H., & Yu, H. L. (2014). A study of supervised term weighting scheme for sentiment analysis. *Expert Systems with Applications*, 41(7), 3506–3513. <https://doi.org/10.1016/J.ESWA.2013.10.056>
- Deselnicu, O. C., Costanigro, M., Souza-Monteiro, D. M., & McFadden, D. T. (2013). A Meta-Analysis of Geographical Indication Food Valuation Studies: What Drives the Premium for Origin-Based Labels? *Journal of Agricultural and Resource Economics*, 38(2), 204–219.
- Diaz-Bone, R. (2013). Discourse Conventions in the Construction of Wine Qualities in the Wine Market. *Economic Sociology*, 14(2), 9.
- Dinnella, C., Pierguidi, L., Spinelli, S., Borgogno, M., Gallina Toschi, T., Predieri, S., Lavezzi, G., Trapani, F., Tura, M., Magli, M., Bendini, A., & Monteleone, E. (2022). Remote testing: Sensory test during Covid-19 pandemic and beyond. *Food Quality and Preference*, 96, 104437. <https://doi.org/10.1016/j.foodqual.2021.104437>
- Dimson, E., Rousseau, P. L., & Spaenjers, C. (2015). The price of wine. *Journal of Financial Economics*, 118(2), 431–449. <https://doi.org/10.1016/j.jfineco.2015.08.005>
- Drake, M. A., Drake, S., Bodyfelt, F., Clark, S., & Costello, M. (2009). History of Sensory Analysis. In S. Clark, M. Costello, M. Drake, & F. Bodyfelt (Eds.), *The Sensory Evaluation of Dairy Products* (pp. 1–6). Springer US. https://doi.org/10.1007/978-0-387-77408-4_1
- Dressler, M. (2018). The German Wine Market: A Comprehensive Strategic and Economic Analysis. *Beverages*, 4(4), 92. <https://doi.org/10.3390/beverages4040092>
- Drummond, G., & Rule, G. (2005). Consumer confusion in the UK wine industry. *Journal of Wine Research*, 16(1), 55–64. <https://doi.org/10.1080/09571260500236633>
- Dubois, M. (2021). The market for wine quality evaluation: Evolution and future perspectives. *American Association of Wine Economists, AAWE Working Paper No. 1*.
- Dubois, M., Agnoli, L., Cardebat, J.-M., Compés, R., Faye, B., Frick, B., Gaeta, D., Giraud-Héraud, E., Le Fur, E., Livat, F., Malorgio, G., Masset, P., Meloni, G., Pinilla, V., Rebelo, J., Rossetto, L., Schamel, G., & Simon-Elorz, K. (2021). Did Wine Consumption Change During the COVID-19 Lockdown in France, Italy, Spain, and Portugal? *Journal of Wine Economics*, 16(2), 131–168. <https://doi.org/10.1017/jwe.2021.19>
- Dubois, P., & Nauges, C. (2010). Identifying the effect of unobserved quality and expert reviews in the pricing of experience goods: Empirical application on Bordeaux wine. *International Journal of Industrial Organization*, 28(3), 205–212. <https://doi.org/10.1016/j.ijindorg.2009.08.003>
- Dunphy, R., & Lockshin, L. (1998). A contemporary perspective of the Australian wine show system as a marketing tool. *Journal of Wine Research*, 9(2), 107–129. <https://doi.org/10.1080/09571269808718140>
- Edwards, F., & Mort, G. (1991). The Expert Wine Taster. *International Marketing Review*, 8(4). <https://doi.org/10.1108/EUM0000000001538>
- Erwig, M., & Gopinath, R. (2012). Explanations for regular expressions. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and*

- Lecture Notes in Bioinformatics*), 7212 LNCS, 394–408. https://doi.org/10.1007/978-3-642-28872-2_27/COVER/
- Etzi, R., Girondini, M., Massetti, G., & Gallace, A. (2022). The impact of contextual information regarding the origin of food on consumers' judgments. *Current Research in Food Science*, 5, 423–431. <https://doi.org/10.1016/J.CRFS.2022.02.003>
- Evans, D. S. (2003). Some Empirical Aspects of Multi-sided Platform Industries. *Review of Network Economics*, 2(3). <https://doi.org/10.2202/1446-9022.1026>
- Faye, B., Fur, E. L., & Prat, S. (2015). Dynamics of fine wine and asset prices: Evidence from short- and long-run co-movements. *Applied Economics*, 47(29), 3059–3077. <https://doi.org/10.1080/00036846.2015.1011321>
- Fernandez, J.-L. (2004). *La critique vinicole en France: Pouvoir de prescription et construction de la confiance*. Harmattan.
- Festré, A., & Garrouste, P. (2015). The 'Economics of Attention': A History of Economic Thought Perspective. *Œconomia. History, Methodology, Philosophy*, 5–1, Article 5–1. <https://doi.org/10.4000/oeconomia.1139>
- Flanagin, A. J., & Metzger, M. J. (2013). Trusting expert- versus user-generated ratings online: The role of information volume, valence, and consumer characteristics. *Computers in Human Behavior*, 29(4), 1626–1634. <https://doi.org/10.1016/j.chb.2013.02.001>
- Francis, I. L., & Williamson, P. O. (2015). Application of consumer sensory science in wine research. *Australian Journal of Grape and Wine Research*, 21, 554–567. <https://doi.org/10.1111/AJGW.12169>
- Franck, G. (2019). The economy of attention. *Journal of Sociology*, 55(1), 8–19. <https://doi.org/10.1177/1440783318811778>
- Friberg, R., & Grönqvist, E. (2012a). Do Expert Reviews Affect the Demand for Wine? *American Economic Journal: Applied Economics*, 4(1), 193–211. <https://doi.org/10.1257/app.4.1.193>
- Friberg, R., & Grönqvist, E. (2012b). Do Expert Reviews Affect the Demand for Wine? *American Economic Journal: Applied Economics*, 4(1), 193–211. <https://doi.org/10.1257/app.4.1.193>
- Frick, B., & Simmons, R. (2013). The impact of individual and collective reputation on wine prices: Empirical evidence from the Mosel valley. *Journal of Business Economics*, 83(2), 101–119. <https://doi.org/10.1007/s11573-013-0652-x>
- Frøst, M. B., & Noble, A. C. (2002a). *Preliminary Study of the Effect of Knowledge and Sensory Expertise on Liking for Red Wines*. 11.
- Frøst, M. B., & Noble, A. C. (2002b). Preliminary study of the effect of knowledge and sensory expertise on liking for red wines. *American Journal of Enology and Viticulture*, 53(4), 275–284. Scopus.
- Galesic, M. (2006). Dropouts on the Web: Effects of Interest and Burden Experienced During an Online Survey. *Journal of Official Statistics*.
- Gans, J., & Kaplan, S. (2017). *Survive and Thrive: Winning Against Strategic Threats to Your Business*. Dog Ear Publishing.
- Garrido, D., Gallardo, R. K., Ross, C. F., Montero, M. L., & Tang, J. (2021). The effect of intrinsic and extrinsic quality on the willingness to pay for a convenient meal: A combination of home-use-test with online auctions. *Journal of Sensory Studies*, n/a(n/a), e12682. <https://doi.org/10.1111/joss.12682>
- Gergaud, O., Ginsburgh, V., & Moreno-Ternero, J. D. (2021). Wine Ratings: Seeking a Consensus among Tasters via Normalization, Approval, and Aggregation. *Journal of Wine Economics*, 16(3), 321–342. <https://doi.org/10.1017/jwe.2021.15>

- Giacalone, D., Llobell, F., & Jaeger, S. R. (2022). “Beyond liking” measures in food-related consumer research supplement hedonic responses and improve ability to predict consumption. *Food Quality and Preference*, 97, 104459. <https://doi.org/10.1016/J.FOODQUAL.2021.104459>
- Gibbs, M., Tapia, M., & Warzynski, F. (2009). Globalization, Superstars, and the Importance of Reputation: Theory & Evidence from the Wine Industry. *Chicago Booth School of Business Research Paper No. 09-13*. <https://doi.org/10.2139/ssrn.1343732>
- Ginon, E., Ares, G., Issanchou, S., Laboissière, L. H. E. dos S., & Deliza, R. (2014). Identifying motives underlying wine purchase decisions: Results from an exploratory free listing task with Burgundy wine consumers. *Food Research International*, 62, 860–867. <https://doi.org/10.1016/j.foodres.2014.04.052>
- Gluckman, R. L. (1986). A Consumer Approach to Branded Wines. *European Journal of Marketing*, 20(6), 21–35. <https://doi.org/10.1108/EUM00000000004649>
- Gokcekus, O., & Gokcekus, S. (2019). Empirical evidence of lumping and splitting: Expert ratings’ effect on wine prices. *Wine Economics and Policy*, S2212977418300656. <https://doi.org/10.1016/j.wep.2019.09.003>
- Gokcekus, O., Hewstone, M., & Cakal, H. (2018). In Vino Veritas? Social Influence on “Private” Wine Evaluations at a Wine Social Networking Site. In O. Ashenfelter, O. Gergaud, K. Storchmann, & W. Ziemba, *World Scientific Handbook in Financial Economics Series* (Vol. 2, pp. 423–437). World scientific. https://doi.org/10.1142/9789813232754_0018
- Gokcekus, O., & Nottebaum, D. (2011). *The buyer’s dilemma – To whose rating should a wine drinker pay attention?* American Association of Wine Economists. https://www.wine-economics.org/dt_catalog/working-paper-no-91/
- Grainger, Keith. (2009). *Wine Quality Tasting and Selection*. Wiley-Blackwell.
- Greenacre, M. J. (1988). Clustering the rows and columns of a contingency table. *Journal of Classification*, 5(1), 39–51. <https://doi.org/10.1007/BF01901670>
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit Social Cognition: Attitudes, Self-Esteem, and Stereotypes. *Psychological Review*, 102(1), 4–27. <https://doi.org/10.1037/0033-295X.102.1.4>
- Grosselin, A., Sevos, J., Gay, A., Pellet, J., & Massoubre, C. (2018). Subjective evaluations of emotional and hedonic valences, subjective nutritional value, and familiarity on 201 “food words” in French population. *Annee Psychologique*, 118(2), 99–171. <https://doi.org/10.3917/ANPSY1.182.0099>
- Gustafson, C. R., Lybbert, T. J., & Sumner, D. A. (2016). Consumer knowledge affects valuation of product attributes: Experimental results for wine. *Journal of Behavioral and Experimental Economics*, 65(Supplement C), 85–94. <https://doi.org/10.1016/j.socec.2016.08.004>
- Gutjar, S., Dalenberg, J. R., de Graaf, C., de Wijk, R. A., Palascha, A., Renken, R. J., & Jager, G. (2015). What reported food-evoked emotions may add: A model to predict consumer food choice. *Food Quality and Preference*, 45, 140–148. <https://doi.org/10.1016/j.foodqual.2015.06.008>
- Halliday, J. (2017). *Halliday Wine Companion 2018*. Hardie Grant.
- Hamilton, L. M., & Lahne, J. (2020). Fast and automated sensory analysis: Using natural language processing for descriptive lexicon development. *Food Quality and Preference*, 83, 103926. <https://doi.org/10.1016/J.FOODQUAL.2020.103926>
- Harrington, R. J. (2008). *Food and wine pairing: A sensory experience*. John Wiley.

- Hay, C. (2010). The political economy of price and status formation in the Bordeaux en primeur market: The role of wine critics as rating agencies. *Socio-Economic Review*, 8(4), 685–707. <https://doi.org/10.1093/ser/mwq007>
- Hayward, L., Jantzi, H., Smith, A., & McSweeney, M. B. (2020a). How do consumers describe cool climate wines using projective mapping and ultra-flash profile? *Food Quality and Preference*, 86, 104026. <https://doi.org/10.1016/J.FOODQUAL.2020.104026>
- Hayward, L., Jantzi, H., Smith, A., & McSweeney, M. B. (2020b). How do consumers describe cool climate wines using projective mapping and ultra-flash profile? *Food Quality and Preference*, 86, 104026. <https://doi.org/10.1016/J.FOODQUAL.2020.104026>
- Herschkowitsch, A., & Goldstein, R. (2009). *The Wine Trials 2010: The World's Bestselling Guide to Inexpensive Wines, with the 150 Winning Wines Under \$15 from the Latest Vintages* (T. Walters, Ed.; 2nd edition). Fearless Critic Media.
- Heslop, L. A., Cray, D., & Armenakyan, A. (2010). Cue incongruity in wine personality formation and purchasing. *International Journal of Wine Business Research*, 22(3), 288–307. <https://doi.org/10.1108/17511061011075400>
- Higgins, L. M., Wolf, M. M., & Wolf, M. J. (2016). Wine on Facebook: A Look at Millennials' Wine Information Search. In G. Szolnoki, L. Thach, & D. Kolb (Eds.), *Successful Social Media and Ecommerce Strategies in the Wine Industry* (pp. 13–29). Palgrave Macmillan US. https://doi.org/10.1057/9781137602985_2
- Hilger, J., Rafert, G., & Villas-Boas, S. (2010). Expert Opinion and the Demand for Experience Goods: An Experimental Approach in the Retail Wine Market. *Review of Economics and Statistics*, 93(4), 1289–1296. https://doi.org/10.1162/REST_a_00117
- Hilger, J., Rafert, G., & Villas-Boas, S. (2011). Expert Opinion and the Demand for Experience Goods: An Experimental Approach in the Retail Wine Market. *Review of Economics and Statistics*, 93(4), 1289–1296. https://doi.org/10.1162/REST_a_00117
- Hjorth-Andersen, C. (1991). Quality indicators: In theory and in fact. *European Economic Review*, 35(8), 1491–1505. [https://doi.org/10.1016/0014-2921\(91\)90014-A](https://doi.org/10.1016/0014-2921(91)90014-A)
- Hodgson, R. T. (2008). An Examination of Judge Reliability at a major U.S. Wine Competition*. *Journal of Wine Economics*, 3(2), 105–113. <https://doi.org/10.1017/S1931436100001152>
- Hommerberg, C. (2011). *Persuasiveness in the discourse of wine: The rhetoric of Robert Parker*. Linnaeus University Press.
- Honoré-Chedozeau, C., Ballester, J., Chatelet, B., & Lempereur, V. (2015). Wine competition: From between-juries consistency to sensory perception of consumers. *BIO Web of Conferences*, 5, 03009. <https://doi.org/10.1051/bioconf/20150503009>
- Honoré-Chedozeau, C., Chollet, S., Lelièvre-Desmas, M., Ballester, J., & Valentin, D. (2020). From perceptual to conceptual categorization of wines: What is the effect of expertise? *Food Quality and Preference*, 80, 103806. <https://doi.org/10.1016/j.foodqual.2019.103806>
- Horowitz, I., & Lockshin, L. (2002). What Price Quality? An Investigation into the Prediction of Wine-quality Ratings. *Journal of Wine Research*, 13(1), 7–22. <https://doi.org/10.1080/0957126022000004020>
- Hsu, G., Roberts, P. W., & Swaminathan, A. (2007). *Standards for quality and the coordinating role of critics*. 48.
- Hsu, G., Roberts, P. W., & Swaminathan, A. (2012). Evaluative Schemas and the Mediating Role of Critics. *Organization Science*, 23(1), 83–97. <https://doi.org/10.1287/orsc.1100.0630>

- Huang, P., Lurie, N. H., & Mitra, S. (2009). Searching for Experience on the Web: An Empirical Examination of Consumer Behavior for Search and Experience Goods. *Journal of Marketing*, 73(2), 55–69. <https://doi.org/10.1509/jmkg.73.2.55>
- Hughson, A. L., & Boakes, R. A. (2002). The knowing nose: The role of knowledge in wine expertise. *Food Quality and Preference*, 13(7–8), 463–472. [https://doi.org/10.1016/S0950-3293\(02\)00051-4](https://doi.org/10.1016/S0950-3293(02)00051-4)
- Humphreys, A., & Carpenter, G. S. (2018). Status Games: Market Driving through Social Influence in the U.S. Wine Industry. *Journal of Marketing*, 82(5), 141–159. <https://doi.org/10.1509/jm.16.0179>
- INRAE. (n.d.). *TimeSens© software 2.0*.
- Jackson, R. S. (2008). Introduction. In R. S. Jackson (Ed.), *Wine Science (Third Edition)* (pp. 1–14). Academic Press. <https://doi.org/10.1016/B978-012373646-8.50004-4>
- Jackson, R. S. (2017). *Nature and Origins of Wine Quality* (pp. 337–370). Academic Press. <https://doi.org/10.1016/B978-0-12-801813-2.00008-2>
- Jaeger, S. R., & Ares, G. (2015). RATA questions are not likely to bias hedonic scores. *Food Quality and Preference*, 44, 157–161. <https://doi.org/10.1016/J.FOODQUAL.2015.04.011>
- Jaeger, S. R., Giacalone, D., Roigard, C. M., Pineau, B., Vidal, L., Giménez, A., Frøst, M. B., & Ares, G. (2013). Investigation of bias of hedonic scores when co-eliciting product attribute information using CATA questions. *Food Quality and Preference*, 30(2), 242–249. <https://doi.org/10.1016/J.FOODQUAL.2013.06.001>
- Jaeger, S. R., Xia, Y., Le Blond, M., Beresford, M. K., Hedderley, D. I., & Cardello, A. V. (2019). Supplementing hedonic and sensory consumer research on beer with cognitive and emotional measures, and additional insights via consumer segmentation. *Food Quality and Preference*, 73, 117–134. <https://doi.org/10.1016/j.foodqual.2018.11.015>
- Jamerson, H. (2009). Intoxicators, educators, and gatekeepers: The enactment of symbolic boundaries in Napa Valley wineries. *Poetics*, 37(4), 383–398. <https://doi.org/10.1016/j.poetic.2009.06.001>
- James, A. (2018). How Robert Parker's 90+ and Ann Noble's Aroma Wheel Changed the Discourse of Wine Tasting Notes. *ILCEA. Revue de l'Institut Des Langues et Cultures d'Europe, Amérique, Afrique, Asie et Australie*, 31, Article 31. <https://doi.org/10.4000/ilcea.4681>
- Jenster, P. V., & Jenster, L. (1993). The European Wine Industry. *International Journal of Wine Marketing*, 5(1), 30–73. <https://doi.org/10.1108/eb008610>
- Jiao, L. (2017). Macroeconomic determinants of wine prices. *International Journal of Wine Business Research*. <https://doi.org/10.1108/IJWBR-09-2016-0032>
- Jockers, M. (2020). *Introduction to the Syuzhet Package*. <https://cran.r-project.org/web/packages/syuzhet/vignettes/syuzhet-vignette.html>
- Jones, G., & Storchmann, K. (2001). Wine market prices and investment under uncertainty: An econometric model for Bordeaux Crus Classés. *Agricultural Economics*, 26(2), 115–133. [https://doi.org/10.1016/S0169-5150\(00\)00102-X](https://doi.org/10.1016/S0169-5150(00)00102-X)
- Josse, J., Pagès, J., & Husson, F. (2008). Testing the significance of the RV coefficient. *Computational Statistics & Data Analysis*, 53(1), 82–91. <https://doi.org/10.1016/J.CSDA.2008.06.012>
- Jung, R., Kumar, K., Patz, C., Rauhut, D., Tarasov, A., & Schüßler, C. (2021). Influence of transport temperature profiles on wine quality. *Food Packaging and Shelf Life*, 29, 100706. <https://doi.org/10.1016/j.fpsl.2021.100706>

- Kaimann, D., Spiess Bru, C. L. M., & Frick, B. (2023). Ratings meet prices: The dynamic relationship of quality signals. *Journal of Wine Economics*, 1–19. <https://doi.org/10.1017/jwe.2023.14>
- Kapferer, J. -N., & Laurent, G. (1993). Further evidence on the consumer involvement profile: Five antecedents of involvement. *Psychology & Marketing*, 10(4), 347–355. <https://doi.org/10.1002/MAR.4220100408>
- Karpik, L. (2000). Le Guide rouge Michelin. *Sociologie du Travail*, 42(3), 369–389. [https://doi.org/10.1016/S0038-0296\(00\)01086-4](https://doi.org/10.1016/S0038-0296(00)01086-4)
- Karpik, L. (2007). *L'économie des singularités*. Gallimard.
- Keh, H. T., & Sun, J. (2018). The Differential Effects of Online Peer Review and Expert Review on Service Evaluations: The Roles of Confidence and Information Convergence. *Journal of Service Research*, 21(4), 474–489. <https://doi.org/10.1177/1094670518779456>
- Ketron, S. (2017). Investigating the effect of quality of grammar and mechanics (QGAM) in online reviews: The mediating role of reviewer credibility. *Journal of Business Research*, 81, 51–59. <https://doi.org/10.1016/j.jbusres.2017.08.008>
- Ketron, S., Spears, N., & Dai, B. (2016). Overcoming information overload in retail environments: Imagination and sales promotion in a wine context. *Journal of Retailing and Consumer Services*, 33, 23–32. <https://doi.org/10.1016/j.jretconser.2016.07.017>
- Keuschnigg, M. (2015). Product success in cultural markets: The mediating role of familiarity, peers, and experts. *Poetics*, 51, 17–36. <https://doi.org/10.1016/j.poetic.2015.03.003>
- Khalafyan, A. A., Temerdashev, Z. A., Akin'shina, V. A., & Yakuba, Yu. F. (2021). Study of consistency of expert evaluations of wine sensory characteristics by positional analysis. *Heliyon*, 7(2), e06162. <https://doi.org/10.1016/j.heliyon.2021.e06162>
- Kiatkawsin, K., & Han, H. (2019). What drives customers' willingness to pay price premiums for luxury gastronomic experiences at michelin-starred restaurants? *International Journal of Hospitality Management*, 82, 209–219. <https://doi.org/10.1016/j.ijhm.2019.04.024>
- King, R. A., Racherla, P., & Bush, V. D. (2014). What We Know and Don't Know About Online Word-of-Mouth: A Review and Synthesis of the Literature. *Journal of Interactive Marketing*, 28(3), 167–183. <https://doi.org/10.1016/j.intmar.2014.02.001>
- Klein, L. R. (1998). Evaluating the Potential of Interactive Media through a New Lens: Search versus Experience Goods. *Journal of Business Research*, 41(3), 195–203. [https://doi.org/10.1016/S0148-2963\(97\)00062-3](https://doi.org/10.1016/S0148-2963(97)00062-3)
- Kolen, M. J., & Brennan, R. L. (2014). Nonequivalent Groups: Linear Methods. In M. J. Kolen & R. L. Brennan (Eds.), *Test Equating, Scaling, and Linking: Methods and Practices* (pp. 103–142). Springer. https://doi.org/10.1007/978-1-4939-0317-7_4
- Kopsacheillis, O., Pipergias Analytis, P., Kaushik, K., Herzog, S., Bahrami, B., & Deroy, O. (2023). *Crowdsourcing the Assessment of Wine Quality—Evidence from Vivino* (SSRN Scholarly Paper 4355578). <https://doi.org/10.2139/ssrn.4355578>
- Kotonya, N., De Cristofaro, P., & De Cristofaro, E. (2018). Of Wines and Reviews: Measuring and Modeling the Vivino Wine Social Network. *2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM)*, 387–392. <https://doi.org/10.1109/ASONAM.2018.8508776>
- Kuiper, P. K., & Hood, K. M. (2019). Examining Sentiment Analysis When Evaluating Survey Responses. *Proceedings - 13th IEEE International Conference on Semantic Computing, ICSC 2019*, 412–415. <https://doi.org/10.1109/ICOSC.2019.8665581>

- Kwak, Y.-S., Nam, Y.-J., & Hong, J.-W. (2021). Effect of Online Collective Intelligence in Wine Industry: Focus on Correlation between Wine Quality Ratings and On-Premise Prices. *Sustainability*, *13*(14), Article 14. <https://doi.org/10.3390/su13148001>
- Kwon, W., & Easton, G. (2010). Conceptualizing the role of evaluation systems in markets: The case of dominant evaluators. *Marketing Theory*, *10*(2), 123–143. <https://doi.org/10.1177/1470593110366907>
- Lam, H. Y., Choy, K. L., Ho, G. T. S., Kwong, C. K., & Lee, C. K. M. (2013). A real-time risk control and monitoring system for incident handling in wine storage. *Expert Systems with Applications*, *40*(9), 3665–3678. <https://doi.org/10.1016/j.eswa.2012.12.071>
- Lagast, S., Gellynck, X., Schouteten, J. J., De Herdt, V., & De Steur, H. (2017). Consumers' emotions elicited by food: A systematic review of explicit and implicit methods. *Trends in Food Science & Technology*, *69*, 172–189. <https://doi.org/10.1016/j.tifs.2017.09.006>
- Lahne, J. (2016). Sensory science, the food industry, and the objectification of taste. *Anthropology of food*, *10*, Article 10. <https://doi.org/10.4000/aof.7956>
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, *4*(NOV), 863. <https://doi.org/10.3389/FPSYG.2013.00863/ABSTRACT>
- Lamote, S., Hermans, D., Baeyens, F., & Eelen, P. (2004). An exploration of affective priming as an indirect measure of food attitudes. *Appetite*, *42*(3), 279–286. <https://doi.org/10.1016/J.APPET.2003.11.009>
- Lamour, C., & De la Robertie. (2015). *A DEFINITION OF SHOPPING PRESCRIPTION AND ITS INTEGRATION INTO THE DECISION-MAKING PROCESS*. 27.
- Lamour, C., & De La Robertie, C. (2016). Prescribed consumption and consumers' decision-making styles: A cross-cultural comparison between Europe and Asia. *International Journal of Retail & Distribution Management*, *44*(3), 266–283. <https://doi.org/10.1108/IJRDM-02-2015-0018>
- Landon, S., & Smith, C. E. (1997). The Use of Quality and Reputation Indicators by Consumers: The Case of Bordeaux Wine. *Journal of Consumer Policy*, *20*(3), 289–323. <https://doi.org/10.1023/A:1006830218392>
- Lange, C., Combris, P., Issanchou, S., & Schlich, P. (2015). Impact of information and in-home sensory exposure on liking and willingness to pay: The beginning of Fairtrade labeled coffee in France. *Food Research International*, *76*, 317–324. <https://doi.org/10.1016/j.foodres.2015.06.017>
- Langstaff, S. A. (2010). Sensory quality control in the wine industry. In D. Kilcast (Ed.), *Sensory Analysis for Food and Beverage Quality Control* (pp. 236–261). Woodhead Publishing. <https://doi.org/10.1533/9781845699512.3.236>
- Lawless, H. T. (1984). Flavor Description of White Wine by “Expert” and Nonexpert Wine Consumers. *Journal of Food Science*, *49*(1), 120–123. <https://doi.org/10.1111/J.1365-2621.1984.TB13686.X>
- Lawrence, G., Symoneaux, R., Maitre, I., Brossaud, F., Maestrojuan, M., & Mehinagic, E. (2013). Using the free comments method for sensory characterisation of Cabernet Franc wines: Comparison with classical profiling in a professional context. *Food Quality and Preference*, *30*(2), 145–155. <https://doi.org/10.1016/J.FOODQUAL.2013.04.005>
- Le Fur, E., & Outreville, J.-F. (2019). Fine wine returns: A review of the literature. *Journal of Asset Management*, *20*(3), 196–214. <https://doi.org/10.1057/s41260-019-00116-6>
- Lecat, B., Brouard, J., & Chapuis, C. (2017). Fraud and counterfeit wines in France: An overview and perspectives. *British Food Journal*, *119*(1), 84–104. <https://doi.org/10.1108/BFJ-09-2016-0398>

- Lecocq, Magnac, Pichery, & Visser. (2005). The Impact of Information on Wine Auction Prices: Results of an Experiment. *Annales d'Économie et de Statistique*, 77, 37. <https://doi.org/10.2307/20079115>
- Lecocq, S., & Visser, M. (2006). What Determines Wine Prices: Objective vs. Sensory Characteristics. *Journal of Wine Economics*, 1(1), 42–56. <https://doi.org/10.1017/S1931436100000080>
- Legin, A., Rudnitskaya, A., Lvova, L., Vlasov, Yu., Di Natale, C., & D'Amico, A. (2003). Evaluation of Italian wine by the electronic tongue: Recognition, quantitative analysis and correlation with human sensory perception. *Analytica Chimica Acta*, 484(1), 33–44. [https://doi.org/10.1016/S0003-2670\(03\)00301-5](https://doi.org/10.1016/S0003-2670(03)00301-5)
- Lehrer, A. (1975). Talking about Wine. *Language*, 51(4), 901. <https://doi.org/10.2307/412700>
- Lesschaeve, I., & Noble, A. C. (2022). Sensory analysis of wine. *Managing Wine Quality*, 243–277. <https://doi.org/10.1016/B978-0-08-102067-8.00010-5>
- Liapakis, A., Tsiligiridis, T., & Yialouris, C. (2020). A Sentiment Lexicon-based Analysis for Food and Beverage Industry Reviews. The Greek Language Paradigm. *International Journal on Natural Language Computing*, 9(2), 21–42. <https://doi.org/10.5121/IJNLC.2020.9203>
- Lim, J. (2011). Hedonic scaling: A review of methods and theory. *Food Quality and Preference*, 22(8), 733–747. <https://doi.org/10.1016/J.FOODQUAL.2011.05.008>
- Ling, B.-H., & Lockshin, L. (2003). Components of Wine Prices for Australian Wine: How Winery Reputation, Wine Quality, Region, Vintage, and Winery Size Contribute to the Price of Varietal Wines. *Australasian Marketing Journal (AMJ)*, 11(3), 19–32. [https://doi.org/10.1016/S1441-3582\(03\)70132-3](https://doi.org/10.1016/S1441-3582(03)70132-3)
- Liu, H.-B., McCarthy, B., & Chen, T. (2013). The Chinese wine market: A market segmentation study. *Asia Pacific Journal of Marketing and Logistics*, 26, 450–471.
- Livat, F., Alston, J. M., & Cardebat, J.-M. (2019). Do denominations of origin provide useful quality signals? The case of Bordeaux wines. *Economic Modelling*, 81, 518–532. <https://doi.org/10.1016/j.econmod.2018.06.003>
- Lockshin, L., & Corsi, A. M. (2012). Consumer behaviour for wine 2.0: A review since 2003 and future directions. *Wine Economics and Policy*, 1(1), 2–23. <https://doi.org/10.1016/j.wep.2012.11.003>
- Lockshin, L., & Corsi, A. M. (2019). Consumer Research For Wine. *Handbook of Eating and Drinking*, 1–18. https://doi.org/10.1007/978-3-319-75388-1_162-1
- Lockshin, L., Jarvis, W., d'Hauteville, F., & Perrouy, J.-P. (2006). Using simulations from discrete choice experiments to measure consumer sensitivity to brand, region, price, and awards in wine choice. *Food Quality and Preference*, 17(3–4), 166–178. <https://doi.org/10.1016/j.foodqual.2005.03.009>
- Lohéac, Y., & Issanchou, S. (2007). Using auctions to estimate prices and value of food products. *Consumer-Led Food Product Development*, 471–491. <https://doi.org/10.1533/9781845693381.3.471>
- Losó, V., Tóth, A., Gere, A., Heszberger, J., Székely, G., Kókai, Z., & Sipos, L. (2012). Methodology problems of the industrial preference mapping. *Acta Alimentaria*, 41(Supplement-1), 109–119. <https://doi.org/10.1556/AALIM.41.2012.SUPPL.11>
- Luc, A., Lê, S., & Philippe, M. (2020). Nudging consumers for relevant data using Free JAR profiling: An application to product development. *Food Quality and Preference*, 79, 103751. <https://doi.org/10.1016/J.FOODQUAL.2019.103751>

- Luc, A., Lê, S., Philippe, M., Mostafa Qannari, E., & Vigneau, E. (2022). A machine learning approach for analyzing Free JAR data. *Food Quality and Preference*, 99, 104581. <https://doi.org/10.1016/J.FOODQUAL.2022.104581>
- Lunardo, R., Saintives, C., & Chaney, D. (2021). Food packaging and the color red: How negative cognitive associations influence feelings of guilt. *Journal of Business Research*, 134, 589–600. <https://doi.org/10.1016/J.JBUSRES.2021.05.052>
- Lynch Jr., J. G., & Ariely, D. (2000). Wine online: Search costs affect competition on price, quality, and distribution. *Marketing Science*, 19(1), 83–103. Scopus. <https://doi.org/10.1287/mksc.19.1.83.15183>
- Macfie, H. (2007). Preference mapping and food product development. *Consumer-Led Food Product Development*, 551–592. <https://doi.org/10.1533/9781845693381.3.551>
- Mahieu, B. (2021). *MultiResponseR*. <https://github.com/MahieuB/MultiResponseR>
- Mahieu, B., Schlich, P., Visalli, M., & Cardot, H. (2021). A multiple-response chi-square framework for the analysis of Free-Comment and Check-All-That-Apply data. *Food Quality and Preference*, 93, 104256. <https://doi.org/10.1016/J.FOODQUAL.2021.104256>
- Mahieu, B., Visalli, M., & Schlich, P. (2022). Identifying drivers of liking and characterizing the ideal product thanks to Free-Comment. *Food Quality and Preference*, 96, 104389. <https://doi.org/10.1016/J.FOODQUAL.2021.104389>
- Mahieu, B., Visalli, M., Thomas, A., & Schlich, P. (2020a). Free-comment outperformed check-all-that-apply in the sensory characterisation of wines with consumers at home. *Food Quality and Preference*, 84, 103937. <https://doi.org/10.1016/J.FOODQUAL.2020.103937>
- Mahieu, B., Visalli, M., Thomas, A., & Schlich, P. (2020b). Using Free-Comment with consumers to obtain temporal sensory descriptions of products. *Food Quality and Preference*, 86, 104008. <https://doi.org/10.1016/J.FOODQUAL.2020.104008>
- Malorgio, G., Camanzi, L., & Grazia, C. (2007). *Effectiveness of European Appellations of Origin on the International wine market* (690-2016–47320). AgEcon Search. <https://doi.org/10.22004/ag.econ.7896>
- Malter, M. S., Holbrook, M. B., Kahn, B. E., Parker, J. R., & Lehmann, D. R. (2020). The past, present, and future of consumer research. *Marketing Letters*, 31(2), 137–149. <https://doi.org/10.1007/s11002-020-09526-8>
- Marks, D. (2015). Seeking the Veritas about the Vino: Fine wine ratings as wine knowledge. *Journal of Wine Research*, 26(4), 319–335. <https://doi.org/10.1080/09571264.2015.1083953>
- Marks, D. (2020). Erring Experts? A Critique of Wine Ratings as Hedonic Scaling. *Journal of Wine Economics*, 15(4), 386–393. <https://doi.org/10.1017/jwe.2020.42>
- Marsh, E., & Rajaram, S. (2019). The Digital Expansion of the Mind: Implications of Internet Usage for Memory and Cognition. *Journal of Applied Research in Memory and Cognition*, 8. <https://doi.org/10.1016/j.jarmac.2018.11.001>
- Masset, P., & Weisskopf, J.-P. (2018). Wine indices in practice: Nicely labeled but slightly corked. *Economic Modelling*, 68, 555–569. <https://doi.org/10.1016/j.econmod.2017.03.025>
- Mastroberardino, P., Calabrese, G., Cortese, F., & Petracca, M. (2019). The Internationalization of Business and Their Approach to New Markets: A Focus on US Wine Consumer. *International Journal of Business and Management*, 14(12), 14. <https://doi.org/10.5539/ijbm.v14n12p14>

- Mazzoli, E., & Palumbo, L. (2022). *In Vivino Veritas: An Investigation on Consumers' Quality Perception and Wine Choice Determinants* (SSRN Scholarly Paper 4114012). <https://papers.ssrn.com/abstract=4114012>
- Meillon, S., Urbano, C., Guillot, G., & Schlich, P. (2010). Acceptability of partially dealcoholized wines – Measuring the impact of sensory and information cues on overall liking in real-life settings. *Food Quality and Preference*, 21(7), 763–773. <https://doi.org/10.1016/j.foodqual.2010.07.013>
- Meiselman, H. L. (2021a). The (gradual) development of emotion measurement for food. *Current Opinion in Food Science*, 40, 187–191. <https://doi.org/10.1016/j.cofs.2021.03.017>
- Meiselman, H. L. (2021b). The (gradual) development of emotion measurement for food. *Current Opinion in Food Science*, 40, 187–191. <https://doi.org/10.1016/J.COFS.2021.03.017>
- Mellet, K., Beauvisage, T., Beuscart, J.-S., & Trespeuch, M. (2014). A “Democratization” of Markets? Online Consumer Reviews in the Restaurant Industry. *Valuation Studies*, 2(1), Article 1. <https://doi.org/10.3384/vs.2001-5992.14215>
- Mérel, P., Ortiz-Bobea, A., & Paroissien, E. (2021). How big is the “lemons” problem? Historical evidence from French wines. *European Economic Review*, 138, 103824. <https://doi.org/10.1016/j.euroecorev.2021.103824>
- Mitchell, V., & Grotorex, M. (1989). Risk Reducing Strategies Used in the Purchase of Wine in the UK. *European Journal of Marketing*, 23(9), 31–46. <https://doi.org/10.1108/EUM00000000000589>
- Mitchell, V., & Papavassiliou, V. (1999). Marketing causes and implications of consumer confusion. *Journal of Product & Brand Management*, 8(4), 319–342. <https://doi.org/10.1108/10610429910284300>
- Mitchell, V.-W., Walsh, G., & Yamin, M. (2005). Towards a Conceptual Model of Consumer Confusion. *ACR North American Advances*, NA-32. <https://www.acrwebsite.org/volumes/9058/volumes/v32/NA-32>
- Mojet, J., Dürschmid, K., Danner, L., Jöchl, M., Heiniö, R.-L., Holthuysen, N., & Köster, E. (2015). Are implicit emotion measurements evoked by food unrelated to liking? *Food Research International*, 76, 224–232. <https://doi.org/10.1016/j.foodres.2015.06.031>
- Morata, A., Escott, C., Bañuelos, M. A., Loira, I., Del Fresno, J. M., González, C., & Suárez-lepe, J. A. (2020). Contribution of Non-Saccharomyces Yeasts to Wine Freshness. A Review. *Biomolecules*, 10(1). <https://doi.org/10.3390/BIOM10010034>
- Morrison, A., & Rabelotti, R. (2017). Gradual catch up and enduring leadership in the global wine industry. *Research Policy*, 46(2), 417–430. <https://doi.org/10.1016/j.respol.2016.09.007>
- Moscovici, D., & Reed, A. (2018). Comparing wine sustainability certifications around the world: History, status and opportunity. *Journal of Wine Research*, 29(1), 1–25. <https://doi.org/10.1080/09571264.2018.1433138>
- Moskowitz, H. R. (1972). Subjective ideals and sensory optimization in evaluating perceptual dimensions in food. *Journal of Applied Psychology*, 56(1), 60–66. <https://doi.org/10.1037/H0032140>
- Moskowitz, H. R., & Krieger, B. (1995). The contribution of sensory liking to overall liking: An analysis of six food categories. *Food Quality and Preference*, 6(2), 83–90. [https://doi.org/10.1016/0950-3293\(95\)98552-T](https://doi.org/10.1016/0950-3293(95)98552-T)
- Moskowitz, H. R., Muñoz, A. M., & Gacula, M. C. (2008). Viewpoints and Controversies in Sensory Science and Consumer Product Testing. *Viewpoints and Controversies in*

- Sensory Science and Consumer Product Testing*.
<https://doi.org/10.1002/9780470385128>
- Moussa, S., & Touzani, M. (2008). The perceived credibility of quality labels: A scale validation with refinement. *International Journal of Consumer Studies*, 32(5), 526–533. <https://doi.org/10.1111/j.1470-6431.2008.00713.x>
- Mueller Loose, S., Francis, I. L. F., & Lockshin, L. (2008). The relationship between wine liking, subjective and objective wine knowledge: Does it matter who is in your “consumer” sample? *4th International Conference of the Academy of Wine Business Research, Siena 17-19th July 2008*.
- Mueller, S., Osidacz, P., Francis, I. L., & Lockshin, L. (2010). Combining discrete choice and informed sensory testing in a two-stage process: Can it predict wine market share? *Food Quality and Preference*, 21(7), 741–754. <https://doi.org/10.1016/j.foodqual.2010.06.008>
- Mussa, M., & Rosen, S. (1978). Monopoly and product quality. *Journal of Economic Theory*, 18(2), 301–317. [https://doi.org/10.1016/0022-0531\(78\)90085-6](https://doi.org/10.1016/0022-0531(78)90085-6)
- Narwal, P., & Nayak, J. K. (2020). How consumers form product quality perceptions in absence of fixed posted prices: Interaction of product cues with seller reputation and third-party reviews. *Journal of Retailing and Consumer Services*, 52, 101924. <https://doi.org/10.1016/j.jretconser.2019.101924>
- Nelson, P. (1970a). Information and Consumer Behavior. *Journal of Political Economy*, 78(2), 311–329. JSTOR.
- Nelson, P. (1970b). Information and Consumer Behavior. *Journal of Political Economy*, 78(2), 311–329.
- Neuninger, R., Mather, D., & Duncan, T. (2017). Consumer’s scepticism of wine awards: A study of consumers’ use of wine awards. *Journal of Retailing and Consumer Services*, 35, 98–105. <https://doi.org/10.1016/j.jretconser.2016.12.003>
- Noble, A. C., Arnold, R. A., Buechsenstein, J., Leach, E. J., Schmidt, J. O., & Stern, P. M. (1987). Modification of a Standardized System of Wine Aroma Terminology. *American Journal of Enology and Viticulture*, 38(2).
- O’Brien, D., Wellbrock, C.-M., & Kleer, N. (2020). Content for Free? Drivers of Past Payment, Paying Intent and Willingness to Pay for Digital Journalism – A Systematic Literature Review. *Digital Journalism*, 8(5), 643–672. <https://doi.org/10.1080/21670811.2020.1770112>
- O’Neil, K. M., & Penrod, S. D. (2001). Methodological variables in Web-based research that may affect results: Sample type, monetary incentives, and personal information. *Behavior Research Methods, Instruments, & Computers*, 33(2), 226–233. <https://doi.org/10.3758/BF03195369>
- Oczkowski, E. (1994). A Hedonic Price Function for Australian Premium Table Wine*. *Australian Journal of Agricultural Economics*, 38(1), 93–110. <https://doi.org/10.1111/j.1467-8489.1994.tb00721.x>
- Oczkowski, E. (2018). Modelling prices and the reputation of individual named wines. *Applied Economics*, 50(32), 3464–3476. <https://doi.org/10.1080/00036846.2017.1422599>
- Oczkowski, E., & Doucouliagos, H. (2015). Wine Prices and Quality Ratings: A Meta-regression Analysis. *American Journal of Agricultural Economics*, 97(1), 103–121. <https://doi.org/10.1093/ajae/aau057>
- Oczkowski, E., & Pawsey, N. (2019). Community and Expert Wine Ratings and Prices. *Economic Papers: A Journal of Applied Economics and Policy*, 38(1), 27–40. <https://doi.org/10.1111/1759-3441.12240>

- Odorici, V., & Corrado, R. (2004). Between Supply and Demand: Intermediaries, Social Networks and the Construction of Quality in the Italian Wine Industry. *Journal of Management & Governance*, 8(2), 149–171. <https://doi.org/10.1023/B:MAGO.0000026542.18647.48>
- Olivesi, S. (2018). *Des vins et des hommes: Une économie symbolique du goût*. Presses universitaires de Grenoble.
- Onur, I., Bruwer, J., & Lockshin, L. (2020). Reducing information asymmetry in the auctioning of non-perishable experience goods: The case of online wine auctions. *Journal of Retailing and Consumer Services*, 54, 102060. <https://doi.org/10.1016/j.jretconser.2020.102060>
- Orth, U. R., Lockshin, L., & d’Hauteville, F. (2007). The global wine business as a research field. *International Journal of Wine Business Research*, 19(1), 5–13. <https://doi.org/10.1108/17511060710740316>
- Orlean, A. (2014). *The Empire of Value: A New Foundation for Economics*. MIT Press.
- Osterland, E. A. (2012). *Power entertaining: Secrets to building lasting relationships, hosting unforgettable events, and closing big deals from America’s 1st master sommelier*. John Wiley & Son.
- Outreville, J.-F., & Le Fur, E. (2020). Hedonic Price Functions and Wine Price Determinants: A Review of Empirical Research. *Journal of Agricultural & Food Industrial Organization*, 18(2). <https://doi.org/10.1515/jafio-2019-0028>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, n71. <https://doi.org/10.1136/bmj.n71>
- Parga-Dans, E., & Alonso González, P. (2017). ‘Marketing quality’ in the food sector: Towards a critical engagement with the ‘quality turn’ in wine. *Geoforum*, 85, 5–8. <https://doi.org/10.1016/j.geoforum.2017.07.005>
- Parga-Dans, E., Alonso González, P., & Otero-Enríquez, R. (2022). The role of expert judgments in wine quality assessment: The mismatch between chemical, sensorial and extrinsic cues. *British Food Journal*, 124(12), 4286–4303. <https://doi.org/10.1108/BFJ-04-2021-0373>
- Park, D.-H., Lee, J., & Han, I. (2007). The Effect of On-Line Consumer Reviews on Consumer Purchasing Intention: The Moderating Role of Involvement. *International Journal of Electronic Commerce*, 11(4), 125–148. <https://doi.org/10.2753/JEC1086-4415110405>
- Park, S. H., Lee, S. H., Seo, W. H., Shin, W., & Hong, J. H. (2022). Consumers better explained drivers of liking for products containing complex flavor with subtle differences than trained panelists: Comparison between consumer-driven free-comment analysis and descriptive analysis of tomato sauce with added garlic flavorings. *Journal of Sensory Studies*, 37(3), e12736. <https://doi.org/10.1111/JOSS.12736>
- Park, S., Heo, J., Oh, J., Chung, S.-J., & Sub Kwak, H. (2023). Consumer testing away from a sensory facility: Application of home-use test and no-contact home-use test. *Food Quality and Preference*, 109, 104905. <https://doi.org/10.1016/j.foodqual.2023.104905>
- Paroissien, E. (2017). *Essays in Empirical Economics on the Formation of Wine Prices* (Issue 2017BORD0839) [Theses, Université de Bordeaux]. <https://tel.archives-ouvertes.fr/tel-01701831>

- Paroissien, E., & Visser, M. (2020). The Causal Impact of Medals on Wine Producers' Prices and the Gains from Participating in Contests. *American Journal of Agricultural Economics*, 102(4), 1135–1153. <https://doi.org/10.1002/ajae.12037>
- Parsons, A. G., & Thompson, A. (2009). Wine recommendations: Who do I believe? *British Food Journal*, 111(9), 1003–1015. <https://doi.org/10.1108/00070700910992899>
- Penagos-Londoño, G. I., Ruiz Moreno, F., Sellers Rubio, R., Del Barrio-García, S., & Casado-Díaz, A. B. (2022). *Consistency of expert product reviews: An application to wine guides*. <https://doi.org/10.36253/wep-12400>
- Perrin, L., & Pagès, J. (2009). Construction of a product space from the ultra-flash profiling method: Application to 10 red wines from the loire valley. *Journal of Sensory Studies*, 24(3), 372–395. <https://doi.org/10.1111/J.1745-459X.2009.00216.X>
- Peynaud, E., & Blouin, J. (1996). *The Taste of Wine: The Art Science of Wine Appreciation*. John Wiley & Sons.
- Pineau, N., Schlich, P., Cordelle, S., Mathonnière, C., Issanchou, S., Imbert, A., Rogeaux, M., Etiévant, P., & Köster, E. (2009). Temporal Dominance of Sensations: Construction of the TDS curves and comparison with time–intensity. *Food Quality and Preference*, 20(6), 450–455.
- Piqueras-Fiszman, B., & Spence, C. (2015). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality and Preference*, 40(PA), 165–179. <https://doi.org/10.1016/J.FOODQUAL.2014.09.013>
- Plaehn, D., & Horne, J. (2008). A regression-based approach for testing significance of “just-about-right” variable penalties. *Food Quality and Preference*, 19(1), 21–32. <https://doi.org/10.1016/J.FOODQUAL.2007.06.003>
- Plott, C. R., & Zeiler, K. (2005). The Willingness to Pay–Willingness to Accept Gap, the “Endowment Effect,” Subject Misconceptions, and Experimental Procedures for Eliciting Valuations. *American Economic Review*, 95(3), 530–545. <https://doi.org/10.1257/0002828054201387>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *The Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- R Core team. (2017). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Rajput, Q., Haider, S., & Ghani, S. (2016). Lexicon-Based Sentiment Analysis of Teachers' Evaluation. *Applied Computational Intelligence and Soft Computing*, 2016, 1–12. <https://doi.org/10.1155/2016/2385429>
- Ramirez, C. D. (2008). Wine Quality, Wine Prices, and the Weather: Is Napa “Different”? *Journal of Wine Economics*, 3(2), 114–131. <https://doi.org/10.1017/S1931436100001164>
- Reuter, J. (2009). Does Advertising Bias Product Reviews? An Analysis of Wine Ratings. *Journal of Wine Economics*, 4(2), 125–151. <https://doi.org/10.1017/S1931436100000766>
- Reuter, J., & Zitzewitz, E. (2006). Do Ads Influence Editors? Advertising and Bias in the Financial Media*. *The Quarterly Journal of Economics*, 121(1), 197–227. <https://doi.org/10.1093/qje/121.1.197>
- Ribeiro, T., Corsi, A., Lockshin, L., Louviere, J., & Loose, S. M. (2020). Analysis of consumer preferences for information and expert opinion using a discrete choice experiment.

- Portuguese Economic Journal*, 19(1), 67–80. <https://doi.org/10.1007/s10258-019-00154-3>
- Rinker, T. (2015). *Dictionary based sentiment analysis that considers valence shifters: Trinker/sentimentr*.
- Rizo, A., Bartu, A., Laguna, L., & Tarrega, A. (2023). Effect of an opinion app on expectations and emotional responses of young consumers toward white wines. *Food Quality and Preference*, 103, 104706. <https://doi.org/10.1016/j.foodqual.2022.104706>
- Robert, P., & Escoufier, Y. (1976). A unifying tool for linear multivariate statistical methods: The RV-coefficient. *Applied Statistics*, 25(3), 257. <https://doi.org/10.2307/2347233>
- Robert Parker Wine Advocate. (n.d.). <https://www.robertparker.com/>
- Roberts, P. W., & Reagans, R. (2007). *Critical Exposure and Price-Quality Relationships for New World Wines in the U.S. Market*. 14.
- Robinson, E., & Higgs, S. (2012). Liking Food Less: The Impact of Social Influence on Food Liking Evaluations in Female Students. *PLOS ONE*, 7(11), e48858. <https://doi.org/10.1371/JOURNAL.PONE.0048858>
- Rodrigues, H., & Parr, W. V. (2019). Contribution of cross-cultural studies to understanding wine appreciation: A review. *Food Research International*, 115, 251–258. <https://doi.org/10.1016/J.FOODRES.2018.09.008>
- Romeo-Arroyo, E., Mora, M., Pazos, N., Deba-Rementeria, S., & Vázquez-Araújo, L. (2022). Effect of product properties and context on the perception of sweetness and liking: A case study with butter cookies. *Journal of Sensory Studies*. <https://doi.org/10.1111/JOSS.12740>
- Runnebaum, R. C., Boulton, R. B., Powell, R. L., & Heymann, H. (2011). Key constituents affecting wine body – an exploratory study. *Journal of Sensory Studies*, 26(1), 62–70. <https://doi.org/10.1111/J.1745-459X.2010.00322.X>
- Sáenz-Navajas, M. P., Alegre, Y., de-la-Fuente, A., Ferreira, V., García, D., Eizaguirre, S., Razquin, I., & Hernández-Orte, P. (2016). Rapid sensory-directed methodology for the selection of high-quality aroma wines. *Journal of the Science of Food and Agriculture*, 96(12), 4250–4262. <https://doi.org/10.1002/JSFA.7636>
- Sáenz-Navajas, M. P., Ballester, J., Pêcher, C., Peyron, D., & Valentin, D. (2013). Sensory drivers of intrinsic quality of red wines: Effect of culture and level of expertise. *Food Research International*, 54(2), 1506–1518. <https://doi.org/10.1016/J.FOODRES.2013.09.048>
- Sáenz-Navajas, M.-P., Ballester, J., Peyron, D., & Valentin, D. (2014). Extrinsic attributes responsible for red wine quality perception: A cross-cultural study between France and Spain. *Food Quality and Preference*, 35, 70–85. <https://doi.org/10.1016/j.foodqual.2014.02.005>
- Sáenz-Navajas, M.-P., Campo, E., Sutan, A., Ballester, J., & Valentin, D. (2013). Perception of wine quality according to extrinsic cues: The case of Burgundy wine consumers. *Food Quality and Preference*, 27(1), 44–53. <https://doi.org/10.1016/j.foodqual.2012.06.006>
- Sauvageot, F., Urdapilleta, I., & Peyron, D. (2006). Within and between variations of texts elicited from nine wine experts. *Food Quality and Preference*, 17(6), 429–444. <https://doi.org/10.1016/J.FOODQUAL.2005.05.007>
- Schamel, G. (2000). *Individual and collective reputations indicators of wine quality*. 22.
- Schamel, G. (2003). International Wine Trade: Analyzing the Value of Reputation and Quality Signals. *Agricultural and Applied Economics Association (AAEA) Conference 2003 July*

- 27-30, Montreal, Canada, No. 376-2016-20554, 16.
<https://doi.org/10.22004/ag.econ.22157>
- Schamel, G. (2004). *An Empirical Analysis of Online Auction Prices for Bordeaux Wine*. 17.
- Schamel, G. (2009). Dynamic Analysis of Brand and Regional Reputation: The Case of Wine. *Journal of Wine Economics*, 4(1), 62–80. <https://doi.org/10.1017/S1931436100000687>
- Schamel, G., & Anderson, K. (2003). Wine Quality and Varietal, Regional and Winery Reputations: Hedonic Prices for Australia and New Zealand. *Economic Record*, 79(246), 357–369. <https://doi.org/10.1111/1475-4932.00109>
- Schamel, G., & Gastaldello, G. (2022). Exploring online community wine ratings: Are more popular wines rated higher? *Book of Abstracts of First Conference of the EuAWE - European Association of Wine Economists, Vila Real, Portugal, May 2022*, 1(1), 156–158.
- Schiefer, J., & Fischer, C. (2008). The gap between wine expert ratings and consumer preferences: Measures, determinants and marketing implications. *International Journal of Wine Business Research*, 20(4), 335–351. <https://doi.org/10.1108/17511060810919443>
- Schifferstein, H. N. J. (1996). Cognitive factors affecting taste intensity judgments. *Food Quality and Preference*, 7(3–4), 167–175. [https://doi.org/10.1016/S0950-3293\(96\)00007-9](https://doi.org/10.1016/S0950-3293(96)00007-9)
- Schnabel, H., & Storchmann, K. (2010). Prices as Quality Signals: Evidence from the Wine Market. *Journal of Agricultural & Food Industrial Organization*, 8(1). <https://doi.org/10.2202/1542-0485.1283>
- Schouteten, J. J., Gellynck, X., & Slabbinck, H. (2021). Do fair trade labels bias consumers' perceptions of food products? A comparison between a central location test and home-use test. *Sustainability (Switzerland)*, 13(3), 1–17. <https://doi.org/10.3390/SU13031384>
- Schroeter, C., Ritchie, J. L., & Rickard, B. J. (2011). Factors that Influence Prices for Cool-Climate Wines: A Hedonic Analysis of the Market for Riesling. *Journal of Agribusiness*, 29(1). <https://ideas.repec.org/a/ags/jloagb/260150.html>
- Schüttler, A., Friedel, M., Jung, R., Rauhut, D., & Darriet, P. (2015). Characterizing aromatic typicality of Riesling wines: Merging volatile compositional and sensory aspects. *Food Research International*, 69, 26–37. <https://doi.org/10.1016/J.FOODRES.2014.12.010>
- Shapin, S. (2012). The Tastes of Wine: Towards a Cultural History. *Rivista Di Estetica*, 51, Article 51. <https://doi.org/10.4000/estetica.1395>
- Shapin, S. (2016a). A taste of science: Making the subjective objective in the California wine world. *Social Studies of Science*, 46(3), 436–460. <https://doi.org/10.1177/0306312716651346>
- Shapin, S. (2016b). A taste of science: Making the subjective objective in the California wine world. *Social Studies of Science*, 46(3), 436–460. <https://doi.org/10.1177/0306312716651346>
- Shapiro, C. (1983). Premiums for High Quality Products as Returns to Reputations. *The Quarterly Journal of Economics*, 98(4), 659–679. <https://doi.org/10.2307/1881782>
- Sharkey, A., Kovacs, B., & Hsu, G. (2022). Expert Critics, Rankings, and Review Aggregators: The Changing Nature of Intermediation and the Rise of Markets with Multiple Intermediaries. *Academy of Management Annals*. <https://doi.org/10.5465/annals.2021.0025>
- Shi, M., Stelick, A., Licker, S., & Dando, R. (2021). On the validity of longitudinal comparisons of central location consumer testing results prior to COVID-19 versus home use testing

- data during the pandemic. *Journal of Food Science*, 86(10), 4668–4677. <https://doi.org/10.1111/1750-3841.15905>
- Shore, M. J., Bukovsky, D. L., Pinheiro, S. G. V., Hancock, B. M., Liptrot, E. M., & Kuhlmeier, V. A. (2023). A survey on the challenges, limitations, and opportunities of online testing of infants and young children during the COVID-19 pandemic: Using our experiences to improve future practices. *Frontiers in Psychology*, 14, 1160203. <https://doi.org/10.3389/fpsyg.2023.1160203>
- Siegrist, M., & Cousin, M.-E. (2009). Expectations influence sensory experience in a wine tasting. *Appetite*, 52(3), 762–765. <https://doi.org/10.1016/j.appet.2009.02.002>
- Simpson, J. (2004). *Selling to Reluctant Drinkers: The British Wine Market, 1860-1914 on JSTOR*. <https://www.jstor.org/stable/3698667?seq=1>
- Singh, A., & Seo, H.-S. (2023). Impacts of Utensil Conditions on Consumer Perception and Acceptance of Food Samples Evaluated under In-Home Testing during the COVID-19 Pandemic. *Foods*, 12(5), Article 5. <https://doi.org/10.3390/foods12050914>
- Smith, B. C. (2019a). Getting More Out of Wine: Wine experts, wine apps and sensory science. *Current Opinion in Food Science*, 27, 123–129. <https://doi.org/10.1016/j.cofs.2019.10.007>
- Smith, B. C. (2019b). Getting More Out of Wine: Wine experts, wine apps and sensory science1. *Current Opinion in Food Science*, S2214799319300165. <https://doi.org/10.1016/j.cofs.2019.10.007>
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- Song, K.-S. (2012). Effects of Wine Selection Attributes on Satisfaction and Repurchase Intention -Focused on the Moderating Effect of Wine Involvement-. *The Journal of the Korea Contents Association*, 12(5), 431–446. <https://doi.org/10.5392/JKCA.2012.12.05.431>
- Sørensen, L. B., Møller, P., Flint, A., Martens, M., & Raben, A. (2003). Effect of sensory perception of foods on appetite and food intake: A review of studies on humans. *International Journal of Obesity*, 27(10), 1152–1166. <https://doi.org/10.1038/SJ.IJO.0802391>
- Soussignan, R., & Schaal, B. (1996). Children's facial responsiveness to odors: Influences of hedonic valence of odor, gender, age, and social presence. *Developmental Psychology*, 32(2), 367–379. <https://doi.org/10.1037/0012-1649.32.2.367>
- Spee, B. T. M., Pelowski, M., Arato, J., Mikuni, J., Tran, U. S., Eisenegger, C., & Leder, H. (2022). Social reputation influences on liking and willingness-to-pay for artworks: A multimethod design investigating choice behavior along with physiological measures and motivational factors. *PLOS ONE*, 17(4), e0266020. <https://doi.org/10.1371/journal.pone.0266020>
- Spence, C., & Wang, Q. J. (2018). What does the term 'complexity' mean in the world of wine? *International Journal of Gastronomy and Food Science*, 14, 45–54.
- Stanco, M., Link to external site, this link will open in a new window, Lerro, M., Link to external site, this link will open in a new window, Marotta, G., & Link to external site, this link will open in a new window. (2020). Consumers' Preferences for Wine Attributes: A Best-Worst Scaling Analysis. *Sustainability*, 12(7), 2819. <https://doi.org/10.3390/su12072819>

- Steenkamp, J.-B. E. M. (1990). Conceptual model of the quality perception process. *Journal of Business Research*, 21(4), 309–333. [https://doi.org/10.1016/0148-2963\(90\)90019-A](https://doi.org/10.1016/0148-2963(90)90019-A)
- Steinberger, M. (2008). Every one a critic the future of wine writing. *World of Fine Wine*, 18, 130–135.
- Stenger, T. (2008). Les processus de décision d'achat de vin par Internet: Entre recherche d'information et prescription en ligne. *Décisions Marketing*, 24.
- Stenger, T. (2017). La prescription dans le commerce en ligne: Proposition d'un cadre conceptuel issu de la vente de vin par Internet. *Revue Française du Marketing*, 27.
- Stigler, G. J. (1961a). The Economics of Information. *Journal of Political Economy*, 69(3), 213–225. <https://doi.org/10.1086/258464>
- Stigler, G. J. (1961b). The Economics of Information. *Journal of Political Economy*, 69(3), 213–225.
- Stone, H., & Sidel, J. L. (2003). Sensory Evaluation | Descriptive Analysis. In B. Caballero (Ed.), *Encyclopedia of Food Sciences and Nutrition (Second Edition)* (pp. 5152–5161). Academic Press. <https://doi.org/10.1016/B0-12-227055-X/01065-8>
- Stone, Herbert., & Sidel, J. L. (1993). *Sensory evaluation practices*. Academic Press.
- Storchmann, K. (2011). Wine Economics: Emergence, Developments, Topics. *Agrekon*, 50(3), 1–28. <https://doi.org/10.1080/03031853.2011.617856>
- Storchmann, K. (2012). Wine Economics. *Journal of Wine Economics*, 7(1), 1–33. <https://doi.org/10.1017/jwe.2012.8>
- Stuen, E. T., Miller, J. R., & Stone, R. W. (2015). An Analysis of Wine Critic Consensus: A Study of Washington and California Wines. *Journal of Wine Economics*, 10(1), 47–61. <https://doi.org/10.1017/jwe.2015.3>
- Teil, G. (2001). La production du jugement esthétique sur les vins par la critique vinicole. *Sociologie du Travail*, 43(1), 67–89. [https://doi.org/10.1016/S0038-0296\(01\)01122-0](https://doi.org/10.1016/S0038-0296(01)01122-0)
- Teil, G. (2021). Wine Diversity: Paradox or Economic Innovation? *Journal of Cultural Analysis and Social Change*, 6(2), 13. <https://doi.org/10.20897/jcasc/11451>
- ten Kleij, F., & Musters, P. A. D. (2003). Text analysis of open-ended survey responses: A complementary method to preference mapping. *Food Quality and Preference*, 14(1), 43–52. [https://doi.org/10.1016/S0950-3293\(02\)00011-3](https://doi.org/10.1016/S0950-3293(02)00011-3)
- Thach, L., & Chang, K. (2015). 2015 Survey of American Wine Consumer Preferences. Wine Business. <https://www.winebusiness.com/news/article/160722/>
- Thach, L., & Olsen, J. (2015). Profiling the high frequency wine consumer by price segmentation in the US market. *Wine Economics and Policy*, 4(1), 53–59. <https://doi.org/10.1016/J.WEP.2015.04.001>
- Thode, S. F., Taylor, L. W., & Maskulka, J. M. (2002). Information Asymmetries in the Pricing of Fine Wines. *International Journal of Wine Marketing*, 14(1), 5–13. <https://doi.org/10.1108/eb008731>
- Thomas, A., Visalli, M., Cordelle, S., & Schlich, P. (2015). Temporal Drivers of Liking. *Food Quality and Preference*, 40, 365–375.
- Thrane, C. (2019). Expert reviews, peer recommendations and buying red wine: Experimental evidence. *Journal of Wine Research*, 30(2), 166–177. <https://doi.org/10.1080/09571264.2019.1614548>
- Tian, L., Lai, C., & Moore, J. D. (2018). *Polarity and Intensity: The Two Aspects of Sentiment Analysis*. 40–47. <https://doi.org/10.48550/arxiv.1807.01466>

- Torraco, R. J. (2005). Writing Integrative Literature Reviews: Guidelines and Examples. *Human Resource Development Review*, 4(3), 356–367. <https://doi.org/10.1177/1534484305278283>
- Torraco, D. D. (2021). Novel Techniques to Measure the Sensory, Emotional, and Physiological Responses of Consumers toward Foods. *Foods*, 10(11), Article 11. <https://doi.org/10.3390/foods10112620>
- Trendel, O., & Werle, C. O. C. (2016). Distinguishing the affective and cognitive bases of implicit attitudes to improve prediction of food choices. *Appetite*, 104, 33–43. <https://doi.org/10.1016/J.APPET.2015.10.005>
- Urdapilleta, I., Parr, W., Dacremont, C., & Green, J. (2011). Semantic and perceptive organisation of Sauvignon blanc wine characteristics: Influence of expertise. *Food Quality and Preference*, 22(1), 119–128. <https://doi.org/10.1016/J.FOODQUAL.2010.08.005>
- Veale, R. (2008). Sensing or knowing?: Investigating the influence of knowledge and self-confidence on consumer beliefs regarding the effect of extrinsic cues on wine quality. *International Journal of Wine Business Research*, 20(4), 352–366. <https://doi.org/10.1108/1751106081091452>
- Vecchio, R., Lisanti, M. T., Caracciolo, F., Cembalo, L., Gambuti, A., Moio, L., Siani, T., Marotta, G., Nazzaro, C., & Piombino, P. (2019). The role of production process and information on quality expectations and perceptions of sparkling wines. *Journal of the Science of Food and Agriculture*, 99(1), 124–135. <https://doi.org/10.1002/jsfa.9153>
- Verdú Jover, A. J., Lloréns Montes, F. J., & Fuentes Fuentes, M. del M. (2004). Measuring perceptions of quality in food products: The case of red wine. *Food Quality and Preference*, 15(5), 453–469. <https://doi.org/10.1016/j.foodqual.2003.08.002>
- Vidal, L., Ares, G., Machín, L., & Jaeger, S. R. (2015). Using Twitter data for food-related consumer research: A case study on “what people say when tweeting about different eating situations.” *Food Quality and Preference*, 45, 58–69. <https://doi.org/10.1016/J.FOODQUAL.2015.05.006>
- Vidal, L., Giménez, A., Medina, K., Boido, E., & Ares, G. (2015). How do consumers describe wine astringency? *Food Research International*, 78, 321–326. <https://doi.org/10.1016/J.FOODRES.2015.09.025>
- Vieira, P. C. (2016). T-Test with Likert Scale Variables. *SSRN Electronic Journal*. <https://doi.org/10.2139/SSRN.2770035>
- Villas-Boas, S. B., Bonnet, C., & Hilger, J. (2021a). Random Utility Models, Wine and Experts. *American Journal of Agricultural Economics*, 103(2), 663–681. <https://doi.org/10.1111/ajae.12129>
- Villas-Boas, S. B., Bonnet, C., & Hilger, J. (2021b). Random Utility Models, Wine and Experts. *American Journal of Agricultural Economics*, 103(2), 663–681. <https://doi.org/10.1111/ajae.12129>
- Vinino. (n.d.). <https://www.vivino.com>
- Vinovae. (n.d.). <https://www.vinovae.com>
- Visalli, M. (2022). A dataset about hedonic valence of descriptive sensory terms used to characterize red wines. *Mendeley Data*. <https://doi.org/10.17632/c7v4zj8vph.1>
- Visalli, M., Dubois, M., Schlich, P., Ric, F., Cardebat, J.-M., & Georgantzis, N. (2022a). A dataset on Bordeaux and Rioja red wines sensory and affective perception collected from French and Spanish consumers at home and international wine students in lab. *Data in Brief*.

- Visalli, M., Dubois, M., Schlich, P., Ric, F., Cardebat, J.-M., & Georgantzis, N. (2022b). Relevance of Free-Comment to describe wine temporal sensory perception: An application with panels varying in culture and expertise. *Food Quality and Preference*, 104785. <https://doi.org/10.1016/J.FOODQUAL.2022.104785>
- Visalli, M., Mahieu, B., Thomas, A., & Schlich, P. (2020a). Automated sentiment analysis of Free-Comment: An indirect liking measurement? *Food Quality and Preference*, 82. <https://doi.org/10.1016/j.foodqual.2020.103888>
- Visalli, M., Mahieu, B., Thomas, A., & Schlich, P. (2020b). Concurrent vs. Retrospective temporal data collection: Attack-evolution-finish as a simplification of Temporal Dominance of Sensations? *Food Quality and Preference*, 85, 103956. <https://doi.org/10.1016/J.FOODQUAL.2020.103956>
- Wagner, S., Issanchou, S., Chabanet, C., Marlier, L., Schaal, B., & Monnery-Patris, S. (2013). Infants' hedonic responsiveness to food odours: A longitudinal study during and after weaning (8, 12 and 22 months). *Flavour* 2:1, 2(1), 1–12. <https://doi.org/10.1186/2044-7248-2-19>
- Waibel, D., Peetz, T., & Meier, F. (2021). Valuation Constellations. *Valuation Studies*, 8, 33–66. <https://doi.org/10.3384/VS.2001-5992.2021.8.1.33-66>
- Wang, Q. J., Niaura, T., & Kantono, K. (2021). How does wine ageing influence perceived complexity? Temporal-Choose-All-That-Apply (TCATA) reveals temporal drivers of complexity in experts and novices. *Food Quality and Preference*, 92, 104230. <https://doi.org/10.1016/J.FOODQUAL.2021.104230>
- Werle, C. O. C., Trendel, O., & Ardito, G. (2013). Unhealthy food is not tastier for everybody: The “ healthy=tasty” French intuition. *Food Quality and Preference*, 28(1), 116–121. <https://doi.org/10.1016/J.FOODQUAL.2012.07.007>
- Whittemore, R., & Knafelz, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52(5), 546–553. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>
- Williamson, P. O., Lockshin, L., Francis, I. L., & Mueller Loose, S. (2016). Influencing consumer choice: Short and medium term effect of country of origin information on wine choice. *Food Quality and Preference*, 51, 89–99. <https://doi.org/10.1016/j.foodqual.2016.02.018>
- Wine & Spirit Education Trust qualification. (n.d.). <https://www.wsetglobal.com/qualifications/wset-level-2-award-in-wines/>
- Winfrey, J. A., & McCluskey, J. J. (2005). Collective Reputation and Quality. *American Journal of Agricultural Economics*, 87(1), 206–213. <https://doi.org/Article>
- Wittwer, G., Berger, N., & Anderson, K. (2003). A model of the world's wine markets. *Economic Modelling*, 20(3), 487–506. [https://doi.org/10.1016/S0264-9993\(01\)00095-5](https://doi.org/10.1016/S0264-9993(01)00095-5)
- Worch, T. (2013). PrefMFA, a solution taking the best of both internal and external preference mapping techniques. *Food Quality and Preference*, 30(2), 180–191. <https://doi.org/10.1016/J.FOODQUAL.2013.05.009>
- Worch, T., Lê, S., Punter, P., & Pagès, J. (2013). Ideal Profile Method (IPM): The ins and outs. *Food Quality and Preference*, 28(1), 45–59. <https://doi.org/10.1016/J.FOODQUAL.2012.08.001>
- Yamamoto, T., Mizuta, H., & Ueji, K. (2021). Analysis of facial expressions in response to basic taste stimuli using artificial intelligence to predict perceived hedonic ratings. *PLOS ONE*, 16(5), e0250928. <https://doi.org/10.1371/JOURNAL.PONE.0250928>
- Yaniv, I. (2004). Receiving other people's advice: Influence and benefit. *Organizational Behavior and Human Decision Processes*, 93(1), 1–13. <https://doi.org/10.1016/j.obhdp.2003.08.002>

- Yoon, C., Cole, C. A., & Lee, M. P. (2009). Consumer decision making and aging: Current knowledge and future directions. *Journal of Consumer Psychology*, 19(1), 2–16. <https://doi.org/10.1016/j.jcps.2008.12.002>
- Yq Low, J., Janin, N., Traill, R. M., & Hort, J. (2022). The who, what, where, when, why and how of measuring emotional response to food. A systematic review. *Food Quality and Preference*, 100, 104607. <https://doi.org/10.1016/j.foodqual.2022.104607>
- Yu, J., Bouamra-Mechemache, Z., & Zago, A. (2018). What is in a Name? Information, Heterogeneity, and Quality in a Theory of Nested Names. *American Journal of Agricultural Economics*, 100(1), 286–310. <https://doi.org/10.1093/ajae/aax067>
- Yuan, G., Han, J., Wang, Y., liang, H., & Li, G. (2019). The product demand model driven by consumer's information perception and quality perception. *Physica A: Statistical Mechanics and Its Applications*, 535, 122352. <https://doi.org/10.1016/j.physa.2019.122352>
- Zanetta, L. D., Umebara, M. T. C., Costa, J. P., Takeda, D. K., & Da Cunha, D. T. (2020). Hedonic, emotional and willingness-to-pay response to beers of a different type in Brazil. *British Food Journal*, 123(1), 87–107. <https://doi.org/10.1108/BFJ-02-2020-0137>
- Zeithaml, V. A. (1988). Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence. *The Journal of Marketing*, 52(3), 2–22. <https://doi.org/10.2307/1251446>
- Zeithammer, R., & Thomadsen, R. (2013). Vertical Differentiation with Variety-Seeking Consumers. *Management Science*, 59(2), 390–401. <https://doi.org/10.1287/mnsc.1120.1585>
- Zhang, C., Antoun, C., Yan, H. Y., & Conrad, F. G. (2020). Professional Respondents in Opt-in Online Panels: What Do We Really Know? *Social Science Computer Review*, 38(6), 703–719. <https://doi.org/10.1177/0894439319845102>
- Zhang, Z., Ye, Q., Law, R., & Li, Y. (2010). The impact of e-word-of-mouth on the online popularity of restaurants: A comparison of consumer reviews and editor reviews. *International Journal of Hospitality Management*, 29(4), 694–700. <https://doi.org/10.1016/j.ijhm.2010.02.002>

References – Chapter II

- Addor, F., and A. Grazioli. 2002. “Geographical Indications beyond Wines and Spirits.” *The Journal of World Intellectual Property* 5(6):865–897.
- Agdomar, M. 2007. “Removing the Greek from Feta and Adding Korbelt to Champagne: The Paradox of Geographical Indications in International Law.” *Fordham Intellectual Property, Media & Entertainment Law Journal*. Available at: <https://www.semanticscholar.org/paper/Removing-the-Greek-from-Feta-and-Adding-Korbelt-to-Agdomar/8336765a6901a149ece4045e0ae9b96b7d03cafc> [Accessed August 14, 2023].
- Akerlof, G.A. 1970. “The Market for ‘Lemons’: Quality Uncertainty and the Market Mechanism.” *The Quarterly Journal of Economics* 84(3):488–500.
- Andersen, S., G.W. Harrison, M.I. Lau, and E.E. Rutström. 2006. “Elicitation using multiple price list formats.” *Experimental Economics* 9(4):383–405.
- Asioli, D., A. Mignani, and F. Alfnes. 2021. “Quick and easy? Respondent evaluations of the Becker–DeGroot–Marschak and multiple price list valuation mechanisms.” *Agribusiness* 37(2):215–234.

- Ay, J.-S. 2021. "The Informational Content of Geographical Indications." *American Journal of Agricultural Economics* 103(2):523–542.
- Bagwell, K., and M.H. Riordan. 1991. "High and Declining Prices Signal Product Quality." *The American Economic Review* 81(1):224–239.
- Bonroy, O., and C. Constantatos. 2014. "On the Economics of Labels: How Their Introduction Affects the Functioning of Markets and the Welfare of All Participants." *American Journal of Agricultural Economics*:aau088.
- Bonroy, O., and C. Constantatos. 2008. "On the use of labels in credence goods markets." *Journal of Regulatory Economics* 33(3):237–252.
- Cardoso, V.A., A.E.B.S. Lourenzani, M.M. Caldas, C.H.C. Bernardo, and R. Bernardo. 2022. "The benefits and barriers of geographical indications to producers: A review." *Renewable Agriculture and Food Systems* 37(6):707–719.
- Castriota, S., and M. Delmastro. 2015. "The Economics of Collective Reputation: Evidence from the Wine Industry." *American Journal of Agricultural Economics* 97(2):469–489.
- Cei, L., G. Stefani, E. Defrancesco, and G.V. Lombardi. 2018. "Geographical indications: A first assessment of the impact on rural development in Italian NUTS3 regions." *Land Use Policy* 75:620–630.
- Chilla, T., B. Fink, R. Balling, S. Reitmeier, and K. Schober. 2020. "The EU Food Label 'Protected Geographical Indication': Economic Implications and Their Spatial Dimension." *Sustainability* 12(14):5503.
- Costanigro, M., C.A. Bond, and J.J. McCluskey. 2012. "Reputation Leaders, Quality Laggards: Incentive Structure in Markets with Both Private and Collective Reputations." *Journal of Agricultural Economics* 63(2):245–264.
- Costanigro, M., J.J. McCluskey, and C. Goemans. 2010. "The Economics of Nested Names: Name Specificity, Reputations, and Price Premia." *American Journal of Agricultural Economics* 92(5):1339–1350.
- Costanigro, M., G. Scozzafava, and L. Casini. 2019. "Vertical differentiation via multi-tier geographical indications and the consumer perception of quality: The case of Chianti wines." *Food Policy* 83:246–259.
- Curzi, D., and M. Huysmans. 2022. "The Impact of Protecting EU Geographical Indications in Trade Agreements." *American Journal of Agricultural Economics* 104(1):364–384.
- Deselnicu, O.C., M. Costanigro, D.M. Souza-Monteiro, and D.T. McFadden. 2013. "A Meta-Analysis of Geographical Indication Food Valuation Studies: What Drives the Premium for Origin-Based Labels?" *Journal of Agricultural and Resource Economics* 38(2):204–219.
- European Commission and Directorate-General for Agriculture and Rural Development. 2021. *Study on economic value of EU quality schemes, geographical indications (GIs) and traditional specialities guaranteed (TSGs) : final report*. Publications Office.
- Frantz, F. 2016. "Twenty Years of TRIPS, Twenty Years of Debate: The Extension of High Level Protection of Geographical Indications – Arguments, State of Negotiations and Prospects." *Annual Survey of International & Comparative Law* 21(1):93.
- Friberg, R., and E. Grönqvist. 2012. "Do Expert Reviews Affect the Demand for Wine?" *American Economic Journal: Applied Economics* 4(1):193–211.
- Frøst, M.B., and A.C. Noble. 2002. "Preliminary study of the effect of knowledge and sensory expertise on liking for red wines." *American Journal of Enology and Viticulture* 53(4):275–284.

- Glogoveţan, A.-I., D.-C. Dabija, M. Fiore, and C.B. Pocol. 2022. "Consumer Perception and Understanding of European Union Quality Schemes: A Systematic Literature Review." *Sustainability* 14(3):1667.
- Goebel, B., and M. Groeschl. 2014. "The Long Road to Resolving Conflicts between Trademarks and Geographical Indications." *The Trademark Reporter* 104:829.
- Gustafson, C.R., T.J. Lybbert, and D.A. Sumner. 2016. "Consumer knowledge affects valuation of product attributes: Experimental results for wine." *Journal of Behavioral and Experimental Economics* 65(Supplement C):85–94.
- Haeck, C., G. Meloni, and J. Swinnen. 2019. "The Value of Terroir: A Historical Analysis of the Bordeaux and Champagne Geographical Indications." *Applied Economic Perspectives and Policy* 41(4):598–619.
- Hilger, J., G. Rafert, and S. Villas-Boas. 2010. "Expert Opinion and the Demand for Experience Goods: An Experimental Approach in the Retail Wine Market." *Review of Economics and Statistics* 93(4):1289–1296.
- Ilbert, H., and M. Petit. 2009. "Are Geographical Indications a Valid Property Right? Global Trends and Challenges." *Development Policy Review* 27(5):503–528.
- Klain, T.J., J.L. Lusk, G.T. Tonsor, and T.C. Schroeder. 2013. "An experimental approach to valuing information." *Agricultural Economics*:n/a-n/a.
- Livat, F., J.M. Alston, and J.-M. Cardebat. 2019. "Do denominations of origin provide useful quality signals? The case of Bordeaux wines." *Economic Modelling* 81:518–532.
- Lockshin, L., W. Jarvis, F. d’Hauteville, and J.-P. Perrouty. 2006. "Using simulations from discrete choice experiments to measure consumer sensitivity to brand, region, price, and awards in wine choice." *Food Quality and Preference* 17(3–4):166–178.
- López-Bayón, S., M. Fernández-Barcala, and M. González-Díaz. 2020. "In search of agri-food quality for wine: Is it enough to join a geographical indication?" *Agribusiness* 36(4):568–590.
- Meloni, G., and J. Swinnen. 2018. "Trade and terroir. The political economy of the world’s first geographical indications." *Food Policy* 81:1–20.
- Menapace, L., G. Colson, C. Grebitus, and M. Facendola. 2011. "Consumers’ preferences for geographical origin labels: evidence from the Canadian olive oil market." *European Review of Agricultural Economics*. Available at: <http://erae.oxfordjournals.org/content/early/2011/01/06/erae.jbq051.abstract> [Accessed April 7, 2011].
- Menapace, L., and G. Moschini. 2012. "Quality certification by geographical indications, trademarks and firm reputation." *European Review of Agricultural Economics* 39(4):539–566.
- Milano, M.Z., and A.A. Cazella. 2021. "Environmental effects of geographical indications and their influential factors: A review of the empirical evidence." *Current Research in Environmental Sustainability* 3:100096.
- Monten, L. 2005. "Geographical Indications of Origin: Should They Be Protected and Why - An Analysis of the Issue from the U.S. and EU Perspectives." *Santa Clara Computer & High Technology Law Journal* 22:315.
- Moschini, G., L. Menapace, and D. Pick. 2008. "Geographical Indications and the Competitive Provision of Quality in Agricultural Markets." *American Journal of Agricultural Economics* 90(3):794–812.
- Mussa, M., and S. Rosen. 1978. "Monopoly and product quality." *Journal of Economic Theory* 18(2):301–317.

- Nelson, P. 1970. "Information and Consumer Behavior." *Journal of Political Economy* 78(2):311–329.
- Raustiala, K., and S.R. Munzer. 2007. "The Global Struggle over Geographic Indications." *European Journal of International Law* 18(2):337–365.
- Sáenz-Navajas, M.-P., E. Campo, A. Sutan, J. Ballester, and D. Valentin. 2013. "Perception of wine quality according to extrinsic cues: The case of Burgundy wine consumers." *Food Quality and Preference* 27(1):44–53.
- Schnabel, H., and K. Storchmann. 2010. "Prices as Quality Signals: Evidence from the Wine Market." *Journal of Agricultural & Food Industrial Organization* 8(1). Available at: <https://www.degruyter.com/document/doi/10.2202/1542-0485.1283/html> [Accessed August 4, 2023].
- Shapiro, C. 1983. "Premiums for High Quality Products as Returns to Reputations." *The Quarterly Journal of Economics* 98(4):659–679.
- Slade, P., J.D. Michler, and A. Josephson. 2019. "Foreign Geographical Indications, Consumer Preferences, and the Domestic Market for Cheese." *Applied Economic Perspectives and Policy* 41(3):370–390.
- Song, X., and X. Wang. 2022. "Fair Use of Geographical Indications: Another Look at the Spirited Debate on the Level of Protection." *World Trade Review* 21(5):597–618.
- Stanco, M., M. Lerro, and G. Marotta. 2020. "Consumers' Preferences for Wine Attributes: A Best-Worst Scaling Analysis." *Sustainability* 12(7):2819.
- Stasi, A., G. Nardone, R. Viscecchia, and A. Seccia. 2011. "Italian wine demand and differentiation effect of geographical indications." *International Journal of Wine Business Research* 23(1):49–61.
- Steenkamp, J.-B.E.M. 1990. "Conceptual model of the quality perception process." *Journal of Business Research* 21(4):309–333.
- Stigler, G.J. 1961. "The Economics of Information." *Journal of Political Economy* 69(3):213–225.
- Török, Á., L. Jantyk, Z.M. Maró, and H.V.J. Moir. 2020. "Understanding the Real-World Impact of Geographical Indications: A Critical Review of the Empirical Economic Literature." *Sustainability* 12(22):9434.
- Vandecandelaere, E., C. Teyssier, D. Barjolle, S. Fournier, O. Beucherie, and P. Jeanneaux. 2020. "Strengthening sustainable food systems through geographical indications: evidence from 9 worldwide case studies." *Journal of Sustainability Research* 2(4):1–37.
- Villas-Boas, S.B., C. Bonnet, and J. Hilger. 2021. "Random Utility Models, Wine and Experts." *American Journal of Agricultural Economics* 103(2):663–681.
- Winfree, J.A., and J.J. McCluskey. 2005. "Collective Reputation and Quality." *American Journal of Agricultural Economics* 87(1):206–213.
- Yu, J., Z. Bouamra-Mechemache, and A. Zago. 2018. "What is in a Name? Information, Heterogeneity, and Quality in a Theory of Nested Names." *American Journal of Agricultural Economics* 100(1):286–310.
- Zago, A.M., and D. Pick. 2004. "Labeling Policies in Food Markets: Private Incentives, Public Intervention, and Welfare Effects." *Journal of Agricultural and Resource Economics* 29(01).
- Zeithaml, V.A. 1988. "Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence." *The Journal of Marketing* 52(3):2–22.
- Zeithammer, R., and R. Thomadsen. 2013. "Vertical Differentiation with Variety-Seeking Consumers." *Management Science* 59(2):390–4

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Appendices - Published papers directly related to the thesis

Appendix A - A Dataset on Bordeaux and Rioja Red Wines Sensory and Affective Perception Collected from French and Spanish Consumers at Home and International Wine Students in Lab

This data paper, co-written with Michel Visalli, Pascal Schlich, François Ric, Jean-Marie Cardebat and Nikolaos Georgantzis is based on the results of the experiment presented in chapter IV has been published in Data in Brief: Visalli M, Dubois M, Schlich P, Ric F, Cardebat JM, Georgantzis N. (2022) *A dataset on the sensory and affective perception of Bordeaux and Rioja red wines collected from French and Spanish consumers at home and international wine students in the lab*. Data in Brief, 46:108873. <https://doi.org/10.1016/j.dib.2022.108873>

Keywords

Sensory analysis, Liking, Free-Comment, Temporal method, Willingness to pay, Cross-cultural, Impact of information, Perceived quality, Incentive-compatible experiment, Stated and revealed preferences

Abstract

This article describes a dataset providing temporal sensory descriptions and affective answers for red wines: two Bordeaux and two Riojas. The wines were tasted at home by French (FR, n=106) and Spanish (SP, n=98) consumers and in the lab by wine students (WC, n=47). Standardized information was displayed on the samples (country and region of origin, name, producer, vintage, alcohol content). The FR and SP panels were split into three groups, the first having no rating information, the second having expert rating information (based on *Wine Advocate* ratings), and the third having consumer rating information (based on online Vivino reviews). The participants first rated their expected liking for the four wines. Then, for each wine sample, they had (in order) to taste the sample while being video recorded, rate their liking, temporally describe the sequence of sensations they perceived using Free-Comment Attack-Evolution-Finish, answer several questions about familiarity and quality perception, and declare their willingness to pay (reserve price). Then, they had to rank the four wines according to their quality. General questions about wine involvement, subjective wine knowledge, valuation behaviour, purchasing, and consumption patterns were asked. Finally, an auction was resolved: participants declaring a reserve price greater than the drawn price won a bottle. The data were used to assess the influence of culture and expertise on temporal sensory evaluations in an article entitled "Using Free-Comment to investigate expertise and cultural differences in wine sensory description". The data can be reused by researchers interested in

studying the impact of external information on preferences and choices or investigating the sensory drivers of liking.

Specifications table

Subject	Food science
Specific subject area	Wines
Type of data	Tables Questionnaire Figures
How the data were acquired	Sensory data were acquired by recruiting two panels of consumers (98 Spanish, 106 French) at home through Qualtrics and one panel of wine students (47 international students) using a web application.
Data format	Tables in raw format (XLSX file)
Description of data collection	Three panels tasted two Bordeaux and two Rioja red wines. Standardized information was displayed on the samples (origin, designation, producer, vintage, alcohol content). The French and Spanish panels were split into three groups, the first having no rating information, the second and third having additional external information, respectively expert rating and consumer rating for the evaluated sample. The participants first rated their expected liking for the four wines on a 7-point scale. Then, for each wine sample, they had (in order) to taste the sample while being video recorded; rate their liking on a 7-point scale; temporally describe the sensations they perceived using Free-Comment Attack-Evolution-Finish; answer several questions (about their familiarity, perception of quality, perception of others' liking); and declare their willingness to pay (reserve price). Then, they had to rank the four wines according to their quality. General questions about their behaviour towards wines were asked (interest, choice, knowledge, purchases, consumption).
Data source location	<ul style="list-style-type: none"> • City/Town/Region: Dijon (students), everywhere in France or Spain (consumers) • Country: France, Spain
Data accessibility	Repository name: Mendeley data Data identification number: 10.17632/f9wtj7s9b8.1 Direct URL to data: https://data.mendeley.com/datasets/f9wtj7s9b8/1
Related research article	M. Visalli, M. Dubois, P. Schlich, F. Ric, J.M. Cardebat, N. Georgantzis. Using Free-Comment to investigate expertise and cultural differences in wine sensory description. Food Quality and Preference.

Value of the data

These data are useful because they provide information about expectations, temporal sensory perception, willingness to pay, and preferences for two Bordeaux and two Rioja red wines tasted in two settings (at home and in the lab) by three panels varying in culture and expertise.

Researchers interested in comparing the influence of peer and expert ratings on consumers' answers can benefit from these data.

Researchers can also use these data to study the influence of expertise and culture on sensory perception and preferences.

Researchers can relate the preference scores obtained with a sensory evaluation with those available in online wine reviews.

Product developers can relate the findings on temporal perception and preferences to investigate drivers of liking for red wines.

Product developers can reproduce the original protocol that allowed us to collect temporal descriptions from consumers at home in ecological conditions.

Data description

The dataset is provided as an Excel file (.xlsx) including five sheets:

Participants provides information about the participants collected during the screening and in the questionnaire.

"Panel" is the panel to which the participant has been assigned (WC: wine connoisseurs, FR: French consumers, SP: Spanish consumers).

"Language" is the language of the participant. "Participant" is the unique anonymized identifier of the participant.

"Age" is the age range of the participant (18-29, 30-40, 41-50, 51-60, 61-70, 71 and older).

"Gender" is the gender of the participant (Male, Female, or Other).

"PCS" is the socioprofessional category of the participant (Employed, Unemployed, Student, Retired, Other).

"Diploma" is the higher level of diploma obtained by the participant (None, High school, Vocational school, Bachelor's degree, Master's degree, PhD, Other).

"Income" is the income-related quality of life estimated by the participant (Living comfortably on present income, Coping on present income, Finding it difficult on present income, Finding it very difficult on present income, I prefer not to answer).

“Group” is the group of the participant (No rating information, Consumer rating information, Expert ratings information).

“QuestionnaireBeginDate” is the date (YYYY-MM:DD hh:mm:ss) when the participant started the study (first connection).

“QuestionnaireEndDate” is the date (YYYY-MM:DD hh:mm:ss) when the participant ended the study.

“PCI1”, “PCI2” and “PCI3” are related to product category involvement (Bruwer et al., 2014).

“PC1” is the answer to the question “Wine interests me a lot” rated on a 5-point Likert scale (1: strongly disagree, 2: disagree, 3: neither agree nor disagree, 4: agree, 5: strongly agree).

“PCI2” is the answer to the question “I often discuss wine with other people” rated on a 5-point Likert scale (same values as PCI1).

“PCI3” is the answer to the question “It gives me pleasure to shop for wine” rated on a 5-point Likert scale (same values as PCI1).

“SWK1”, “SWK2”, “SWK3” and “SWK4” are related to subjective wine knowledge (Mueller Loose et al., 2008).

“SWK1” is the answer to the question “I feel confident in my ability to choose wine” (Kapferer & Laurent, 1993) rated on a 5-point Likert scale (same values as PCI1).

“SWK2” is the answer to the question “I know more about wine than many other people” rated on a 5-point Likert scale (same values as PCI1).

“SWK3” is the answer to the question “I would describe myself as being very knowledgeable about wine” rated on a 5-point Likert scale (same values as PCI1).

“SWK4” is the answer to the question “Did you already follow a wine education course?” (1: no, 2: yes, without certification, 3: yes, with certification).

“CP1” and “CP2” are related to consumption patterns (Bruwer & Buller, 2013).

“CP1” is the answer to the question “How often do you consume wine at home?” (1: daily, 2, at least once a week, 3: at least once a month, 4: less than once a month, 5: never).

“CP2” is the answer to the question “How often do you consume wine outside of home (restaurant, bar, club, etc.)?” (same values as CP1).

“AC1” is the answer to the question “If you read this sentence correctly, please answer ‘strongly disagree’” (Lunardo et al., 2021) rated on a 5-point Likert scale (same values as PCI1, expected answer=1).

“VB1”, “VB2”, “VB3” and “VB4” are related to valuation behaviour (Thach & Chang, 2015).

“VB1” is the answer to the question “I use wine apps to help me decide which wine to buy” (1: never, 2: once in a while, 3: often, 4: always).

“VB2” is the answer to the question “I use wine professional expert ratings (wine reviews, point scores, medals, and awards) to help me decide which wine to buy” (same values as VB1).

“VB3” is the answer to the question “I often seek advice from other people before purchasing a wine” rated on a 5-point Likert scale (same values as PCI1).

“VB4_1” to “VB4_8” are the answers to the question “Whose advice do you trust most when selecting a wine?” (VB4_1: Friends, VB4_2: Family members, VB4_3: Colleagues, VB4_4: Sommelier, VB4_5: Professional Wine Expert, VB4_6: Wine blogger or influencer, VB4_7: Wine Guide or Magazine, VB4_8: Only my own). Answers are 1 if the option was checked and 0 otherwise.

“PP1”, “PP2”, “PP3”, and “PP4” are related to purchasing patterns (Thach & Olsen, 2015).

“PP1_1” to “PP1_7” are the answers to the question “Where do you buy your wine?” (PP1_1: I do not buy wine, PP1_2: Supermarket, PP1_3: Wine store, PP1_4: Online, PP1_5: Directly from the winemaker, PP1_6: Restaurants and bars, PP1_7: Other). Answers are 1 if the option was checked and 0 otherwise.

“PP2” is the answer to the question “For a 75-cl bottle of red wine, you spend on average - for informal drinking” (1: I do not buy wine, 2: less than 5€, 3: 5-10€, 4: 11-20€, 5: 21-30€, 6:30€ and more).

“PP3” is the answer to the question “For a 75-cl bottle of red wine, you spend on average - for a formal occasion or a gift” (same values as PP2).

“PP4” is the answer to the question “How much does your household spend on wine monthly?” (1: 0€, 2: 50€ or less, 3: 51-100€, 4: 101-150€, 5: 151€ or more).

Qualities provides information about the subjective qualities evaluated for each wine by the participants.

“Panel” and “Participant” are the same as in the “Participants” tab.

“Wine” is the code of the evaluated wine.

“EL1” is the answer to the question “How much do you think you will like this wine?” (Danner et al., 2020), rated on a 7-point hedonic scale (1: dislike extremely, 2: dislike moderately, 3: dislike slightly, 4: neither like nor dislike, 5: like slightly, 6: like moderately, 7: like extremely).

“SL1” is the answer to the question “How much did you like this wine?” (Danner et al., 2020), rated on a 7-point hedonic scale (same values as EL1).

“QE1” is the answer to the question “I think this wine is high quality”, rated on a 5-point Likert scale (same values as PCI1).

“QE2” is the answer to the question “Most people would like this wine”, rated on a 5-point Likert scale (same values as PCI1).

“F1” is the answer to the question “This wine profile is familiar to me”, rated on a 5-point Likert scale (same values as PCI1).

“RQ1” is the answer to the question “Rank the 4 wines by clicking on ‘click to choose a wine’ and then giving each wine a rank. #1=most qualitative wine, #4=least qualitative wine”.

“BDM1” is the answer (reserve price) to the question “What is the maximum price (in €uros) you are willing to pay for a 75cl bottle of the wine you just tasted?” (Lohéac & Issanchou, 2007).

TemporalPerception provides information about temporal sensory perception evaluated for each wine by the participants.

“Panel” and “Participant” are the same as in the “Participants” tab.

“Wine” is the code of the evaluated wine.

“Period” is the code of the period defined in the question (AEF1: “At first, I perceived this wine”, AEF2: “Then, after a few moments, I perceived it”, AEF3: “At the end of the tasting, I perceived it”).

“Description” is the Free-Comment description of “Product” at “Period” depending on the period, as entered by “Participant” (in English, French or Spanish).

“Keywords” contains the lemmas related to sensory attributes (canonical form, masculine, singular), separated by commas, translated into English (if required).

AuctionResolution provides information about the results of the auction.

“Panel” and “Participant” are the same as in the “Participants” tab.

“RandomProduct” is the code of the randomly drawn wine (between W1, W2 or W4, W3 being not available at the end of the study).

“RandomPrice” is the price randomly drawn in the distribution of the prices of red wines of Bordeaux and Rioja (extracted from Vivino).

“Result” was the result of the auction (win if RandomPrice \geq reserve price for RandomProduct, lose otherwise).

Questionnaire 1 includes commented screenshots of the online questionnaire used to collect data, translated from French and Spanish to English.

Table 1 provides objective information about wines.

Table 2 provides subjective information about wines collected on the Robert Parker Wine Advocate (*Robert Parker Wine Advocate*, n.d.) and Vivino (*Vivino*, n.d.) websites in May 2022.

Table 3 describes the individual characteristics of the participants in the three panels by group.

Figure 1 shows the standardized labels displayed on the wine samples.

Figure 2 is the flowchart of the participants (recruited, participated, completed).

Experimental design, materials and methods

Samples

The four products (W1, W2, W3, and W4) were nonorganic red wines produced in France or in Spain.

Code	Appellation	Winery	Variety	Vintage	Alcohol Content	Price in euros
W1	AOC Bordeaux Supérieur	Chateau Féret Lambert	Merlot 90%, Cabernet 10%	2018	14.5	15.5
W2	AOC Pessac Léognan	La Louvière	Merlot 40%, Cabernet Sauvignon 60%	2018	13.5	15.6
W3	DOP Rioja	Bhilar	Tempranillo 85%, Grenache 10%, Viura 5%	2018	13.5	16
W4	DOP Rioja	Miguel Merino	Tempranillo 100%	2018	14.0	14.5

Table 1: Objective information about wines. AOC: Appellation d'Origine Controlée (protected designation of origin). DOP: Denominación de Origen Protegida (protected designation of origin).

The 750 ml bottles were purchased from an online store.

The wines chosen came from two regions to study the cultural impact and have noncongruent Vivino and Parker scores to study the impact of information (expert or consumer ratings from reviews). The year of production was the same, and the prices were very close.

Code	Parker score	Vivino score	Parker description	Vivino description
W1	85/100	3.76/5 (383 notes)	"Deep garnet-purple colored, the 2018 Feret-Lambert leaps from the glass with crème de cassis, boysenberries and black raspberries followed by plum pudding and cloves nuances. Full-bodied, it coats the mouth with dried berries and exotic spice flavors, framed by chewy tannins and just enough freshness, finishing earthy". (Lisa Perrotti-Brown, 23rd Apr 2019)	Light/Strong: 8.5/10; Supple/Tannic: 6.5/10; Dry/Liquorous:0.5/10; Sweet/Acid: 7/10; Prune, blackberry, black fruit (79%); Oak, vanilla, tobacco (46%); Earthy, leather, smokey (41%); Cherry, raspberry, red berries (32%); Pepper, licorice, anise (14%)
W2	94/100	4.07/5 (84 notes)	"Medium to deep garnet-purple in color, the 2018 la Louviere leaps from the glass with notions of redcurrant jelly, fresh blackberries and warm black plums, plus nuances of dried mint, cedar chest and ground cloves. The medium-bodied palate is refreshing and savory in the mouth, featuring a light touch of finely grained tannins and bold freshness, finishing with a compelling red berry lift. It's an elegant, lively expression of this vintage and one that	Light/Strong: 8/10; Supple/Tannic: 7.5/10; Dry/Liquorous:0.5/10; Sweet/Acid: 8.5/10; Oak, vanilla, tobacco (37%); Somy, leather, cocoa (21%); Blackberry, black fruit, blackcurrant (19%); Cherry, strawberry, sour cherry (14%); Licorice, pepper, anise (13%)

			really works! "(Lisa Perrotti-Brown, 31st Mar 2021)	
W3	88/100	3.21/5 (16 notes)	"It has a strong note of cider on the nose, with a volatile touch and a nutty touch and very low alcohol." (Luis Gutiérrez, 28th Jun 2019)	Light/Strong: 4.5/10; Supple/Tannic: 6/10; Dry/Liquorous:3.5/10; Sweet/Acid: 6.5/10; Blackcurrant (50%)
W4	90/100	4.10/5 (135 notes)	"The wine is juicy, very drinkable but serious, with fantastic balance and very clean aromas and flavors. It's quite fruit driven but has the complexity of a more serious wine produced with attention to detail. It already has Rioja character." (Luis Gutiérrez, 30th Oct 2020)	Light/Strong: 7/10; Supple/Tannic: 6.5/10; Dry/Liquorous:2/10; Sweet/Acid: 6.5/10; Vanilla, oak, chocolate (41%); Prune, black cherry, black fruit (27%); Cocoa, leather, earthy (21%); Cherry, strawberry (14%); Pepper, licorice, anise (7%)

Table 2: Subjective information about wines.

The reviews in *Wine Advocate* were conducted by highly experienced tasters, specially trained to understand and recognize wine quality in a glass. They used 100-point quality scales to evaluate the wines. The Vivino taste profiles of wines were based on user reviews. The values reported in Table 2 were measured on the bipolar scales ("Light/strong", "Supple/Tannic", "Dry/Liquorous", "Sweet/Acid") displayed on the website and converted between 0 and 10. The percentages associated with the flavours correspond to the percentages of consumers who cited the flavour according to Vivino's counts.

Vinovae (*Vinovae*, n.d.) used a patented process to repackage the bottles in 20 ml polyethylene terephthalate (PET) screw bottles in an inert atmosphere devoid of oxygen. The process was designed to avoid the risk of oxygenation and ensure the preservation of the organoleptic qualities of the wines. The screw bottles were labelled with original information (origin, designation, producer, vintage, alcohol content) and displayed in a standardized way. The samples were sent to the consumers' houses by postal mail.

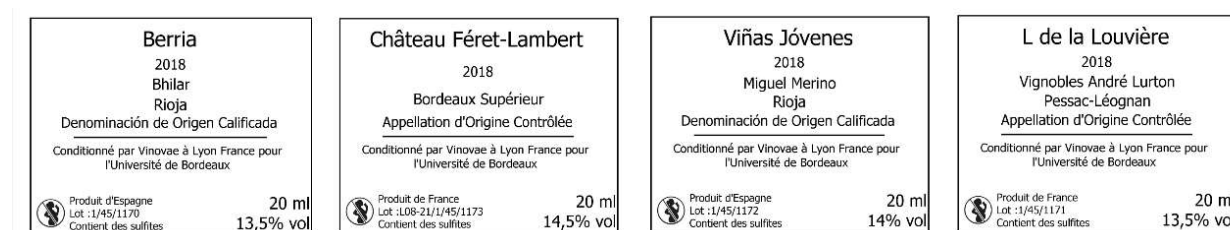


Figure 1: Standardized labels of the samples

Participants

"Wine connoisseur" panel (WC): Fifty students of the School of Wine and Spirits Business of the Burgundy School of Business in Dijon were recruited through a mailing. They were natives from different countries and selected based on their knowledge about wines (they were at least holders of WSET certificate (Wine and Spirits Education Trust) Level 2 Award in Wines (*Wine & Spirit Education Trust Qualification.*, n.d.)).

French (FR) and Spanish (SP) consumer panels: A total of 150 French consumers and 150 Spanish consumers were recruited from a panel recruitment agency database through online questionnaires (Qualtrics). The selection criteria included (i) being available to participate in a

20-minute online study involving the at-home tasting of four wines; (ii) having consumed red wine at home within the past month; (iii) possessing at least one wine glass at home; (iv) owning a computer with a webcam and a good internet connection (Chrome, Firefox or Edge browser); (v) agreeing to be video recorded during the tasting; and (vi) agreeing to provide a postal address for the shipment of samples. Quotas on individual characteristics (age, gender, employment status, education level, family income) were also established to balance the two consumers panels. The appropriate sample size was determined based on the literature (Asioli et al., 2021b).

All participants (WC, FR, SP) signed an informed consent form. They were informed that they would receive compensation worth 20 euros (that may include a bottle of wine depending on the resolution of an auction), and they could refuse to participate or stop participating in the study at any time without providing a reason; however, in that case, they would not receive any compensation. They were also informed that the study was an academic research project without any commercial interests and that the information collected would be used exclusively for research purposes.

Consumers in FR and SP panels were both divided into three groups of 50: the first (control group) had no other information than the label (“no rating information”), the second received information about expert ratings (“expert rating information”), the third received information about consumer ratings (“consumer rating information”).

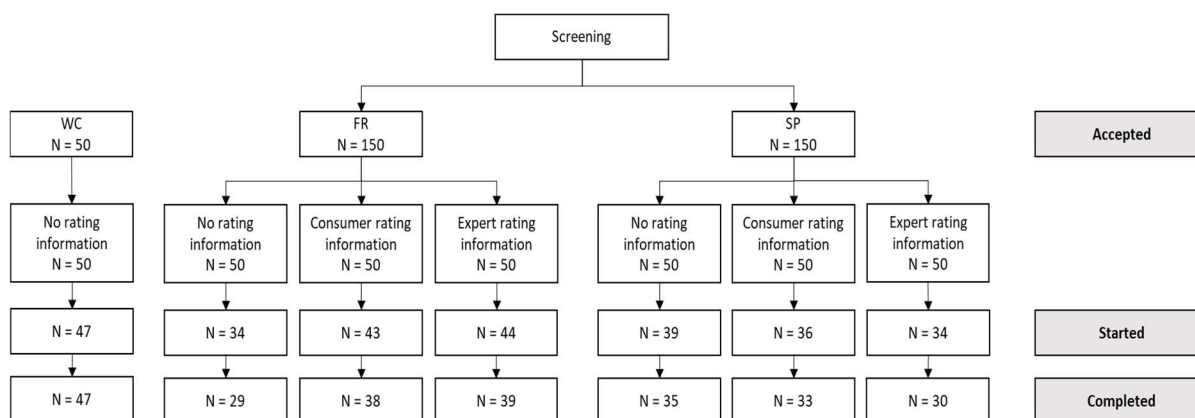


Figure 2. Participant flowchart

Forty-seven (94%) students finally completed the study in the WC panel, 106 consumers (70%) in the FR panel, and 98 (65%) in the SP panel.

	WC	FR no rating	FR consumer rating	FR expert rating	SP no rating	SP consumer rating	SP expert rating
Age 18-29	57%	7%	11%	13%	6%	10%	6%
Age 30-40	21%	17%	18%	15%	37%	30%	27%
Age 41-50	15%	21%	13%	26%	23%	30%	27%
Age 51-60	4%	17%	16%	13%	23%	13%	18%
Age 61-70	2%	31%	32%	21%	11%	17%	18%
Age 70+	-	7%	11%	10%	-	-	3%
Female	62%	59%	48%	46%	46%	60%	52%
Male	36%	41%	53%	52%	54%	40%	48%
Other	2%	-	-	3%	-	-	-

Employed	11%	55%	55%	59%	77%	73%	79%
Other	-	14%	-	3%	3%	3%	3%
Retired	-	28%	37%	26%	9%	3%	8%
Student	89%	3%	5%	5%	-	-	6%
Unemployed	-	-	3%	8%	11%	20%	3%
PhD	4%	-	-	8%	3%	7%	6%
High school	-	34%	24%	23%	6%	13%	12%
Bachelor's degree	51%	17%	17%	13%	49%	33%	48%
Master degree	43%	17%	24%	21%	20%	30%	21%
None	-	-	-	5%	-	-	-
Other	2%	-	5%	-	-	3%	-
Vocational school	-	31%	32%	28%	23%	13%	12%
Living comfortably	34%	10%	24%	23%	45%	40%	45%
Finding it difficult	9%	21%	13%	15%	12%	3%	12%
No answer	23%	-	3%	3%	-	-	-
Coping on income	34%	69%	61%	59%	42%	57%	42%

Table 3. Participant characteristics

Data collection

The consumers received an email containing an individualized URL to invite them to connect to the TimeSens version 2 web application (INRAE, n.d.) using a web browser (Chrome, Firefox, or Edge were recommended to ensure maximum compatibility with the web app) on their computer. The FR and SP panels completed the experiment at home, and the WC panel completed the experiment in the sensory lab of the Burgundy School of Business (Dijon, France, 32 available individual boxes) during three sessions.

The experimental procedure followed the steps of the questionnaire described below.

Screen 1: reading and acceptance of the conditions of the study.

Screen 2: reminder that four wines had to be evaluated and that the tasting part would be video recorded.

Screen 3: rating of expected liking of the four wines using a 7-point hedonic scale (question EL1).

Screen 4: instructions to prepare by having a glass of water and an empty wine glass available for the tasting.

Screen 5: instructions for webcam calibration included facing the webcam; having the face and forefront visible (no glasses); adapting the light to be homogeneous; having the face occupy 25 to 30% of the screen; avoiding white clothing, direct lighting, a dark environment, and anything that masks the face; and turning off the phone during the study.

Screen 6: instruction checklist displayed on screen 5.

Screen 7: displaying the video flux of the webcam to adjust the calibration of the webcam.

Screen 8: instructions for water tasting (warm-up) included pouring some water in the wine glass; looking at the water, swirling and sniffing it; and taking a small mouthful and at the same time clicking on the button to start the video recording.

Screen 9: displaying the video flux from the webcam during the water tasting (ten seconds).

Screen 10: instructions for preparing a new sample included emptying the wine glass; pouring the appropriate wine sample in the glass (the order of presentation of the samples was balanced over participants based on a William's Latin square); looking at the wine, swirling and sniffing it; and taking a small mouthful and at the same time clicking on the button to start the video recording. The label corresponding to the wine sample they had to taste was displayed on the screen (see Figure 1). The participants in the "expert rating information" group received the following supplementary information to the right of the sample label: "This wine was scored $x/100$ by the *Wine Advocate* – Robert Parker". The participants in the "consumer rating information" group also received supplementary information: "This wine was rated $x/5$ by consumers – Vivino website".

Screen 11: displaying the video flux from the webcam during the wine tasting (ten seconds). This was the only moment when a wine sample was tasted.

Screen 12: rating of liking on a 7-point hedonic scale (question SL1).

Screen 13: explanation of the wine description task, a Free-Comment Attack-Evolution-Finish (FC-AEF) (Mahieu et al., 2020b). The participants were informed that they had to retrospectively describe the sensations they perceived in mouth during the tasting in chronological order. Three periods were defined to summarize the tasting: "at first", "after a few moments" and "at the end of the tasting". For each period, they had to describe their sensations (tastes, aromas) using their own words. The same words could be used in different periods. A fictive example with chocolate was shown to help the participants understand the task.

Screen 14: FC-AEF task (questions AEF1, AEF2 and AEF3), as explained on screen 13.

Screen 15: rating of question F1 ("The wine I just tasted is similar to the wines I normally select").

Screen 16: rating of questions QE1 ("I think this wine is high quality") and QE2 ("Most people would like this wine").

Screen 17: explanation of the Becker–DeGroot–Marschak (BDM) method (Becker et al., 1964). The participants were instructed they would have to propose a price corresponding to the maximum price they would pay for a 75-cl bottle of the tasted wine. They were informed that they could indicate 0 if they did not like the product and did not wish to buy it. They were told that an auction would happen only for one of the four wines randomly drawn at the end of the survey. For this wine, if the price drawn was higher than the indicated price, the participant would lose the auction and would not receive the wine. If the price drawn was lower than the indicated price, the participant would win the auction and receive the bottle in the following few days.

Screen 18: scoring of their maximum willingness to pay for a 75-cl bottle (question BDM1), as explained on screen 17.

Screen 19: instructions for glass rinsing.

Screen 20 to 42: the procedure described on screens 10 to 19 was repeated for the three other wines (explanation screens 13 and 17 were displayed once).

Screen 43: ranking of the four wines (no ex-aequo allowed, question RQ1).

Screen 44: rating of questions PC1 (“Wine interests me a lot”), PCI2 (“I often discuss wine with other people”) and PCI3 (“It gives me pleasure to shop for wine”).

Screen 45: rating of questions SWK1 (“I feel confident in my ability to choose wine”), SWK2 (“I know more about wine than many other people”), SWK3 (“I would describe myself as being very knowledgeable about wine”) and SWK4 (“Have you already taken a wine education course?”).

Screen 46: answering questions VB1 (“I use wine apps to help me decide which wine to buy”) and VB2 (“I use wine professional expert ratings (wine reviews, point scores, medals and awards) to help me decide which wine to buy”).

Screen 47: rating of question VB3 (“I often seek advice from other people before purchasing a wine”).

Screen 48: answering question VB4 (“Whose advice do you trust most when selecting a wine?”, multiple answers authorized).

Screen 49: answering question PP1 (“Where do you buy your wine?”, multiple answers authorized).

Screen 50: answering questions PP2 (“For a 75cl bottle of red wine you spend on average - for informal drinking”), PP3 (“For a 75cl bottle of red wine you spend on average - for a formal occasion or for a gift”) and PP4 (“How much does your household spend on wine monthly?”).

Screen 51: answering questions CP1 (“How often do you consume wine at home?”); CP2 (“How often do you consume wine outside from home (restaurant, bar, club, etc.)?”) and AC1 (“If you read this sentence correctly, please answer ‘strongly disagree’”).

Screen 52: drawing of the wine and the random price and resolution of the auction.

Screen 53: study debriefing.

Screen 54: end screen.

Ethics statements

Each participant was informed of the conditions for participating and validated an informed consent form. The research was carried out in accordance with the Declaration of Helsinki and received approval from the Burgundy School of Business Research Ethics Committee (reference of the application: CERBSB2022-9).

Appendix B - Using Free-Comment to Investigate Expertise and Cultural Differences in Wine Sensory Description

This paper, co-written with Michel Visalli, Pascal Schlich, François Ric, Jean-Marie Cardebat and Nikolaos Georgantzis is based on the results of the experiment presented in chapter IV has been published in *Food Quality and Preference*: Visalli, M., Dubois, M., Schlich, P., Ric, F., Cardebat, J.-M., & Georgantzis, N. (2023). *Relevance of free-comment to describe wine temporal sensory perception: An application with panels varying in culture and expertise*. *Food Quality and Preference*, 105, 104785. <https://doi.org/10.1016/j.foodqual.2022.104785>

Keywords

Consumer study. Temporal perception. Home-use test. Attack-Evolution-Finish. FC-AEF. Sensory analysis.

Abstract

Wine is a complex product, and numerous sensory evaluation methods have been tested to characterize it. Among these, new sensory analysis evaluation methods have been developed to allow consumers to describe products using their own vocabulary. Recently, Free-Comment Attack-Evolution-Finish (FC-AEF) was introduced to add the temporal aspects of tasting to the free description of wine. This method has been rarely used thus far, but as FC-AEF does not influence consumers by presenting them with predefined lists of attributes, it is of special interest to study the semantic aspects of sensory perception related to expertise and culture. FC-AEF was used to collect temporal data about two Bordeaux and two Rioja wines. Three panels of participants evaluated the products: French consumers at home (n=106), Spanish consumers at home (n=98), and international wine students (“connoisseurs”) in a sensory lab (n=47). Textual data were processed to extract relevant groups of sensory words and then used to characterize wines with and without considering the temporal aspects of tasting. The three panels were able to discriminate between the two Rioja and the two Bordeaux wines; however, only the French panel perceived differences between the two Bordeaux wines. Only the connoisseurs’ panel succeeded in perceiving temporal differences within the wines. However, the panels disagreed on the nature of the sensory differences between the samples. The impact of expertise on the ability to describe wines seems quite clear and in favour of experts. It is more difficult to conclude the impact of culture, as little agreement was observed in the wine descriptions of the consumer panels. An original framework based on a combination of semantic and statistical criteria was used to extract relevant sensory information from the wine comments. This article provides some methodological answers to challenges raised by the analysis of Free-Comment data and its application for the semantic investigation of differences in perception observed in wine descriptions collected with different panels.

1. Introduction

Wine is a complex product, and describing its perception is a question that dates back to antiquity (Shapin, 2016b). Amerine & Roessler (1976) were pioneers in the sensory evaluation of wine, being among the first to attempt to transform subjective judgements into objective descriptions (Shapin, 2016b). Since then, many sensory analysis methods have been developed (Lesschaeve & Noble, 2022). Traditional descriptive methods used with trained panels rely on the use of a specific list of sensory attributes based on standardized descriptive vocabulary. These methods are time-consuming and thus money-consuming due to the duration of the training to reach a consensus about the use of the attributes (M. P. Sáenz-Navajas et al., 2016). Moreover, some authors have reported limitations about the use of such predetermined lists for wine characterization. Perrin & Pagès (2009) highlighted the risk of forgetting important attributes. Lawrence et al. (2013) wondered if imposing attributes could lead the panellists to select attributes that do not exist in the evaluated sample.

Thus, new sensory analysis evaluation methods have been developed that allow untrained panellists to describe products using their own vocabulary (M. P. Sáenz-Navajas et al., 2016). Among these methods, Free-Comment (FC) has been used in several studies related to wine. Sauvageot et al. (2006) used FC to make an expert panel describe Chardonnay wine qualities. They concluded that the method required in-depth examination to become a useful technique in food science. Bécue-Bertaut et al. (2008) proposed a statistical framework to analyze FC data and applied it to consumers' descriptions of Spanish wine. They concluded with the interesting potential of FC. Lawrence et al. (2013) used FC to make a professional panel characterizing Cabernet Franc wines. They highlighted several advantages of FC over methods using a list of attributes: the method is faster and allows new information and specific characteristics of wines to be introduced. The second assertion was confirmed by Coulon-Leroy et al. (2017), who used Mixed Profiling, a method combining a predefined list of attributes with FC, to characterize Cabernet Franc and Gamay wines with wine professionals. Schüttler et al. (2015) used FC with wine experts to characterize the typicality of Riesling wines and found conclusions in agreement with former sensory studies. Vidal, Giménez, et al. (2015) used FC to show that consumers accurately understand the meaning of wine astringency using a limited vocabulary, whereas the use of terms extracted from a mouthfeel wheel was not relevant. Mahieu et al. (2020a) used FC and Check-All-That-Apply methods with consumers to characterize French wines and concluded that there was better product discrimination using FC. FC does not consider temporality in the perceived sensations. However, it is common for wine experts to describe their perceptions as a temporal "attack-evolution-finish" sequence (Grainger, 2009; Harrington, 2008; Osterland, 2012; Spence & Wang, 2018). This sequence can be measured with a predefined list of descriptors using the Attack-Evolution-Finish (AEF)

method described in Visalli et al. (2020b) AEF was adapted to replace the list of attributes by FC using the so-called Free-Comment AEF method (FC-AEF) proposed by Mahieu et al. (2020b). FC-AEF provided additional information compared to AEF; however, to date, it has only been used in one consumer study to evaluate dark chocolate.

FC and FC-AEF do not require training, so the methods can be used both with consumer and expert panels. However, these methods, like all verbalization tasks, are intrinsically related to semantics. Many authors have reported an influence of the level of expertise of the tasters on verbalization tasks related to wine. Lehrer (1975) found that nonexperts generate useless descriptions due to the lack of consensus in word applications. Lawless (1984) demonstrated that experienced subjects used more terms with concrete references to describe wines. Hughson & Boakes (2002) suggested that differences in performance between novices and experts were due to a lack of vocabulary. Croijmans & Majid (2016) concluded that experts have only a limited and domain-specific advantage in communicating about flavours. Sáenz-Navajas et al. (2016) reported difficulty for consumers in describing wines. Croijmans et al. (2019) showed that wines were described differently by experts and by novices, with experts being more in agreement but using more specific source-based terms compared to novices. Bianchi et al. (2021) suggested that such differences can also be due to different understandings of wine lexicons. In addition to expertise, cultural aspects can affect wine description. Sáenz-Navajas et al. (2013) showed a cross-cultural agreement in wine discrimination based on aroma properties of Spanish and French trained panels, but this agreement was not confirmed for the in-mouth description. More generally, several authors (Ares, 2018; Rodrigues & Parr, 2019) pointed out the need for methodological attention with regard to these aspects.

This article presents analyzes of part of the data described in Visalli et al. (2022a). It focuses on the FC-AEF data describing two Bordeaux and two Rioja wines collected using consumer panels (France and Spain) and an international panel of connoisseurs. The methodological aspects of the use of FC-AEF for wine characterization under different conditions are studied. The objective of this study was to demonstrate that data collected using Free-Comment are usable to describe complex products including a temporal dimension and provide interesting semantic information to understand the difference in perception between panels.

2. Materials and methods

2.1 Protocol

Below is a summary of the protocol. A detailed description of the protocol can be found in the data paper, "A dataset on the sensory and affective perception of Bordeaux and Rioja red

wines collected from French and Spanish consumers at home and international wine students in the lab.” (Visalli et al., 2022a).

2.1.1 Participants

Three panels were recruited. The first panel (WC panel) was composed of wine connoisseurs. Fifty students of the School of Wine and Spirits Business of Burgundy School of Business in Dijon were recruited through a mailing. They were native from different countries and selected based on their knowledge about wines (they were at least holders of WSET certificate (Wine and Spirits Education Trust) Level 2 Award in Wines). The second and third panels were composed of regular wine consumers. One hundred fifty French consumers (FR panel) and 150 Spanish consumers (SP panel) were recruited from a database belonging to Qualtrics, a panel recruitment agency, through online questionnaires. The selection criteria included (i) being available to participate in a 20-minute online study involving the at-home tasting of four wines; (ii) having consumed red wine at home within the past month; (iii) possessing at least one wine glass at home; (iv) owning a computer with a webcam and an internet connection (Chrome, Firefox or Edge browser); (v) agreeing to be video recorded during the tasting; and (vi) agreeing to provide a postal address for the shipment of samples. Quotas on individual characteristics (age, gender, employment status, education level, family income) were established to balance the two consumers panels.

The research was carried out following the Declaration of Helsinki and received approval from the Burgundy School of Business Research Ethics Committee (reference of the application: CERBSB2022-9). The participants were informed of the conditions and validated an informed consent form. They received a compensation worth 20 euros (either 20€ through Lydia or, if they won the experimental auction, the bottle of wine and 20€ minus the price of the bottle; see data paper for more details).

The consumers in the FR and SP panels were both divided into three groups of 50: the first had no other information than the label (group “no rating information”), the second received information about expert ratings (group “expert rating information” with scores from the *Wine Advocate*), and the third received information about peer ratings (group “peer rating information” with scores from Vivino).

2.1.2 Samples

Four non-organic red wines produced in France or Spain in 2018 were tasted in this study. They were all in the same price range, between 14 and 16 euros for a 75cl bottle. W1 (winery: Chateau Féret Lambert, composition: Merlot 90%, Cabernet 10%, alcohol content: 14.5°) was an AOC (Appellation d’Origine Controlée: protected designation of origin) Bordeaux Supérieur,

W2 (La Louvière, Merlot 40%, Cabernet Sauvignon 60%, 13.5°) was an AOC Pessac Léognan, W3 (Bhilar, Tempranillo 85%, Grenache 10%, Viura 5%, 13.5°) and W4 (Miguel Merino, Tempranillo 100%, 14.5°) were Rioja DOP (Denominación de Origen Protegida: protected designation of origin). In order to ease the logistics of home-use tests, the wines were repackaged in 20 ml PET screw bottles in an inert atmosphere devoid of oxygen to avoid the risk of oxygenation and ensure the preservation of the organoleptic qualities of the wines (patented technology). The screw bottles were labeled with original information (origin, designation, producer, vintage, alcohol content) displayed in a standardized way, then shipped by postal mail to the participants of the consumer panels (FR, SP).

2.1.3 Experimental procedure

The participants received an email containing an individualized URL to invite them to connect to the TimeSens version 2 web application (INRAE, n.d.) using a web browser (Chrome, Firefox, or Edge were recommended to ensure maximum compatibility with the web app) on their computer. The FR and SP Panels completed the experiment at home; the WC panel completed the experiment in the sensory lab of the Burgundy School of Business (Dijon, France).

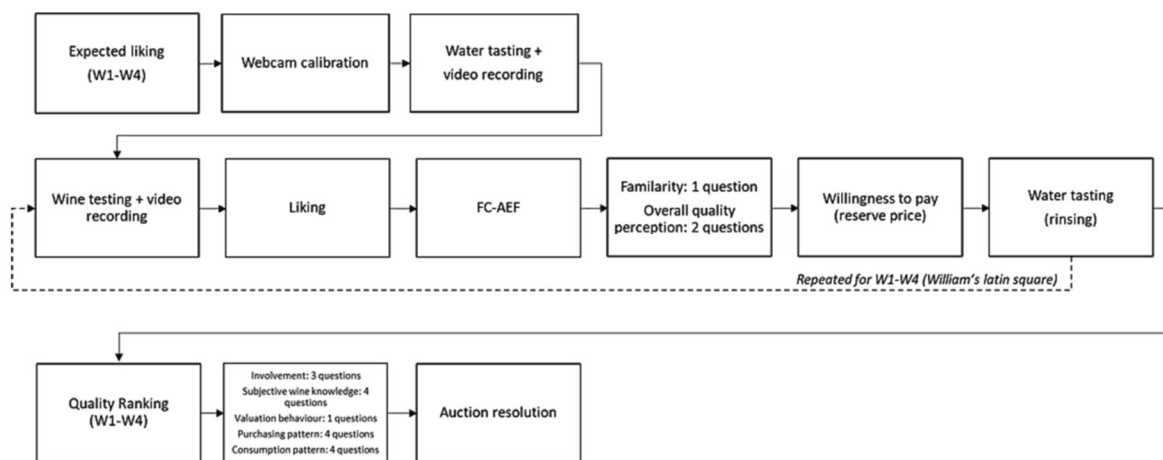


Figure 1: Summary of the experimental procedure

Figure 1 summarizes the experimental procedure for the three panels (see data paper for more details). This article specifically focuses on the results from wine descriptions using FC-AEF; other results will be presented elsewhere.

Expected liking and water tasting

The participants first had to rate their expected liking before tasting the four wines using a 7-point hedonic scale. Then, they were invited to calibrate their webcam. They were instructed to pour some water into their wine glass and then to look at the water, swirl, and sniff it. Then,

they were invited to take a small mouthful and at the same time click on the button to start the video recording. More details about this part of the experimental procedure can be found in the data paper.

Wine tasting

After the water tasting, the participants were instructed to empty their wine glass and then pour the appropriate wine sample into the glass. The order of presentation of the samples was balanced over participants based on a William's Latin square. The participants were instructed to look at the wine and then swirl and sniff it. Then, they were invited to take a small mouthful and at the same time click on the button to start the video recording (it was the only tasting of this wine). The label corresponding to the wine sample they had to taste was displayed on the screen. The participants in the "expert rating information" group had the following supplementary information to the right of the sample label: "This wine has been rated $x/100$ by the *Wine Advocate* – Robert Parker". The participants in the group "peer rating information" also had supplementary information: "This wine has been rated $x/5$ by consumers – website Vivino". After 10 seconds, they had to rate their liking on a 7-point hedonic scale. Then, the FC-AEF task was explained. The participants were informed that they had to retrospectively describe the sensations they perceived in mouth during the tasting in chronological order. Three periods were defined to summarize the tasting: "at first", "after a few moments" and "at the end of the tasting". For each period, they had to describe their sensations (tastes, aromas) using their own words. They were informed that they could use the same words in different periods or enter "nothing" if they perceived nothing. A fictive example with chocolate was displayed to help them understand the concept. Then, they had to perform the FC-AEF task for the sample they tasted (see Figure 2).

Wine description université
BORDEAUX 23/54

Describe the sensations you perceived during the tasting (tastes, aromas) in chronological order. Use your own words to answer. You can use the same word at different times. If you haven't perceived anything for a period, enter "nothing".

At first I perceived this wine to be

Then after a few moments I perceived it to be

And at the end of the tasting I perceived it to be

NEXT

Figure 2: Screen for FC-AEF measurement.

The participants next rated their familiarity with the wine, their appreciation of the wine quality, and their expectation about how other people would like the wine using a 5-point Likert scale. Then, they had to indicate their willingness to pay for a 75-cl bottle of the tasted wine. Finally, they were instructed to empty and rinse their glass, and the procedure for wine tasting was repeated for the three other wine samples.

Wine ranking and BDM auction resolution

After having tasted the four wines, the participants had to rank them, with wine ranked first being the most qualitative and wine ranked fourth the least qualitative. Then, several questions were asked about their involvement in wine, their subjective wine knowledge, their consumption pattern, their purchasing pattern, and their valuation behaviour. Finally, one of the wines was randomly drawn for each subject, and the auction was resolved.

2.2 Data analysis

Statistical analyzes were performed using R 4.1.0 software (R Core team, 2017).

2.2.1 Characterization of panels

The main characteristics of participants were reported within each panel (number, gender, age). The mean scores of variables likely to explain differences in terms of descriptive ability between panels (product category involvement, subjective wine knowledge, consumption pattern, and purchasing pattern) were computed, and differences between panels were evaluated using a one-way ANOVA model. Tukey LSD post hoc tests were performed when the panel effect was significant ($\alpha=0.05$, means followed by the same letter were not significantly different).

2.2.2 Selection and grouping of words, by panel

FC data were processed by a custom program. First, all French and Spanish wine descriptions were translated into English using Google Translate. Second, the descriptions were cleaned: the letters were transformed to lower-case, and accented characters and punctuation marks were removed. Third, using regular expressions (Erwig & Gopinath, 2012) associated with a custom lexicon of words related to sensory perception, words or groups of words were extracted from descriptions and lemmatized to singular form. Fourth, quantifiers associated with the extracted lemmas were searched and summarized as “not”, “high” or “low”. Example: “Fruité, acidité et équilibré, peu tannique, de belle rondeur.” → “Fruity, acidity and balanced, low tannin, nice roundness” → “fruity acidity and balanced low tannin nice roundness” → “fruity acid balanced tannic round” → “fruity, acid, balanced, tannic_low, round”.

The results obtained with the program were manually checked and corrected by the authors of the article. Only words related to objective sensory perception (taste, flavour, mouthfeel) were retained.

The number of different words used by each panel was counted, and the average number of words used per product/participant/period was calculated. The differences in citations were evaluated using two ANOVA models. The first one (i.e. Number of words = Participant (nested in Panel) + Panel + Product + Period + dual interactions) was carried out to test whether the number of words used by period to describe the perception depended on the panel, the wine, or the period. The second one (i.e. Total number of different words = Participant (nested in Panel) + Panel + Product + Panel x Product) was carried out to test whether the total number of distinct words (all periods combined) used to describe the perception depended on the panel or the wine. Tukey LSD post hoc tests were performed for significant factors ($\alpha=0.05$, means followed by the same letter were not significantly different).

For each panel independently, the lemmas related to sensory words remaining after data pretreatment were aggregated into groups of sensory words based on an ascending hierarchical classification using the methodology presented in Greenacre (1988) and applied to FC as in Mahieu et al. (2020a). This step ensures a grouping of words having the same “semantic meanings” and the same “statistical properties”. All words in the same group were thereafter considered equivalent and interchangeable for a given panel in the context of the study. To facilitate reading, the groups of words were identified by short labels representative of the sensory concept. Only groups of words cited by at least 5% of the participants for one wine were kept.

2.2.3 Between and within product comparisons, by panel

The usual χ^2 framework was not well suited to analyze multiple-response collected with Free-Comment (Mahieu et al., 2021). To overcome this limitation, Mahieu et al. (2021) developed a framework and an R package MultiResponseR (Mahieu, 2021) for the multidimensional analysis of contingency tables derived from FC data. This framework presents a lot of features for the purpose of product comparisons within each panel. Indeed, it includes a test of dimensionality, a test for pairwise product comparisons, and a test of significance of product by descriptor associations.

Two types of analyzes have been carried out for each panel: (a) between products, to compare the overall (all periods combined) differences of product characterization, and (b) within product, to compare the temporal differences of product characterization between the periods (attack, evolution finish) for a given product. For (a), three contingency tables (one by panel: “FR”, “SP”, “WC”) were computed, the row variables being the four products (“W1” to “W4”)

and the column variables being the group of words (the groups of words cited in several periods by the same participant counting as one). For (b), 12 contingency tables (one for each panel x product: “FR-W1” to “FR-W4”, “SP-W1” to “SP-W4” and “WC-W1” to “WC-W4”) were computed, the row variables being the three periods (“T1”, “T2” and “T3”) and the column variables being the group of words. Then, the differences between the row variables were tested using the procedure summarized below.

(i) The dimensionality of the dependence between the row and column variables of the contingency tables was tested using dimensionality tests (2000 simulations) based on the multiple-response χ^2 framework.

(ii) When at least one dimension was significant ($\alpha=0.05$), the multiple-response correspondence analysis (mrCA) was computed on the contingency tables.

(iii) The outputs of mrCA were displayed using a standard biplot, and 95% confidence ellipses were computed with a total bootstrap procedure (Cadoret & Husson, 2013) with 2000 simulations. Procrustes rotations were performed on the significant dimensions.

(iv) For each pair of row variables of the contingency tables, total bootstrap tests were performed on the significant dimensions to assess the significance of the difference. When significant ($\alpha=0.05$), multiple-response hypergeometric tests (2000 simulations, $\alpha = 0.05$) were performed to test if the descriptors were cited in a proportion that was significantly greater than the overall average citation proportion. The results of the multiple-response hypergeometric tests are summarized in tables with cells representing the citation rates.

The similarities between the three product configurations obtained with between products mrCA (a) were compared and tested using the RV coefficient (Robert & Escoufier, 1976) and standardized RV coefficient (Josse et al., 2008) for each pair of panels. The tables of citation rates (rows being the group of words and columns being the product) obtained as a result of the hypergeometric test were vectorized, and then correlations between “FR”/“SP”, “FR”/“WC” and “SP”/“WC” were computed (keeping only the matching group of words) to test the similarity of the descriptions. Finally, the differences in conclusions obtained from the three panels were qualitatively described and interpreted.

3. Results

3.1 Characterization of panels

Table 1 summarizes the characteristics of participants by panel. Forty-seven (94%) students completed the study in the WC panel, 106 consumers (70%) in the FR panel, and 98 (65%) in

the SP panel. Due to dropouts, the two consumer panels were finally not balanced in their compositions.

	FR, n=106	SP, n=98	WC, n=47
Age: 18-40	28%	39%	79%
Age: 41-60	35%	45%	15%
Age: 61+	37%	16%	6%
Gender: male	49%	48%	36%
Gender: female	51%	52%	62%
Gender: other	-	-	2%

Table 1: Characteristics of participants, by panel

As expected, the mean scores were similar between the consumer panels and different from the WC panel for product category involvement (FR: 4.07, a; SP: 4.18, a, WC: 4.73, b), consumption pattern (SP: 2.09, a, FR: 2.15, a, WC: 2.47, b) and purchasing pattern (SP: 3.25, a, SP: 3.29, a, WC: 4.38, b). However, unexpected differences were observed for subjective wine knowledge (FR: 3.08, a, SP: 3.44, b, WC: 3.68, b). The participants in the WC panel were more involved (interest in wine, discussion about wine, pleasure to buy wine) and had a greater budget dedicated to wine, but they consumed wine less frequently compared to the consumer panels. The participants in the WC and SP panels declared being more knowledgeable about wine than the participants in the FR panel.

3.2 Selection and grouping of words, by panel

One hundred thirty-two different words related to objective sensory description were used by the WC panel, 121 by the FR panel, and 105 by the SP panel (177 distinct words, including 36 hapaxes).

	W1				W2				W3				W4			
	T1	T2	T3	ALL	T1	T2	T3	ALL	T1	T2	T3	ALL	T1	T2	T3	ALL
WC	2.0	2.0	1.8	4.7	1.8	2.1	1.8	4.7	1.7	1.8	1.9	4.4	2.0	2.0	2.3	5.1
	2	0	8	9	5	9	8	4	0	4	8	9	2	4	6	9
SP	1.2	1.2	1.1	2.7	1.1	1.3	1.2	2.8	1.2	1.2	1.2	2.8	1.2	1.3	1.2	3.0
	2	7	9	7	9	0	6	8	1	7	2	8	7	2	7	1
FR	1.2	1.2	1.2	2.5	1.2	1.2	1.1	2.5	1.2	1.2	1.2	2.5	1.1	1.2	1.3	2.6
	1	1	9	0	4	6	9	6	6	3	1	4	8	8	2	1

Table 2: average number of words used per participant to describe wine samples, grouped by panel (WC, SP, FR); product (W1 to W4); and period (T1 to T3). ALL corresponds to the number of different words in all periods combined.

When considering the number of words by period, the main factors Panel ($F=309.5$, $p<0.001$), Product ($F=2.9$, $p=0.034$), and Participant ($F=5.7$, $p<0.001$) were significant, and the interactions were not. Table 2 shows that the participants in the WC panel used significantly more words by product/period (1.96, b) compared to the FR and SP panels (1.21, a and 1.24, a). Small but significant differences were observed in the number of words by product: W3 (1.41, a) and W1 (1.45, a) had fewer words by period than W2 (1.47, ab) and W4 (1.55, b).

When considering the total number of distinct words and all periods combined, only the main factors Panel ($F=338.1$, $p<0.001$) and Participant ($F=6.2$, $p<0.001$) were significant. The participants in the WC panel used significantly more words in all periods combined (4.80, c) compared to the SP (2.87, b) and FR (2.50, a) panels.

As a statistical warning, it is to be noticed that many tests were run to make these comparisons and many variables were correlated with each other, thus the overall study-wise error rate is probably inflated. However, the F statistics related to the Panel factor in both comparisons are large enough to interpret the Panel effect as the major source of difference between the number of words used to characterize the perception.

One hundred and five words (59% compared to total words, 74% compared to total words without hapaxes) have been retained and aggregated into 28 groups of sensory words.

Group label	WC	FR	SP
acid	acid, acid_high, acid_low, fresh, sour	acid, acid_high, acid_low, fresh, sour	acid, acid_low, lively, sour
alcohol	alcohol, alcohol_high, alcohol_low, warm	alcohol, alcohol_high, warm	alcohol, alcohol_high, warm
bitter	bitter	bitter, bitter_low	bitter, bitter_low
body		body, robust, thick	body, character, robust, thick
caramel	balsamic, chocolate		
dry	dry		dry
earthy	earthy, forest, mushroom		
floral	floral, violet		
fresh			fresh
fruity_dry	dried_fruit		
fruity_fresh	berry, blackberry, blackcurrant, blueberry, cherry, crunchy, raspberry, strawberry	berry, blackberry, blackcurrant, cherry, grape, raspberry, strawberry	berry, blackcurrant, blueberry, cherry, crunchy, raspberry
fruity_mature	black_fruit, cooked_fruit, jam, maturity, plum, ripe, ripe_fruit		
fruity_overall	fruity, red_fruit	fruity, red_fruit	fruity, red_fruit
herbaceous	herbaceous, bell_pepper		
intense		aromatic, intense, odourous, pronounced, tasty	aromatic, intense, odourous, tasty
light	bland, intense_low, light, thin, watery	bland, fluid, light, not_strong	bland, light, not_body, watery
long	long	long	
pungent	egg, pungent, sulphur	pungent, vinegar	
spicy	pepper, spicy		spicy
spicy_sweet	cinnamon, clove, liquorice		liquorice
strong	not_balanced, strong	strong	strong
sugary		sugary	sugary
sweet	sweet, round	sweet, round	sweet, round
tannic_high	astringent, drying, green, harsh, rough, sticky_tannic, tannic, tannic_high, young	astringent, astringent_high, drying, fleshy, green, harsh, harsh_low, rough, tannic, tannic_high, young	harsh, harsh_low, rough, tannic, tannic_high, young
tannic_low	easy, tannic_low, smooth, soft	easy, rough_low, smooth, soft, tannic_low, velvety	easy, not_astringent, smooth, soft, tannic_low

vegetal	leave, vegetal, vegetable		
woody_aromas	burnt_toast, cedar, cigare_box, cocoa, coffee, oak, smoky, tobacco, vanilla	burnt_toast, cocoa, coffee, oak, smoky, tobacco, vanilla	cocoa, coffee, oak, smoky, vanilla, tobacco
woody_overall	woody	woody	woody

Table 3: groups of words obtained after Greenacre classification and cited by at least 5% of the panel for at least one wine, by panel.

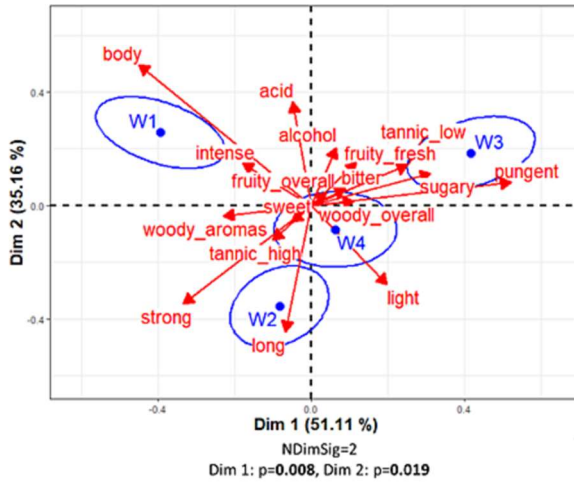
Table 3 shows that some groups of words were relatively similar regardless of the panel: *acid*, *alcohol*, *bitter*, *fruity_fresh*, *fruity_overall*, *sweet*, *strong*, *tannic_high*, *tannic_low*, *woody_aromas*, and *woody_overall*. Among these groups, it is interesting to note that few modulators have been retained (i) because few have been effectively used by the participants, and (ii) because of the disagreement in the use of the modulators. For example, the citation rates of the attributes *acid*, *acid_high*, *acid_low* were highly correlated (WC and FR panels), so the ascending hierarchical classification aggregated them in the same cluster and therefore considered them as synonymous. It was also true for *alcohol* and *bitter*, but not for *tannic*, with two groups being retained (low vs. high).

WC was the only panel to perceive *caramel*, *earthy*, *floral*, *fruity_dry*, *fruity_mature*, *herbaceous*, and *vegetal* aromas, suggesting an increased ability due to expertise in recognition and/or the verbalization of perceived aromas. However, some aroma dimensions seemed to be perceived in a very generic way dissociated from the sensory terms that are expected to constitute them. *Fruity_overall* was perceived differently from other fruity groups (*fruity_fresh*, *fruity_mature*, *fruity_dry*). It was the same with *woody_overall*, which was perceived differently from *woody_aromas*.

SP used *fresh* differently from WC and SP, who associated *fresh* with *acid*. Only the two consumer SP and FR panels used terms related to *intensity*, *body*, and *sugary* (which was different from *sweet*), possibly denoting a different understanding of these terms.

3.3 Between and within product comparisons, by panel

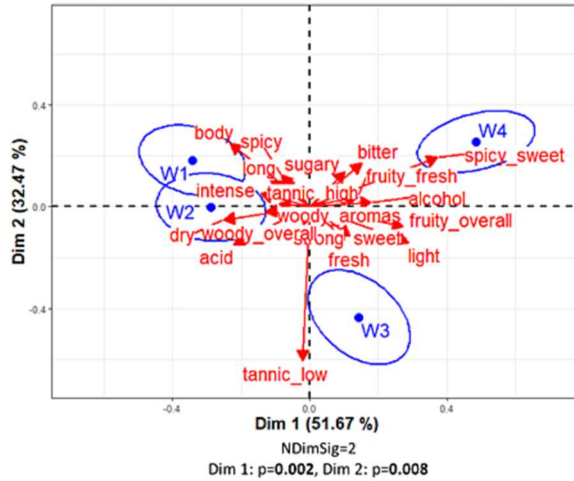
A - mr CA biplot and hypergeometric test, panel FR



	W1	W2	W3	W4
acid	22.64	12.26	19.81	16.04
alcohol	9.43	7.55	11.32	4.72
bitter	13.21	13.21	16.04	13.21
body	8.49	0.00	0.94	2.83
fruity_fresh	7.55	6.60	10.38	5.66
fruity_overall	28.30	26.42	29.25	31.13
intense	13.21	7.55	7.55	11.32
light	13.21	22.64	20.75	26.42
long	4.72	11.32	3.77	9.43
pungent	1.89	4.72	13.21	8.49
strong	17.92	23.58	8.49	13.21
sugary	1.89	1.89	6.60	5.66
sweet	13.21	13.21	11.32	15.09
tannic_high	25.47	29.25	22.64	20.75
tannic_low	3.77	3.77	8.49	4.72
woody_aromas	6.60	4.72	1.89	6.60
woody_overall	7.55	8.49	10.38	8.49

Colored cell: proportion significantly greater than the overall average citation proportion of the attribute
(green: alpha ≤ 0.05, strong evidence; orange: 0.05 < alpha ≤ 0.15, weak evidence)

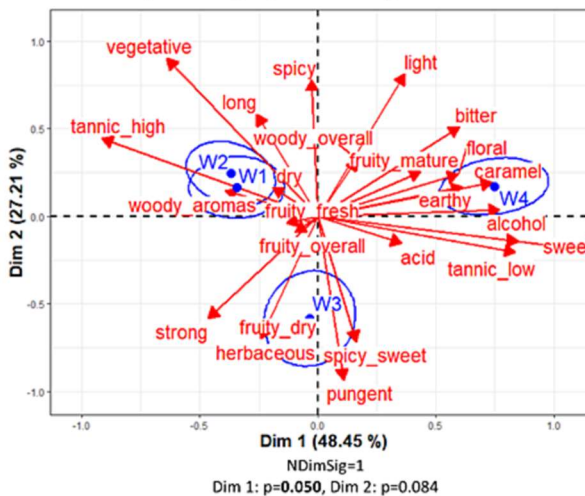
B - mr CA biplot and hypergeometric test, panel SP



	W1	W2	W3	W4
acid	14.29	21.43	15.31	8.16
alcohol	5.10	4.08	7.14	9.18
bitter	11.22	15.31	11.22	20.41
body	16.33	14.29	6.12	9.18
dry	10.20	19.39	9.18	6.12
fresh	8.16	4.08	11.22	8.16
fruity_fresh	5.10	4.08	6.12	8.16
fruity_overall	16.33	29.59	31.63	36.73
intense	25.51	23.47	19.39	18.37
light	5.10	11.22	16.33	17.35
long	6.12	6.12	3.06	4.08
spicy	5.10	3.06	2.04	3.06
spicy_sweet	0.00	0.00	1.02	5.10
strong	20.41	21.43	22.45	19.39
sugary	15.31	13.27	13.27	19.39
sweet	26.53	26.53	34.69	31.63
tannic_high	8.16	9.18	5.10	7.14
tannic_low	2.04	4.08	11.22	0.00
woody_aromas	10.20	9.18	8.16	7.14
woody_overall	19.39	13.27	15.31	11.22

Colored cell: proportion significantly greater than the overall average citation proportion of the attribute
(green: alpha ≤ 0.05, strong evidence; orange: 0.05 < alpha ≤ 0.15, weak evidence)

C - mr CA biplot and hypergeometric test, panel WC



	W1	W2	W3	W4
acid	10.64	31.91	27.66	29.79
alcohol	19.15	2.13	12.77	23.40
bitter	4.26	12.77	6.38	17.02
caramel	10.64	8.51	10.64	21.28
dry	8.51	4.26	4.26	4.26
earthy	8.51	10.64	10.64	19.15
floral	4.26	4.26	4.26	10.64
fruity_dry	4.26	4.26	8.51	2.13
fruity_fresh	31.91	21.28	25.53	23.40
fruity_mature	21.28	23.40	21.28	31.91
fruity_overall	57.45	55.32	57.45	53.19
herbaceous	4.26	4.26	8.51	2.13
light	10.64	6.38	2.13	12.77
long	4.26	14.89	4.26	6.38
pungent	0.00	2.13	6.38	2.13
spicy	23.40	25.53	12.77	23.40
spicy_sweet	4.26	4.26	10.64	6.38
strong	8.51	6.38	10.64	2.13
sweet	0.00	2.13	4.26	8.51
tannic_high	51.06	59.57	38.30	27.66
tannic_low	6.38	4.26	10.64	17.02
vegetative	12.77	12.77	2.13	4.26
woody_aromas	42.55	34.04	31.91	27.66
woody_overall	6.38	10.64	6.38	10.64

Colored cell: proportion significantly greater than the overall average citation proportion of the attribute
(green: alpha ≤ 0.05, strong evidence; orange: 0.05 < alpha ≤ 0.15, weak evidence)

Figure 3: mrCA biplot and table summarizing the results of the hypergeometric test. A: FR panel, B: SP panel, C: WC panel. “NDimSig” is the number of significant dimensions. “p” is the p-value of the dimension test. Red arrows indicate the relative importance and correlation between the descriptors and the dimensions. Blue circles represent the 95% confidence ellipses. Products having no ellipse intersection were perceived differently.

Figure 3A shows that the FR panel multidimensionally discriminated between the four wines. W1 has a greater citation rate for *body*, *intense*, W2 for *long*, *strong*, and *tannic_high*. W3 was perceived very differently: it has greater citation rates for *alcohol*, *fruity_fresh*, *sugary*, *tannic_low* but also *pungent*. W4 was perceived in between W2 and W3, it has a greater citation rate for *light*. All wines were perceived as equally bitter, *fruity_overall*, *sweet*, and *woody* (*overall* and *aromas*).

Figure 3B shows that the SP panel multidimensionally discriminated the two Rioja wines (W3 and W4) but not the Bordeaux (W1 and W2). W1 has greater citation rate for *body*, *woody_overall*, W2 for *acid*, *dry*. W1 and W2 were also perceived (non-significantly) more *intense*, *long*, *tannic_high*, *woody_aromas*. W3 has greater citation rates for *fruity_fresh*, *light*, *sweet*, *tannic_low*. W4 has a greater citation rate for *alcohol*, *bitter*, *fruity_overall*, *light*, *spicy_sweet*, and *sugary*.

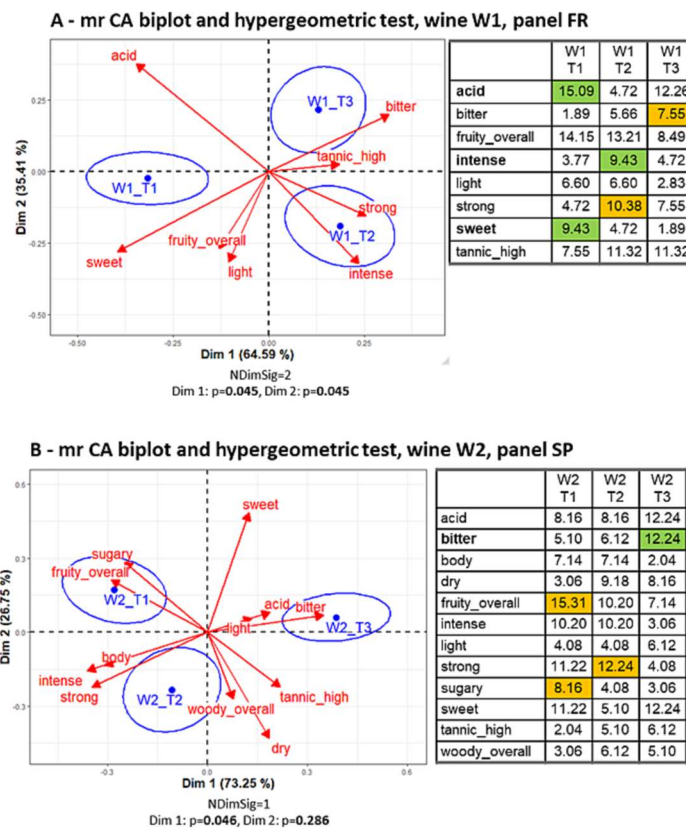
Figure 3C shows that WC panel multidimensionally discriminated the two Rioja wines (W3 and W4) but not the Bordeaux (W1 and W2). W1 has a greater citation rate for *dry*, *fruity_fresh*, *fruity_aromas*, W2 for *acid*, *long*, W1 and W2 for *tannic_high*, *vegetal*. W3 has greater citation rates for *pungent*, *spicy_sweet*, *strong*. W4 has a greater citation rate for *alcohol*, *bitter*, *caramel*, *earthy*, *floral*, *fruity_mature*, *light*, *sweet*, *tannic_low*.

Regarding the common characteristics across the panels, the two Bordeaux W1 and W2 were more associated with terms related to medium or full-bodied wines (common with Vivino reviews and *Wine Advocate* for W1), and W4 was more perceived as a low-bodied, fruity wine (common with *Wine Advocate* review). Some major differences exist between the panels. SP and WC had greater citation rates for *acid* with W2 (common with Vivino reviews), while FR had greater rate *acid* and *dry* for W1. SP and WC had greater citation rates for *alcohol* with W4, while FR had a greater rate for W3, W1 having the greater alcohol content. There was no agreement on *dry*, *sweet*, and *sugary*, questioning the use of these words. *Dry* was opposed to *sweet* in WC panel (where Vivino opposed *dry* to *liquorous* and *sweet* to *acid*), while it was associated with *acid* in SP panel and not used in FR panel. *Sweet* and *sugary* (used only by consumer panels) seem to measure different sensory dimensions. *Light* and *strong* were not fully opposed, which can traduce different clusters of perception or a hedonic use of the words.

The RV coefficient between the product configurations of WC and SP was significant (RV=0.97; RVs=2.03, p=0.04), denoting a great similarity. Indeed, the two panels agreed regarding product discrimination. The RV coefficients between the product configurations of WC and FR (RV=0.78; RVs=-1.27, p=0.79) and SP and FR (RV = 0.80; RVs=-0.46, p=0.62) were non-significant. The FR panel discriminated all product pairs and perceived W2 as closer to W4 than to W1, contrarily to SP and WC which did not discriminate W1 and W2.

The coefficients of correlation between the vectorized citation rates (for group of words common between two panels) were significantly different from zero between WC and FR (r=0.51, p<0.001) and between SP and FR (r=0.39, p=0.001), and non-significantly different from zero between WC and SP (r=0.10, p=0.47).

These results show that even if they perceived the same differences between products, the WC and SP panels did not characterize these differences in the same way. The two consumer panels were closer in terms of general perception and use of terms but disagreed on the characterization of product differences.



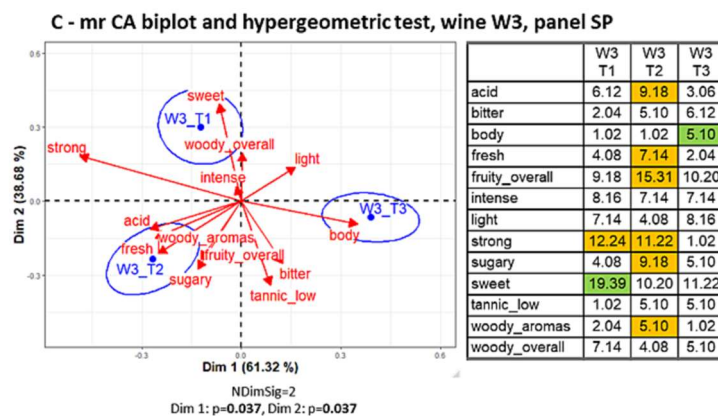


Figure 4: mrCA biplot and table summarizing the results of the hypergeometric test (significant mrCA only). A: wine W1, FR panel; B: wine W2, SP panel; C: wine W3, SP panel. “NDimSig” is the number of significant dimensions. “p” is the p-value of the dimension test. Red arrows indicate the relative importance and correlation between the descriptors and the dimensions. Blue circles represent the 95% confidence ellipses. Periods having no ellipse intersection were perceived differently.

Figure 4A shows that for the FR panel, only W1 has significant differences between periods (thus other mrCAs are not presented). The wine has a greater citation rate for *acid* and *sweet* in period T1 (attack), *intense* and *strong* in period 2 (evolution), and *bitter* in period T3 (finish). However, the citation rates are quite low, denoting a lack of agreement on temporal perception.

Figures 4B and 4C show that, for the SP panel, only W2 and W3 have significant differences between periods (thus, other mrCAs are not presented). As with the FR panel, the citation rates are quite low, denoting a lack of agreement on the temporal perception. There was no obvious product signature, except perhaps for *strong*, which was cited more in T2 (common with FR), and *bitter*, which was cited more in T3 (nonsignificant for W2).

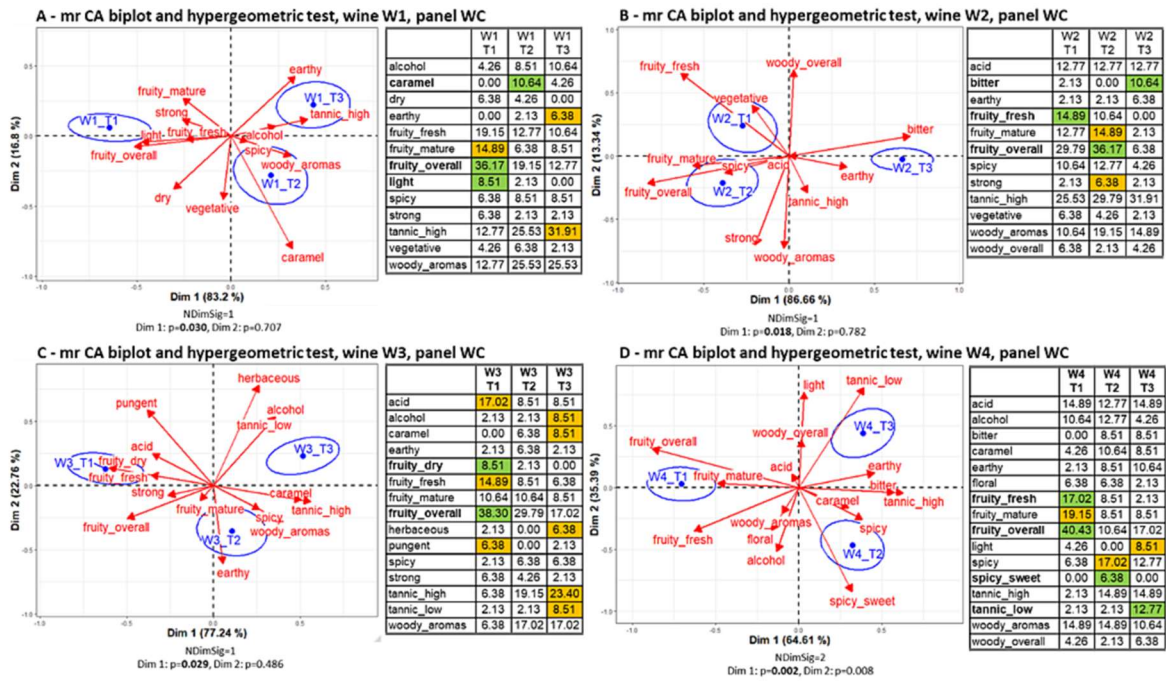


Figure 5: mrCA biplot and table summarizing the results of the hypergeometric test for the WC panel, A: wine W1, B: wine W2, C: wine W3, D: wine W4. “NDimSig” is the number of significant dimensions. “p” is the p-value of the dimension test. Red arrows indicate the relative importance and correlation between the descriptors and the dimensions. Blue circles represent the 95% confidence ellipses. Periods having no ellipse intersection were perceived differently.

Figure 5A-D shows that for the WC panel, all periods have significant differences between periods. The citation rates are higher than for the FR and SP panels, denoting a better consensus and thus a better ability to discriminate the periods. *Fruity (fresh, mature, dry, overall)* was cited more in periods T1 (W1, W3, W4) and T2 (W2). *Caramel* was cited more in T2 (W1) and T3 (W3). *Earthy* (W1) and *herbaceous* (W3) were cited more in T3. *Tannic (high, low)* was cited more in period T3 (WA, W3, W4). W3 received more citations of *tannic_high* and *tannic_low*, which seems to be contradictory; however, this disagreement could probably be interpreted as *tannic_medium*. It is interesting to note that W1 and W2 were not discriminated. Thus, additional analysis was run. The results from the WC panel were aggregated into three contingency tables, one by period, the row variables being the four products and the column variables being the group of words. Then, the differences between periods within each panel x product were tested using the procedure described in 2.2.3.

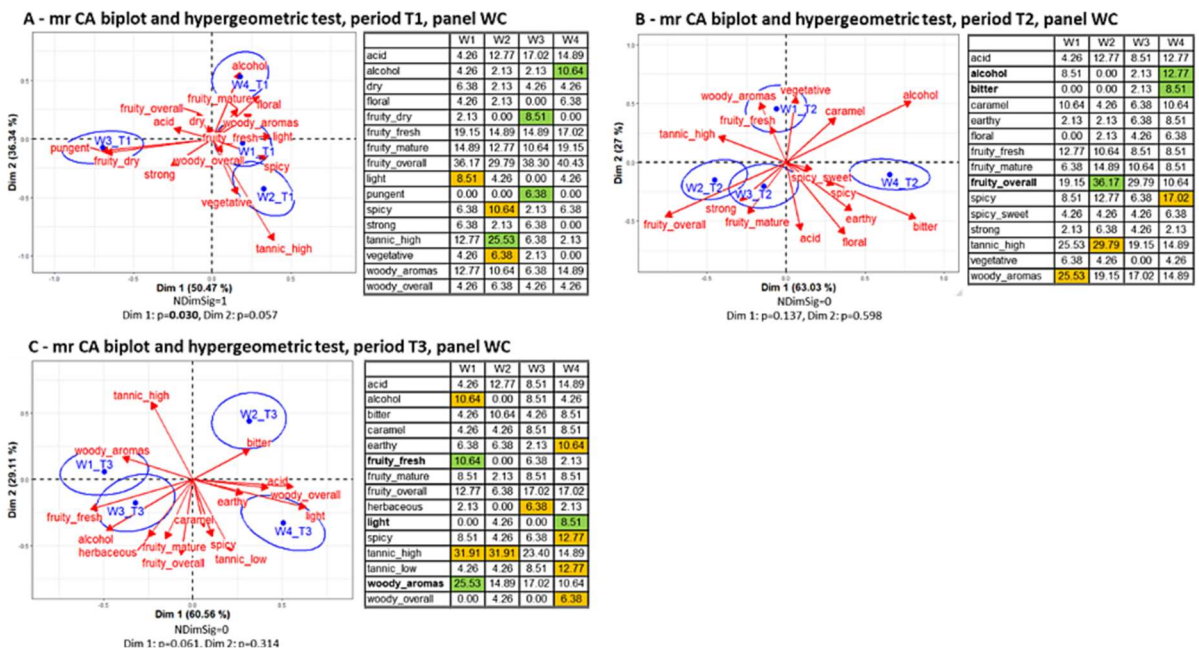


Figure 6: mrCA biplot and table summarizing the results of the hypergeometric test for the WC panel, A: period T1, B: period T2, C: period T3. “NDimSig” is the number of significant dimensions. “p” is the p-value of the dimension test. Red arrows indicate the relative importance and correlation between the descriptors and the dimensions. Blue circles represent the 95% confidence ellipses. Products having no ellipse intersection were perceived differently.

Figure 6A-C shows that period T1 was the period during which the products were the most discriminated. W1 and W2 were better discriminated in this period, W1 received more citations of *light* and W2 more of *spicy*, *tannic_high*, and *vegetal*. Multidimensional differences were not significant in periods T2 and T3; however, there was a small effect (p=0.06) for T3, confirming that when including the temporal aspect, W1 and W2 were perceived differently (finishing more with *alcohol*, *fruity_fresh*, and *woody_ aromas* for W1).

4. Discussion

4.1 Effectiveness of FC-AEF as a method for wine description

The objective of this study was to test the effectiveness of FC-AEF to describe wines. To this end, FC data were processed to extract relevant groups of sensory words from consumers’ descriptions. These groups of words were then used to discriminate between products with and without considering the temporal aspects of sensory perception. Analysis of FC-AEF data relies heavily on textual data analysis. The methodology used performed well but can still be improved, notably by enriching the lexicons of sensory terms used or by including terms not related to an objective sensory description that were not considered in this study.

The hierarchical classification already includes the possibility for words to be grouped with other words sharing the same meaning but with the additional constraint of being statistically

correlated. Examples of words not retained because of the absence of consensual definition and/or classification include for example: “secondary aroma”, “clean”, “patchouli”, etc. Examples of words not retained because they were not classified in the same parent cluster (here *fruity*) include “banana”, “peach”, “apple”, etc. We believe that forcing these elements to aggregate is more likely to add noise than information to the data. Moreover, it is part of the original data analysis strategy which tries to be as less subjective as possible compared to manual grouping. Moreover, it is part of the original data analysis strategy which tries to be less subjective than hand-made grouping. As the data are available in Visalli et al. (2022), other data preprocessing approaches can be tested and compared. With the described approach, a larger number of words (more than 100) was generated compared to the study of (Hayward et al., 2020a), which generated approximately 70 words. The mean number of terms used to describe wines was also slightly greater (more than 2.5 vs. approximately 2.2) compared to the same study.

Many of the aroma terms used by the participants to describe the wines can be found on Noble’s wheel of aromas (Noble et al., 1984), which was also observed by Hayward et al. (2020). However, this does not mean that the terms were interpreted in the same way. Indeed, the words were aggregated into 28 groups sharing similar meanings based on the approach of (Mahieu et al., 2020a). Interestingly, these groups of words do not fully correspond to the classification of the wheel of aromas, notably *fruity*, *woody*, and *spicy*. This confirms the point of view of (Candau & Wathelet, 2011), who stated that olfactory “categories” are not categories from the point of view of classical and prototype theories. It is also possible that *fruity_overall* and *woody_overall* reflect general expectations about wines rather than specific aroma perceptions. *Spicy/spicy_sweet* could either be relative to a generic/specific differentiation or a subclassification of spices. Contrary to the observation of (Vidal, Giménez, et al., 2015), *tannic* seems to be consensually perceived (including low vs. high-intensity levels) and verbalized among the panels. However, *tannic* was the only group of words being differentiated regarding levels of intensity. This means that even if semantic differences in intensities were perceived at an individual level, these differences (*acid*, *bitter*, *alcohol*) were not consistent, and only presence/absence made sense at the panel level. This may be due to the absence of training of the participants or to the fact that the task of rating was not explicitly required. More generally, the groups of attributes can be seen as the most consensual “meta-descriptors” used to describe perception, which includes the physiological and cognitive aspects of sensory perception. In this sense, these meta-descriptors can be relevant in explaining the sensory dimensions of wines that lack definition, such as *body* (Runnebaum et al., 2011) and *freshness* (Morata et al., 2020), or that can be interpreted in different ways, such as *light* (Hayward et al., 2020b).

Both the consumer and WC panels were able to use FC-AEF without familiarization and to discriminate Bordeaux wines from Rioja wines without considering the temporal aspects. The three panels coincided in perceiving the Bordeaux wines as medium- to full-bodied, with Riojas being perceived as lighter and fruitier. Other differences between products were not consensual among the three panels. This could be due to expertise and/or cultural effects (see 4.2), but the two consumer panels presented a relatively low agreement at the panel level. Thus, even if statistical evidence in sensory differences between wines were observed, the results are to be moderated because the citation rates were rather low for the attributes concerned (8 to 23% in FR panel, 5 to 21% in WC panel). As always, questions about the validity and reproducibility of the results cannot be ignored.

Only the WC panel perceived temporal differences during the three phases of tasting (attack, evolution, finish). It is possible that only the WC panel had significant results because some of the participants may have misunderstood the instructions and instead evaluated the wines using more traditional methods (using the olfactory evaluation to describe the attack, the taste and retro-nasal evaluations in mouth to describe the evolution, and the aftertaste evaluation after swallowing to describe the finish). However, this seems unlikely given the results presented in Figure 6. As (Mahieu et al., 2020b) succeeded in identifying temporal changes in solid products (chocolates), it may not be related to FC-AEF, as other temporal methods have sometimes also failed (Wang et al., 2021), but rather to the difficulty of measuring the temporal aspect of a complex product such as wine (Lockshin & Corsi, 2019).

It nevertheless seems reasonable to consider that using FC-AEF to obtain insight into the temporal description of wines requires a minimum of training.

4.2 Effectiveness of FC-AEF as a method for understanding differences in sensory description between different panels

As an example of application, FC-AEF was used for investigating sensory differences perceived by panels varying in culture and expertise. Indeed, FC-AEF allows us to investigate the semantics behind the differences of perception without influencing the answers, avoiding some issues identified by Ares (2018) related to data collection such as the use of scales and “common” predefined vocabulary. For this purpose, the temporal dimension is presumably pointless; however, FC-AEF probably encouraged the participants to focus on the entire tasting experience. Thus, it would be interesting to compare (in terms of richness of vocabulary) the results obtained with the approach of Mahieu et al. (2020a) focusing on sensory modalities (vision, texture, aromas) rather than temporal periods of perception.

Overall, the sensory descriptions of the wines differed depending on the panel, suggesting an impact of expertise and cultural factors. Even if the term “expert” may be too strong for

describing the student WC panel, the results of this study confirm the superior ability of experienced tasters in wine description. The participants in the WC panel used almost twice as many words in all periods combined compared to the SP and FR consumer panels (4.80 vs. 2.87 and 2.50). Only three groups of sensory words were perceived (for at least one wine) by more than 25% of participants in the FR panel (*fruity_overall, light, tannic_high*) and in the SP panel (*fruity_overall, intense, sweet*), versus eight in the WC panel (*acid, fruity_fresh, fruity_mature, fruity_overall, spicy, tannic_high, woody_aromas*). These results are congruent with the findings of (Lawless, 1984), (Urdapilleta et al., 2011) and (Croijmans et al., 2019).

Two limitations must be mentioned. First, the setting effect was combined with the expertise effect, as the students performed the experiment in a sensory lab. Thus, they could have been more focused on the task than the consumer participants, who performed it at home in less controlled conditions. Second, the tasting was not blind; thus, it is not possible to definitely conclude if expertise increased the sensory perception ability or if knowledge influenced the participants in a way that led to more consensual descriptions regarding the expectations about the wines (e.g. *vegetal* as a typical characteristic of Cabernet Sauvignon grape variety for Bordeaux wines).

Only the FR panel was able to discriminate the two Bordeaux wines. Moreover, each panel identified some specific wine characteristics. These concerns included characteristics being perceived by only one consumer panel, such as *long* or *pungent* (FR panel) or *dry, fresh, spicy* and *liquorice* (SP panel) or differences in the characterization of the same wines (*acid, fruity_overall*). Sáenz-Navajas et al. (2013) previously reported the use of different terminology to describe red wine characteristics by French and Spanish trained panelists. Valentin et al. (2021) showed that providing information on the origin of the wines affected more French participants than other nationalities. However, in this study, the cultural differences should be interpreted with caution, as other factors (in addition to the potential validity issue identified in 4.1) may also explain the differences. The participants in the SP panel considered themselves were more knowledgeable about wine than did the participants in the FR panel, and they used more words to describe the wines. In addition, despite the use of a framework combining semantics and statistics for the determination of relevant sensory groups of words, translation included the usual problems that could have affected the results.

5. Conclusion

FC-AEF was used as a sensory descriptive method for wine characterization. It allowed both consumer and expert panels to discriminate the samples, but describing temporal differences in wines was out of the consumers' reach. As FC-AEF requires participants to express their perception in natural language, it avoids some biases relative to the use of scales and

attributes and can be useful for example to study expertise or cultural differences. However, minimal expertise seems to be necessary to obtain robust conclusions, and further studies are required to study the validity of the sensory and semantic differences observed with panels of consumers. The framework used to extract relevant sensory information from FC-AEF could be applied to online consumer wine reviews to compare the differences in conclusions between sensory analysis, wine apps, and wine critics.

Acknowledgments

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Appendix C - Hedonic valence of descriptive sensory terms as an indirect measure of liking: a preliminary study with red wines

This paper, co-written with Michel Visalli, Benjamin Mahieu and Pascal Schlich is partly based on the results of the experiment presented in chapter IV. It has been published in Food Quality and Preference: *Visalli, M., Mahieu, B., Dubois, M., & Schlich, P. (2023). Hedonic valence of descriptive sensory terms as an indirect measure of liking: A preliminary study with red wines. Food Quality and Preference, 108, 104861. <https://doi.org/10.1016/j.foodqual.2023.104861>*

Keywords

Drivers of liking. Ideal product. Food preference. Consumer study. Sentiment analysis. Free-Comment.

Abstract

Predicting and/or understanding consumers' preferences based on sensory descriptions has long been an objective in food science. This article proposes a method to build a dictionary of hedonic valence of sensory attributes related to the perception of red wines. One hundred and sixty-six consumers were asked about their expected liking for products presenting certain sensory attributes. Based on their answers, the hedonic valences of these sensory attributes were computed. Hedonic valences of sensory attributes allow us to determine the characteristics that are expected to positively or negatively influence liking of red wines. Conclusions based on hedonic valences of sensory attributes were compared to those drawn with drivers of liking computed using free-comment and check-all-that-apply questions combined with stated liking scores in three wine-tasting studies. Except for a few exceptions, the conclusions were similar, suggesting that hedonic valence of sensory attributes can be useful to obtain a general overview of expectations for a product category, while drivers of liking can be used to investigate differences specific to a set of products. Hedonic valence of sensory descriptions based on free-comment and check-all-that-apply data were computed at the individual level in an attempt to predict liking without directly asking for it. Hedonic valence of sensory descriptions and stated liking scores were moderately correlated but led to the same ranking of products at the panel level. Thus, it seems that hedonic valence of sensory descriptions can be considered indirect measure of liking. However, further comparisons involving more studies and different food categories are necessary to confirm these promising results.

1. Introduction

It has long been proven that sensory perception is one of the main determinants of consumer preference for food products (Cardello, 1994; Moskowitz & Krieger, 1995; Sørensen et al., 2003). It is therefore natural that many researchers have become interested in explaining or predicting liking based on sensory descriptions. Moskowitz (1972) was among the first to use just-about-right (JAR) scales to measure the appropriateness of the level of specific attributes relative to their subjective ideal product. The method has since been widely used, despite some researchers' criticism. These latter argued that considering the whole consumer experience, i.e., combining data about sensory attribute intensity with liking scores, would better help in product optimization (Plaehn & Horne, 2008). Preference mapping (Carroll, 1972) was the first developed method combining sensory profile measures obtained with a trained panel and consumers' hedonic evaluations. Preference mapping has been extensively used, and many developments have been proposed (Macfie, 2007), but several limitations have been reported regarding some practical aspects of the statistics used (Losó et al., 2012; Worch, 2013).

When preference mapping was created, the scientific community mostly agreed on the facts that consumers were not reliable in sensory characterization (Stone & Sidel, 1993) and that including questions about specific sensory characteristics could bias hedonic scores (Prescott et al., 2011). This paradigm was later questioned (Jaeger et al., 2013; Jaeger & Ares, 2015; Moskowitz et al., 2008), while new methods based on consumer responses emerged. Conversely to preference mapping, these methods asked about sensory description and liking to the same panel of consumers. Ares et al. (2011) used three consumer profiling techniques (intensity scales, check-all-that-apply questions and projective mapping) to identify consumers' ideal product and compared the results to those obtained using external preference mapping. Worch et al. (2013) developed the ideal profile method, asking consumers to rate products on their perceived and ideal intensities for sensory attributes in an attempt to determine the profile of an ideal product. Brard & Lê (2016) proposed an alternative based on pairwise comparisons. Thomas et al. (2015) and Ares et al. (2017) used temporal dominance of sensations (Pineau et al., 2009) and temporal check-all-that-apply (Castura et al., 2016), respectively, to determine temporal drivers of liking. Park et al. (2022) relied on free-comment (ten Kleij & Musters, 2003) to identify drivers of liking. Mahieu et al. (2022a) determined both drivers of liking and ideal product based on FC data and concluded that the two are complementary tools.

Several limitations can be reported with these methods. First, conclusions based on drivers of liking can be difficult to generalize, as they are determined based on a limited number of products and sensory characteristics, conversely to an ideal product. Second, ideal products are virtual products that do not exist and may never have been experienced. Third, the stated

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liking can be biased by several factors. In unblinded conditions, the expectations generated by packages, labels, or information about products have been reported to influence consumers' perceptions (Cardello, 2007; Piqueras-Fiszman & Spence, 2015; Schouteten et al., 2021). Even without explicit information about products, other potentially influencing factors have been reported, including nutritional factors (Trendel & Werle, 2016; Werle et al., 2013), cognitive factors (Lim, 2011; Schifferstein, 1996), social factors (Robinson & Higgs, 2012), location factors (Romeo-Arroyo et al., 2022; Shi et al., 2021), contextual factors (Etzi et al., 2022), etc. These limitations could explain why liking is a poor predictor of consumer choices (Giacalone et al., 2022).

As an alternative to liking, some authors recommend indirect measures (Greenwald & Banaji, 1995; Lamote et al., 2004). Thus, recent years have seen an increased use of perceptual measures that go beyond liking (Giacalone et al., 2022), most of them focusing on emotional valence or arousal (Meiselman, 2021b). Among the techniques allowing the measurement of emotional valence is sentiment analysis. Sentiment analysis is widely used to automatically determine the emotional valence in a corpus of text (Mohammad, 2016). Sentiment analysis is well adapted to FC; thus, it has been transposed to food science in different ways. Vidal, Ares, et al., (2015) analyzed Twitter food-related data, highlighting the insights provided by content analysis but also identifying limitations such as the time-consuming procedure for data analysis. (Z. Chen et al., 2021) combined text mining with Syuzhet (Jockers, 2020), a generic dictionary of valenced words, to identify basic emotions related to meat alternatives. (Luc et al., 2020) proposed Free-JAR profiling as an adaptation of JAR based on FC and computed sentiment scores using sentimentR (Rinker, 2015), another generic dictionary. Visalli et al. (2020a) investigated machine-learning as an alternative to dictionaries to compute sentiment scores based on food descriptions collected with FC. They correlated these scores with liking scores and produced mitigated conclusions, leading them to wonder whether a classifier specifically trained on sensory data would have given better results. Luc et al. (2022) filled in the gap and trained a classifier based on Free-JAR data to compute valences. Their results were promising, but the authors pointed out that the amount of data collected in sensory analysis could not be large enough to ensure robust performances of machine-learning techniques.

Different from emotional valence is the concept of hedonic valence. Most authors associated hedonic valence with facial responsiveness to pleasant or unpleasant odours (Soussignan & Schaal, 1996; Wagner et al., 2013; Yamamoto et al., 2021). Grosselin et al. (2018) defined it as the degree to which a represented food evokes pleasure or displeasure and measured it using a Likert scale. They showed that emotional and hedonic valences, although globally correlated, can be differentiated. In Grosselin's study, hedonic valence was established at the

product level, but it could have been at the sensory attribute level inside a specific product space.

Based on this idea, this article is a continuation of the work of Visalli et al. (2020a) aiming at indirectly measuring liking based on consumers' descriptions. To this end, a dictionary of hedonic valences of sensory attributes specific to red wines was created based on consumers' expected level of liking for products presenting these sensory attributes. The authors hypothesize that: (H1) hedonic valences of sensory attributes can be used to obtain an overview of the determinants of preference for an entire product space, such as red wines; and (H2) hedonic valences of sensory descriptions computed based on consumers' free-comments can be proxies or indirect measures of liking. To test these hypotheses, three datasets from previously published studies involving red wine sensory descriptions and hedonic evaluations by panels of consumers are used. To test H1, the conclusions related to characteristics driving consumers' preferences obtained with drivers of liking and hedonic valences of sensory attributes are compared. To test H2, the conclusions related to product discrimination obtained with stated liking and hedonic valences of sensory descriptions are compared. Finally, the pros and cons of this new approach are discussed.

2. Materials and methods

2.1 Protocol

2.1.1 Datasets on red wines including FC and liking data (previous studies)

The data described in Visalli et al. (2022b) and Mahieu et al. (2020a) have been used. Both investigated French consumers' sensory perception of wines in the home context in unblinded conditions. Dataset A includes FC tasting descriptions and liking data from 106 French consumers for four red PDO (protected denomination of origin) wines: two Bordeaux (W1 and W2) and two Rioja (W3 and W4). Dataset B includes FC tasting descriptions and liking data from 60 consumers for four different red wines: one Bordeaux (Bor), one Beaujolais (Gam), one Languedoc (Lan) and one Val de Loire (Val). Dataset C includes check-all-that-apply (CATA) (Adams et al., 2007) tasting descriptions and liking data collected from 60 consumers (different from dataset B) on the same products.

2.1.2 Selection of words used for building the dictionary of hedonic valences of sensory attributes

To build the dictionary of hedonic valences of sensory attributes, a preliminary step consisted of selecting a list of attributes as representative as possible of the verbatim words used to describe the taste of red wines. Thus, this list had to include the words that were among the most frequently used by consumers and that had the least ambiguous possible meanings. To

avoid the lassitude of the participants when filling out the questionnaire (see 2.1.4), the number of attributes included in the list also had to remain limited.

The initial selection included all the attributes kept after data pretreatment (see 2.2.1) of datasets A, B, and C. Then, the selection was refined, and the least cited terms were either removed because of ambiguous meaning (example: *Crunchy*, *Green*, *Fleshy*) or aggregated with other terms having the same meaning (example: *Long* and *Persistent*). For clarity, initial translations from French to English have been homogenized between datasets (see 3.1). Due to differences in linguistic nuances between English and French, “*Sugary*” (in French: “sucré”, exclusively related to basic taste) was differentiated from “*sweet*” (in French: “doux”, not exclusively related to taste).

2.1.3 Participants recruited for the building of the lexicon of hedonic valences of sensory attributes

The consumers were recruited through a mailing campaign using PanelSens, a database registered in the ChemoSens Platform's PanelSens and declared to the relevant authority (Commission Nationale Informatique et Libertés—CNIL— authorization number 1148039). The emails were sent to 3 500 adult consumers. The only criterion for participation was to consume red wine at least once a month. The consumers were informed that the questionnaire would take approximately five minutes and that they would not be compensated. All consumers who agreed to participate had to complete an informed consent form before receiving an e-mail containing a personal link allowing them to connect to an online questionnaire created using TimeSens© software 2.0 (INRAE, Dijon, France).

2.1.4 Experimental procedure

The questionnaire consisted of the five phases described below.

Instruction screen

After having accepted the conditions of the study, the participants were informed that they would have to answer questions related to the sensory attributes of red wines always formulated in the same way, with an example: “I like red wines that have [fruity aromas]” (the part between square brackets changed for each attribute). Five possible answers (Likert scale) were presented as buttons labeled “Strongly disagree”, “Disagree”, “Neither agree nor disagree”, “Agree”, “Strongly agree”. The participants were warned that as soon as they clicked on one of the buttons corresponding to one of the answers, they would go to the next question without the possibility of going back.

Warm-up screen

The instructions were illustrated with a warm-up measurement screen (Figure 1).

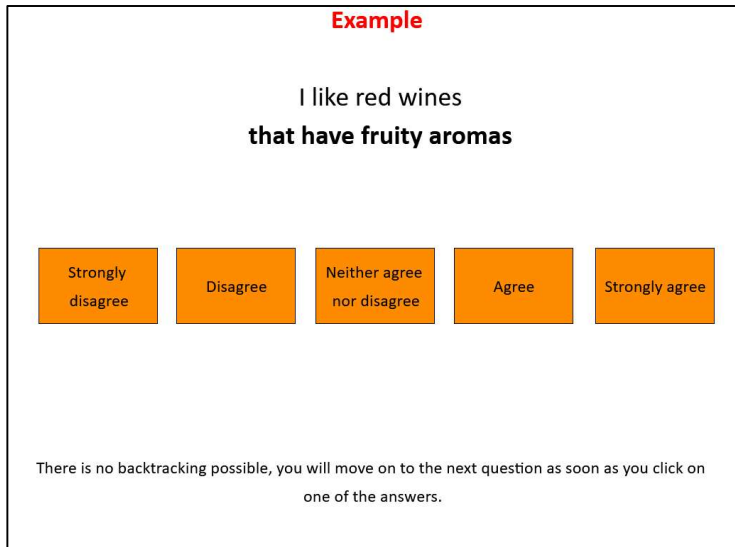


Figure 1: Warm-up screen for hedonic valence of sensory attributes measurement

Measurement screens (repeated for each sensory attribute)

Then, for each selected sensory attribute, the question was presented as shown in Figure 2.

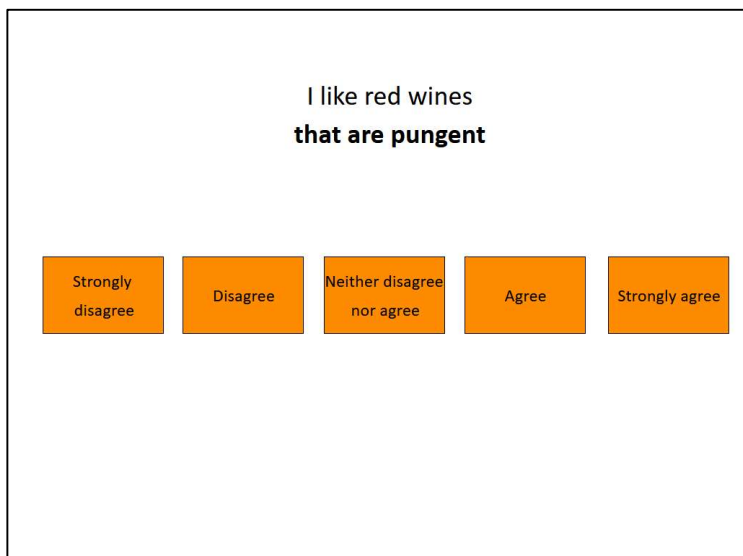


Figure 2: screen for hedonic valence of sensory attributes measurement

The sensory attributes were presented in a randomized order. To check the consistency of participants' answers, two attributes were replicated: *Vegetable* and *TannicLow*. These attributes were chosen because their hedonic valence were not expected to be obviously positive or negative.

Attitudes towards wine

Once they had answered the questions about the hedonic valence of sensory attributes, the participants were questioned about their attitude towards wine. Seven questions were asked in a randomized order. The wording of the questions and answers are shown in Table 1.

Question	Possible answers
I have already taken introductory courses in wine tasting	Yes; No
I use wine apps to help me decide which wine to buy	Yes; No
I use wine professional expert ratings (wine reviews, point scores, medals and awards) to help me decide which wine to buy	Yes; No
I am very interested in wine	Likert scale (“Strongly disagree”, “Disagree”, “Neither agree nor disagree”, “Agree”, “Strongly agree”)
I would describe myself as a wine connoisseur	Likert scale (same modalities as previous question)
How much does your household spend on wine each month?	0; 50€ or less; 51 to 100€; 101 to 150€; More than 150€
How often do you drink wine at home?	“Every day”; “At least once a week”; “At least once a month”; “Less than once a month”; “Never”

Table 1: Questions asked to the participants

Individual characteristics

Finally, the participants were questioned about their age and gender.

2.2 Data analysis

Statistical analyzes were performed using R 4.1.0 software (R Core team, 2017). All tests were performed at alpha = 5%.

2.2.1 Data pretreatment of datasets A, B and C

Detailed comments about the sensory descriptions of datasets A can be found in Visalli et al. (2022b) and B and C in Mahieu et al. (2020a).

Sensory attributes (FC and CATA) were *a posteriori* aggregated into using the methodology presented in Greenacre (1988) and exemplified in Mahieu et al. (2020a). The principle consisted in grouping sensory attributes depicting the same information based on successive ascending hierarchical classifications, until no grouping was possible. Sensory attributes could be aggregated if and only if they conveyed the same meaning and belonged to the same segment of the classification. These groups of sensory attributes constitute “sensory concepts” which can be seen as the result of both a statistical and a semantic grouping. If no grouping was possible, a sensory concept can be constituted of a single sensory attribute. Sensory concepts could be different from one dataset to another. For a given dataset, sensory attributes within the same sensory concept are assumed to be (i) synonymous and substitutable for each other; and (ii) different from the sensory attributes present in other sensory concepts. The sensory concepts extracted from the three datasets are shown in Table 2.

Dataset A	Dataset B	Dataset C
Long	Woody	Alcohol
Strong	RedFruit	Light
Sugary	[Fruity; Blackberry]	Astringent
Sour	[Redcurrant; Cherry; Raspberry]	Bitter
Alcohol	Short	Intense
Bitter	[Sweet; Fresh; Light]	Balanced
Body	[Alcohol; Strong]	Sweet
[Fruity; RedFruit]	Harsh	Long
[Blackberry; Blackcurrant; Cherry; Raspberry; Strawberry]	Pungent	Sour
Intense	Sour	RedFruit
[Light; IntenseLow]	Animal	RipeFruit
[Pungent; Vinegar]	[Balanced; Round]	[Herbaceous; Vegetable]
Sweet	Astringent	Blackfruit
[Tannic; Astringent; Harsh]	Long	[Pepper; Spicy]
[TannicLow; Velvety]	Blackcurrant	[Woody; Burned]
[Oak; Smokey; Vanilla; Tobacco; BurntToast; Cocoa; Coffee]	Bitter	Undergrowth
Woody	Pepper	Animal
	Tannic	
	Spicy	
	Dry	

Table 2: Sensory concepts extracted from datasets A, B and C (between square brackets: sensory attributes aggregated into a same sensory concept)

For example, [*Tannic; Astringent; Harsh*] should be read as the sensory concept including the sensory attributes *Tannic*, *Astringent* and *Harsh*.

2.2.2 Characterization of the participants

To characterize the panels, attitudes towards wines and individual characteristics of participants were summarized as frequencies. The mean duration required for completing the questionnaire was calculated.

2.2.3 Computation of the hedonic valence of sensory attributes of red wines

The answers to Likert scales for each sensory attribute were coded -2 (strongly disagree), -1 (disagree), 0 (neither agree nor disagree), 1 (agree), and 2 (strongly agree). The choice of a bipolar scale was made to make the interpretation of hedonic valences of sensory attributes easier (positive valence: score greater than 0, negative valence: score lower than 0). Then, frequencies for each “attribute x answer” were computed.

Hedonic valences were computed for each sensory attribute as the averages of the related Likert scores (Kuiper & Hood, 2019; Rajput et al., 2016; Tian et al., 2018), and then compared to 0 using t-tests (Vieira, 2016). As the number of subjects was large, the Cohen effect size were also indicated when the t-tests were significant (Lakens, 2013). Groups of sensory attributes with the same mean hedonic valence were constituted based on the results of Tukey’s HSD post-hoc test of the ANOVA model: *Hedonic valence of sensory attribute = Subject + Attribute + error*.

2.2.4 Computation of drivers of liking and comparison with hedonic valences of sensory attributes

The drivers of liking of studies A, B and C were computed as proposed in Mahieu et al. (2022b).

The liking scores were regressed against the subject (random effect), the product and the sensory concept factors (0: absence; 1: presence) using a mixed linear model fitted on all evaluations (Example model for dataset A: $Liking = Product + Subject + Long + \dots + Woody + error$). The regression loading was considered an estimate of the impact of the sensory concept on the liking scores.

The conclusions related to characteristics driving consumers' preferences obtained with hedonic valences of sensory attributes and drivers of liking were qualitatively compared.

2.2.5 Computation of hedonic valences of sensory descriptions and comparison with stated liking scores

The computation of hedonic valences of sensory descriptions is inspired from scores of sentiment analysis. The more basic approach consists of computing the following score for each sentence: $(N_p - N_n)/(N_p + N_n)$, where N_p is the number of positively valenced words and N_n the number of negatively valenced words (Deng et al., 2014). This score is unsuitable for sensory data because it would (i) give the same binary weight (1 or -1) to all sensory attributes regardless of their hedonic valence; and (ii) ignore the fact that some attributes belong to the same sensory concept (see 2.2.1) and thus could contribute more than they should. Several alternative scores have been proposed in the literature, depending on the context (Deng et al., 2014). Thus, the authors chose (i) to give higher weights to sensory attributes depending on the intensity of hedonic valences (for example: *Vinegar* and *Alcohol* have both negative hedonic valences but with very different intensities); and (ii) to give the same weight to each sensory concept (for example: all sensory attributes in [*Blackberry*; *Blackcurrant*; *Cherry*; *Raspberry*; *Strawberry*] can be considered synonymous with "berry" and thus contribute as a single attribute).

Figure 3 describes the computation of the hedonic valence of a sensory description for one subject and one product.

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Subject	Product	Sensory concept	Citation	Hedonic valence of the concept
S01	Lan	Alcohol	0	-
S01	Lan	Light	1	$HV_1 = HV_{\text{Light}}$
S01	Lan	Astringent	0	-
S01	Lan	Bitter	0	-
S01	Lan	Intense	1	$HV_2 = HV_{\text{Intense}}$
S01	Lan	Balanced	0	-
S01	Lan	Sugary	0	-
S01	Lan	Long	0	-
S01	Lan	Sour	0	-
S01	Lan	RedFruit	0	-
S01	Lan	RipeFruit	0	-
S01	Lan	[Herbaceous; Vegetable]	1	$HV_3 = \text{mean}(HV_{\text{Herbaceous}}, HV_{\text{Vegetable}})$
S01	Lan	BlackFruit	0	-
S01	Lan	[Pepper; Spicy]	1	$HV_4 = \text{mean}(HV_{\text{Pepper}}, HV_{\text{Spicy}})$
S01	Lan	[Woody; Burned]	0	-
S01	Lan	Undergrowth	0	-
S01	Lan	Animal	0	-
				$HVD_{S01, Lan} = \text{mean}(HV_1; HV_2; HV_3; HV_4)$

Figure 3: Computation of the hedonic valence of a sensory description (HVD) for subject S01 and product S01.

First, the hedonic valence of each sensory concept was computed as the average of the hedonic valence of each sensory attribute contributing to the concept. Second, for each “subject x product” evaluation (FC or CATA), the hedonic valence of the sensory description was computed as the average of hedonic valences of the sensory concepts cited. Sensory concepts not cited do not intervene in the computation of hedonic valences of sensory descriptions, i.e. they do not count as zero. Hedonic valences of sensory descriptions range between -2 and 2.

For each dataset, the Pearson coefficients of correlation between the hedonic valences of sensory descriptions and stated liking scores (at the subject level) were computed and tested against 0. Then, the differences between products’ mean scores were compared using an ANOVA model, i.e., *hedonic valence of sensory description or Liking = Subject + Product + error*, followed by a Tukey’s HSD post-hoc test (to consider only if product factor was significant).

3. Results

Data are available on Mendeley data (Visalli, 2022).

3.1 Characterization of the participants

A total of 169 consumers participated, and 166 completed the questionnaire. Table 3 summarizes their characteristics.

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Question	Answer
Age	18-35: 23% 36-55: 31% 56 and more: 46%
Gender	Women: 43% Men: 57%
How often do you drink wine at home?	Daily: 8% Weekly: 57% Monthly: 30% Less than monthly: 5%
I use wine apps to help me decide which wine to buy	Yes: 17% No: 83%
I use wine professional expert ratings (wine reviews, point scores, medals and awards) to help me decide which wine to buy	Yes: 51% No: 49%
I have already taken introductory courses in wine tasting	Yes: 36% No: 64%
I am very interested in wine	Yes: 71% No: 7% No opinion: 22%
I would describe myself as a wine connoisseur	Yes: 23% No: 31% No opinion: 46%
How much does your household spend on wine each month?	0€: 3% 50€ or less: 64% 51 to 100€: 27% 101 to 150€: 6%

Table 3: Characteristics of the participants

Filling the questionnaire took less than five minutes as expected (median = 4 min, 48 s).

3.2 Hedonic valence of sensory attributes of red wines

Attribute	Question	-2	-1	0	1	2	Mean	Sd	P-value	Group	D
Balanced	that are balanced	0	0	11.1 8	60.5 3	28.2 9	1.17	0.6 1	<0.00 1	v	L
Long	that are long in mouth	1.32	1.97	9.21	56.5 8	30.9 2	1.14	0.7 6	<0.00 1	v	L
RedFruit	with red fruit aromas	0.66	5.26	9.87	60.5 3	23.6 8	1.01	0.7 8	<0.00 1	uv	L
Body	with body	1.32	4.64	11.2 6	60.9 3	21.8 5	0.97	0.8 0	<0.00 1	uv	L
Blackcurrant	with blackcurrant aromas	0	3.97	16.5 6	60.2 6	19.2 1	0.95	0.7 2	<0.00 1	uv	L
Fruity	with fruity aromas	0	4.64	12.5 8	67.5 5	15.2 3	0.93	0.6 8	<0.00 1	uv	L
Round	that are round	1.32	1.99	17.8 8	59.6	19.2 1	0.93	0.7 5	<0.00 1	uv	L
Velvety	with smooth, velvety tannins	0	1.97	28.2 9	51.9 7	17.7 6	0.86	0.7 2	<0.00 1	tuv	L
Blackberry	with blackberry aromas	0.66	7.24	21.0 5	55.2 6	15.7 9	0.78	0.8 2	<0.00 1	stuv	L
Intense	that are aromatically intense	1.32	6.58	19.0 8	58.5 5	14.4 7	0.78	0.8 2	<0.00 1	stuv	L
RipeFruit	with ripe fruit aromas	1.32	7.28	23.1 8	54.3	13.9 1	0.72	0.8 4	<0.00 1	rstu	L
BlackFruit	with black fruit aromas	2.65	7.95	22.5 2	51.6 6	15.2 3	0.69	0.9 2	<0.00 1	rstu	M
Cherry	with cherry aromas	3.31	7.95	19.2 1	56.9 5	12.5 8	0.68	0.9 1	<0.00 1	qrstu	M
Raspberry	with raspberry aromas	3.31	8.61	21.1 9	50.9 9	15.8 9	0.68	0.9 6	<0.00 1	qrstu	M

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Redcurrant	with redcurrant aromas	1.97	11.1 8	22.3 7	51.3 2	13.1 6	0.63	0.9 2	<0.00 1	pqrst u	M
Woody	with woody aromas	3.97	11.9 2	23.8 4	49.6 7	10.6	0.51	0.9 7	<0.00 1	opqrs t	M
Undergrowth	with undergrowth aromas	4.61	15.7 9	25	44.7 4	9.87	0.39	1.0 2	<0.00 1	nopqr s	S
Light	that are light	1.99	12.5 8	38.4 1	38.4 1	8.61	0.39	0.8 9	<0.00 1	nopqr s	S
Strawberry	with strawberry aromas	4.64	18.5 4	26.4 9	38.4 1	11.9 2	0.34	1.0 6	<0.00 1	nopqr	S
Fresh	that are fresh	3.31	15.2 3	33.1 1	41.0 6	7.28	0.34	0.9 4	<0.00 1	nopqr	S
Spicy	with spicy aromas	5.26	17.7 6	26.3 2	43.4 2	7.24	0.30	1.0 2	<0.00 1	mnop q	S
Sweet	that are sweet	3.95	15.1 3	35.5 3	38.1 6	7.24	0.30	0.9 5	<0.00 1	mnop q	S
Strong	that are strong	3.31	19.8 7	29.8	43.0 5	3.97	0.25	0.9 3	0.001	lmnop	S
Tannic	that are tannic	9.21	16.4 5	26.3 2	40.7 9	7.24	0.20	1.0 9	0.023	lmno	N
Oak	with oak aromas	4.61	23.6 8	28.2 9	36.1 8	7.24	0.18	1.0 2	0.034	klmno	N
TannicLow	with low tannin	3.31	29.1 4	32.4 5	30.4 6	4.64	0.04	0.9 6	0.611	jklmn	N S
TannicLow2	with low tannin	3.95	31.5 8	26.3 2	32.8 9	5.26	0.04	1.0 1	0.63	jklmn	N S
Burned	with burned aromas	8.61	25.1 7	28.4 8	31.7 9	5.96	0.01	1.0 8	0.88	ljkln	N S
BurntToast	with burnt toast aromas	7.89	28.9 5	29.6 1	28.9 5	4.61	-0.07	1.0 4	0.437	hijklm	N S
Dry	that are dry	8.55	27.6 3	32.2 4	26.3 2	5.26	-0.08	1.0 5	0.353	hijklm	N S
Alcohol	with high alcohol	5.26	25	45.3 9	22.3 7	1.97	-0.09	0.8 7	0.195	hijklm	N S
Vanilla	with vanilla aromas	9.27	29.8	31.7 9	23.1 8	5.96	-0.13	1.0 6	0.128	hijkl	N S
Cocoa	with cocoa aromas	9.87	30.2 6	28.2 9	27.6 3	3.95	-0.14	1.0 6	0.094	hijkl	N S
Smokey	with smoky aromas	9.27	35.1	27.1 5	25.1 7	3.31	-0.22	1.0 3	0.01	ghijk	S
Coffee	with coffee aromas	12	32	30	24	2	-0.28	1.0 2	0.001	ghij	S
Animal	with animal aromas	13.9 1	32.4 5	31.1 3	17.8 8	4.64	-0.33	1.0 7	<0.00 1	fghij	S
Sugary	that are sugary	12.5	37.5	28.9 5	15.7 9	5.26	-0.36	1.0 6	<0.00 1	fghi	S
Herbaceous	with herbaceous aromas	9.87	42.1 1	26.3 2	19.7 4	1.97	-0.38	0.9 8	<0.00 1	efgh	S
IntenseLow	with low aromatic intensity	11.1 8	50.6 6	25	11.8 4	1.32	-0.59	0.8 9	<0.00 1	defg	M
Pepper	with pepper aromas	14	47.3 3	24	12.6 7	2	-0.59	0.9 5	<0.00 1	defg	M
Astringent	that are astringent	20.3 9	36.8 4	26.3 2	15.7 9	0.66	-0.61	1.0 0	<0.00 1	defg	M
Harsh	that are harsh	25.6 6	37.5	20.3 9	13.8 2	2.63	-0.70	1.0 8	<0.00 1	def	M
Vegetable2	with vegetable aromas	19.0 8	47.3 7	25	7.89	0.66	-0.76	0.8 7	<0.00 1	cde	L
Vegetable	with vegetable aromas	21.0 5	48.6 8	19.0 8	9.21	1.97	-0.78	0.9 5	<0.00 1	cd	L
Tobacco	with tobacco aromas	35.5 3	35.5 3	18.4 2	10.5 3	0	-0.96	0.9 8	<0.00 1	bcd	L

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Sour	that are sour	33.7 7	50.9 9	10.6	4.64	0	-1.14	0.7 8	<0.00 1	abc	L
Bitter	that are bitter	36.8 4	49.3 4	12.5	1.32	0	-1.22	0.7 1	<0.00 1	ab	L
Pungent	that are pungent	50.6 6	40.1 3	3.95	5.26	0	-1.36	0.7 9	<0.00 1	a	L
Short	that are short in mouth	50.6 6	41.4 5	5.92	1.97	0	-1.41	0.6 9	<0.00 1	a	L
Vinegar	with vinegar aromas	54.3	35.1	8.61	1.99	0	-1.42	0.7 3	<0.00 1	a	L

Table 4: Hedonic valence of sensory attributes of red wines sorted from the best to the worst. Attribute: name of the sensory attribute; Question: content of the question (translated from French) presented to the participants, preceded by “I like red wines...”; -2 to 2: percentage of occurrence at answer (-2 to 2); Mean: mean hedonic valence of the sensory attribute; Sd: standard deviation, P-value: p-value of the t-test of comparison to 0; Group: Tukey group of the ANOVA; D: Cohen effect size (NS: not significant; N: negligible; S: small; M: medium; L: large).

Table 4 shows the 50 sensory attributes for which the hedonic valences were computed. Forty-two have a hedonic valence significantly different from 0. Sensory attributes with a medium or large positive hedonic valence include *Balanced*, *Long*, *RedFruit*, *Body*, *Blackcurrant*, *Fruity*, *Round*, *Velvety*, *Blackberry*, *Intense*, *RipeFruit*, *BlackFruit*, *Cherry*, *Raspberry*, *Redcurrant* and *Woody*. Sensory attributes having a medium or large negative hedonic valence include *IntenseLow*, *Pepper*, *Astringent*, *Harsh*, *Vegetable*, *Tobacco*, *Sour*, *Bitter*, *Pungent*, *Short* and *Vinegar*. Most positive hedonic valences are related to fruity aromas, and most negative hedonic valences are related to astringency, bitterness and acidity. Duration (*Short* vs. *Long*), intensity (*Intense* vs. *IntenseLow*) and balance (*Balanced*, *Round*, *Velvety* vs. *Harsh*) are also important in determining hedonic valence.

Non-significance for hedonic valences of sensory attributes can be interpreted in two ways: either a majority of participants provided a score of 0 (example: *Alcohol*) or two distinct groups with different preferences exist, one having scored the attribute as positive, the other as negative (example: *Cocoa*, *TannicLow*).

The two replicated attributes (*Vegetable* and *TannicLow*) are in the same group, which indicates consistent ratings at the panel level. All *Fruity*-related attributes except *Strawberry* are also in the same group. This is not the case for *Woody*-related sensory attributes, with *Oak* having a positive hedonic valence and *Smokey*, *Coffee* and *Tobacco* having negative ones. This is the same for *Spicy* (positive) compared to *Pepper* (negative).

3.3 Drivers of liking and comparison with hedonic valences of sensory attributes

Sensory concept	Estimate	Se	t	P-value	Similar conclusion?
[Blackberry; Blackcurrant; Cherry; Raspberry; Strawberry]	0.79	0.32	2.49	0.013	yes
Sugary	0.74	0.40	1.89	0.060	yes but NS
Sweet	0.59	0.24	2.40	0.017	yes
Body	0.56	0.40	1.39	0.165	yes but NS
[Fruity; RedFruit]	0.50	0.16	3.06	0.002	yes
Woody	0.50	0.25	2.00	0.046	yes
Long	0.36	0.27	1.36	0.174	yes but NS
[Oak; Smokey; Vanilla; Tobacco; BurntToast; Cocoa; Coffee]	0.22	0.32	0.67	0.503	incongruous
Intense	0.15	0.24	0.62	0.534	yes but NS
[TannicLow; Velvety]	0.00	0.33	-0.01	0.990	incongruous
[Light; IntenseLow]	-0.04	0.19	-0.22	0.829	incongruous
Strong	-0.09	0.21	-0.45	0.650	no but NS
[Tannic; Astringent; Harsh]	-0.27	0.17	-1.59	0.112	incongruous
[Pungent; Vinegar]	-0.49	0.29	-1.69	0.093	yes but NS
Alcohol	-0.59	0.31	-1.91	0.057	yes but NS
Bitter	-0.63	0.23	-2.78	0.006	yes
Sour	-0.76	0.19	-3.91	0.000	yes

Table 5: Drivers of liking computed on dataset A. Estimate: regression loading; Se: standard error; t: T value; P-value: p-value of the t-test; Similar conclusion: comparison of results between drivers of liking and hedonic valences of sensory attributes.

Table 5 shows the results of the regression ($p < 0.001$; adjusted R^2 : 0.39) allowing us to identify drivers of liking based on FC and the liking data of dataset A. Drivers of liking and hedonic valences of sensory attributes concur that [Blackberry; Blackcurrant; Cherry; Raspberry; Strawberry], Sweet, [Fruity; RedFruit] and Woody are positive drivers of liking, and Bitter and Sour are negative drivers. Some sensory concepts aggregate sensory attributes having different hedonic valences, leading to incongruency: [Oak; Smokey; Vanilla; Tobacco; BurntToast; Cocoa; Coffee], [TannicLow; Velvety], [Light; IntenseLow], [Tannic; Astringent; Harsh], potentially explaining why these attributes are not significant.

Sensory concept	Estimate	Se	T	P-value	Similar conclusion?
[Balanced; Round]	1.21	0.52	2.33	0.021	yes
Long	0.90	0.57	1.59	0.114	yes but NS
Blackcurrant	0.78	0.85	0.92	0.358	yes but NS
RedFruit	0.70	0.48	1.47	0.143	yes but NS
Animal	0.66	1.28	0.51	0.608	no but NS
Spicy	0.38	0.71	0.53	0.594	yes but NS
[Sweet; Fresh; Light]	0.34	0.33	1.03	0.306	yes but NS
Woody	0.32	0.47	0.67	0.504	yes but NS

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Dry	0.29	0.89	0.33	0.743	yes
[Fruity; Blackberry]	0.26	0.35	0.76	0.450	yes but NS
[Redcurrant; Cherry; Raspberry]	0.17	0.59	0.29	0.774	yes but NS
Pepper	0.08	0.70	0.11	0.911	no but NS
Bitter	-0.08	0.62	-0.13	0.897	yes but NS
[Alcohol; Strong]	-0.21	0.36	-0.60	0.549	incongruous
Astringent	-0.61	0.48	-1.27	0.207	yes but NS
Tannic	-0.69	0.49	-1.39	0.167	no but NS
Harsh	-1.11	0.54	-2.05	0.042	yes
Short	-1.12	0.63	-1.78	0.076	yes but NS
Sour	-1.23	0.39	-3.17	0.002	yes
Pungent	-1.43	0.71	-2.01	0.046	yes

Table 6: Drivers of liking computed on dataset B. Estimate: regression loading; Se: standard error; t: T value; P-value: p-value of the t-test; Similar conclusion: comparison of results between drivers of liking and hedonic valences of sensory attributes.

Table 6 shows the results of the regression ($p < 0.001$; adjusted R^2 : 0.22) allowing us to identify drivers of liking based on FC and the liking data of dataset B. With this dataset, only *[Alcohol; Strong]* aggregates attributes having different valences. Regardless of the significance, most conclusions are the same, except for *Animal* and *Pepper* (positive with drivers of liking and negative with hedonic valences of sensory attributes) and *Tannic* (negative with drivers of liking and positive with hedonic valences of sensory attributes).

Sensory concept	Estimate	Se	t	P-value	Similar conclusion?
Balanced	1.33	0.28	4.82	0.000	yes
BlackFruit	0.96	0.26	3.67	0.000	yes
[Pepper; Spicy]	0.54	0.27	1.96	0.051	Incongruous
[Woody; Burned]	0.42	0.27	1.53	0.128	yes but NS
Long	0.40	0.23	1.78	0.077	yes but NS
RedFruit	0.38	0.31	1.23	0.221	yes but NS
Intense	0.37	0.25	1.46	0.146	yes but NS
Animal	0.28	0.36	0.80	0.426	no but NS
Sugary	0.23	0.38	0.61	0.545	yes but NS
Light	0.17	0.32	0.55	0.584	yes but NS
RipeFruit	0.08	0.32	0.25	0.804	yes but NS
Undergrowth	0.06	0.30	0.21	0.833	yes but NS
[Herbaceous; Vegetable]	0.04	0.49	0.08	0.937	no but NS
Alcohol	-0.17	0.25	-0.66	0.509	yes but NS
Astringent	-0.34	0.26	-1.31	0.191	yes but NS
Bitter	-0.37	0.33	-1.12	0.263	yes but NS
Sour	-0.90	0.30	-2.97	0.003	yes

Table 7: Drivers of liking computed on dataset C. Estimate: regression loading; Se: standard error; t: T value; P-value: p-value of the t-test; Similar conclusion: comparison of results between drivers of liking and hedonic valences of sensory attributes.

Table 7 shows the results of the regression ($p < 0.001$; adjusted R^2 : 0.52) allowing us to identify drivers of liking based on CATA and the liking data of dataset C. With this dataset, only [Pepper; Spicy] aggregates sensory attributes having different hedonic valences. Regardless of the significance, most conclusions are similar, except for *Animal* and [*Herbaceous*; *Vegetable*] (positive with drivers of liking and negative with hedonic valences of sensory attributes).

3.4 Hedonic valences of sensory descriptions and comparison with stated liking scores

Product	Liking	HVD
W3 (Rioja)	4.47 a	-0.07 a
W4 (Rioja)	4.88 ab	0.05 ab
W1 (Bordeaux)	5.08 b	0.09 ab
W2 (Bordeaux)	5.20 b	0.13 b

Table 8: Results of ANOVA for comparison of products based on stated liking scores and hedonic valences of sensory descriptions for dataset A. Mean values are indicated, letters being the groups of Tukey's post-hoc test.

Table 8 shows that conclusions based on stated liking ($F_{\text{Product}}=6.93$, $p < 0.001$; $F_{\text{Subject}}=2.17$, $p < 0.001$) and hedonic valences of sensory descriptions ($F_{\text{Product}}=2.82$, $p=0.039$; $F_{\text{Subject}}=1.85$, $p < 0.001$) were comparable in dataset A. Mean hedonic valences of sensory descriptions were ordered in the same way as the mean liking scores, but liking was more discriminative. The correlation between stated liking scores and hedonic valences of sensory descriptions at the individual level was 0.48 ($p < 0.001$), which corresponds to a moderate effect size (Cohen, 2013).

Product	Liking FC	HVD FC	Liking CATA	HVD CATA
Lan	5.30 a	0.00 a	5.28 a	0.17 a
Val	5.37 a	-0.12 a	5.58 ab	0.25 ab
Gam	6.00 ab	0.05 ab	5.90 ab	0.27 b
Bor	6.60 b	0.30 b	6.18 b	0.29 b

Table 9: Results of ANOVA for comparison of products based on stated liking scores and hedonic valences of sensory descriptions for datasets B (FC) and C (CATA). Mean values are indicated, letters being the groups of Tukey's post-hoc test.

Table 9 shows that conclusions based on stated liking (dataset B: $F_{\text{Product}}=5.99$, $p < 0.001$; $F_{\text{Subject}}=1.24$, $p=0.146$; dataset C: $F_{\text{Product}}=3.44$, $p=0.018$; $F_{\text{Subject}}=2.34$, $p < 0.001$) and hedonic valences of sensory descriptions (dataset B: $F_{\text{Product}}=5.55$, $p=0.001$; $F_{\text{Subject}}=1.32$, $p=0.086$;

dataset C: $F_{\text{Product}}=4.53$, $p=0.004$; $F_{\text{Subject}}=1.63$, $p=0.008$) were also very comparable in datasets B and C. The ranks of Lan and Val were inverted in dataset B, but the discrimination was similar. Mean hedonic valences of sensory descriptions were ordered in the same way as the mean liking scores for dataset B, and with this dataset hedonic valences of sensory descriptions were more discriminative. The correlations between stated liking scores and hedonic valences of sensory descriptions at the individual level were 0.42 (dataset B, $p<0.001$) and 0.41 (dataset C, $p<0.001$), which corresponds to medium effect sizes.

4. Discussion

4.1 Building of the dictionary of hedonic valences of sensory attributes

The most crucial resource for dictionary-based valence approaches is the dictionary used. This article proposes a method to associate a score of hedonic valence to each word of a pre-existing lexicon related to the sensory perception of red wines. To produce this dictionary, consumers were asked for their expected liking for products presenting certain sensory characteristics. This approach presents numerous advantages. Compared to Visalli et al., (2020a) or Chen et al. (2021), the obtained valence scores are not generic but specific to the object of interest, i.e., liking of red wines. Compared to the machine-learning algorithm of Luc et al. (2022) or the approach described in Liapakis et al. (2020), the present method does not require a massive amount of collected and annotated data. Moreover, in this study, no tasting was required because the sensory characteristics were determined based on existing literature. Thus, the hedonic valences of sensory attributes were simply obtained thanks to a questionnaire easy to deliver and fill out by participants (less than five minutes on average). It enabled us to “screen” a large number of red wine sensory attributes at a low cost. However, a minimum knowledge about the sensory characteristics of the product category is needed, and not all product categories have been studied as much as wines. In this case, lexicon-generating studies are still required. To be as representative as possible of the red wine product space, other attributes, such as those of Noble’s wheel of aroma (Noble et al., 1987), should be included. This study highlights that it would be preferable to ask for hedonic valence for specific sensory attributes rather than a generic group of attributes such as *Woody* or *Spicy* that could aggregate attributes with different valences. Similarly, it could be interesting to include intensity levels for nonaroma attributes. Indeed, this study shows that sensory attributes implicitly referring to an intensity level (for example *Tannic*, *TannicLow* and *Astringent*) can have different valences. Thus, the hedonic valences of sensory attributes such as *Sour*, *Bitter*, *Alcohol* (etc.) could be asked about at different levels of intensity (for example: “I like red wine with low bitterness”, “I like red wine with high bitterness”, etc.).

The selection of consumers is also very important. In this study, all participants were recruited in Dijon and surroundings; thus, most of them were probably familiar with Burgundy wines. As a result, it is probable that the hedonic valences of sensory attributes cannot be generalized for all wine consumers, as their expectations could be very different. In addition, the participants have not been compensated for the study; thus, they might have been more involved than the average in wine evaluation, which could also limit the generalizability of the results. These two limitations can be circumvented by more classical recruiting. Other limitations of the presented approach are the corollaries of its advantages. The questionnaire was implemented in a specific language (with its particular linguistic nuances) and for a specific object of interest. According to Liapakis et al. (2020), this could be a more effective and accurate approach.

Conversely to stated liking, the measures of hedonic valences of sensory attributes rely on previously experienced tastings. This presupposes a (subjective) memorization of a tasting event not necessarily focused on sensory attribute identification. In the absence of such a memory, the answers could be biased by expectations and/or representations about sensory attributes or by associations with other product spaces. In addition, a strong hypothesis is made about a common understanding of sensory attributes.

Despite the limitations, the results seem to be reliable and valid regarding the literature. The valence scores of the replicated attributes were very close and not significantly different, denoting consistency in participants' answers, but a test–retest would be required to confirm this. Francis & Williamson (2015) summarized the drivers of liking of red wines identified in 11 studies. Notably, they observed that, in general, fruity flavour is an important positive driver of liking, while sourness and bitterness are negative drivers of liking. Less obviously, they also observed that alcohol does not usually influence liking and that astringency can either positively or negatively influence liking. These conclusions are in line with those obtained with the hedonic valences of sensory attributes.

4.2 Comparison of hedonic valences of sensory attributes with drivers of liking

The conclusions drawn with hedonic valences of sensory attributes were compared to those drawn with drivers of liking computed on CATA or FC data associated with liking in three datasets. By construction, drivers of liking highlighted less significant attributes than hedonic valences because it depends on the sensory attributes perceived in the product space (Mahieu et al., 2022a), in contrast to hedonic valences of sensory attributes, where all subjects can express their opinion for each attribute. Regardless of significance, most conclusions about the polarization of sensory attributes are similar, but some differences were observed. To increase the percentage of citations, the authors chose to aggregate some attributes within

sensory concepts. This sometimes led to incongruent associations of sensory attributes similarly associated with product from a descriptive perspective but having different hedonic valences. This occurred with attributes lacking a consensual definition, such as *Light* or *Strong*, but also with *Woody* or *Spicy* attributes. In this case, it would be better not to aggregate the sensory attributes. Drivers of liking have the advantage (and inconvenience) of being exclusively representative of the set of products included in the study and thus could be more adapted to depict the influence of sensory attributes on liking for specific products. This could explain why *Animal* has a negative hedonic valence and was considered as a (nonsignificant) positive driver of liking. Indeed, generally speaking, *Animal* can be seen as negative in red wine, but for a specific set of products, it can be seen as positive. This could also be true for other sensory attributes of specific wines (sparkling wines, ice wines, old wines, etc.).

Based on the results, Hypothesis H1 was verified: hedonic valence of attributes can be used to screen the generic sensory determinants of preference for an entire product space without tasting or directly asking about liking. However, these promising results remain to be confirmed in other product spaces less “hedonically valenced” than wines.

4.3 Prediction of liking based on hedonic valences of sensory descriptions and drivers of liking

Hedonic valences of sensory descriptions were computed at the individual level and then correlated with stated liking scores. The discrimination ability of the two measures was compared. Hedonic valence of sensory descriptions efficiency to discriminate products is dependent on the sensory evaluation method. While hedonic perceptions were the same, the sensory descriptions differed between datasets B and C, as FC and CATA showed different associations between wines and sensory attributes (Mahieu et al., 2020a). The method should be able to report the most representative valenced attributes, and these attributes should have been perceived with a relative consensus. The authors think that FC is the more adapted measure for the computation of hedonic valences of sensory descriptions because it is the only measure that does not restrict (except for verbalization ability) or influences consumers' perception of products. This opinion is supported by Park et al. (2022), who suggested that FC better identified drivers of liking compared to the standardized descriptors used in descriptive analysis.

Hedonic valences of sensory descriptions calculation heavily depend on the extracted sensory concepts. Words with nonconsensual meaning can degenerate the computation of the hedonic valences of sensory descriptions. Thus, as mentioned by Hamilton & Lahne (2020), it could be interesting to test different formulas to compute hedonic valences of sensory descriptions and test the stability of the results, especially without sensory attribute aggregation.

Hedonic valences of sensory descriptions and stated liking moderately correlate but, except for an inversion in dataset B, lead to the same ranking of products at the panel level. The level of discrimination seems comparable but not exactly equivalent. These results remain to be confirmed, as the three datasets included only four products with average levels of discrimination, making similar conclusions easy to reach.

As the hedonic valences of sensory descriptions can be computed on any sensory description, it could be tested to predict liking based on online wine reviews by consumers. The results could then be compared with those obtained with far more sophisticated machine-learning algorithms such as those of Chen et al. (2018).

Based on these results, Hypothesis H2 is partially validated: it seems that hedonic valence of sensory descriptions can be used as an indirect measure of liking.

4.4 Perspectives

The ideal product can be estimated based on hedonic valences of sensory attributes: it should be the one maximizing the mean hedonic valence of sensory descriptions. Thus, it could be interesting to compare the ideal product predicted using hedonic valences of sensory descriptions with an ideal product estimated using one of the methods presented in the introduction. The hedonic valence of sensory descriptions approach has the theoretical advantage of not presupposing the existence and/or the capacity of consumers to objectively describe an ideal product (especially if it has never been experienced). In turn, hedonic valence of sensory descriptions does not precisely quantify expected intensities of sensory attributes that maximize liking and could be less useful for product formulation. To overcome this limitation, as suggested in Section 4.1, an hedonic valence of sensory attributes measurement including different levels of intensity could be used together with a rate-all-that-apply (Ares et al., 2014) sensory evaluation to compute a more accurate hedonic valence of sensory descriptions.

5. Conclusion

This article describes how to build a dictionary of hedonic valences of sensory attributes applicable to red wines. Hedonic valence can provide an overview of the main sensory determinants of preferences for a delimited food category in a cost-effective way because it does not necessarily require tasting. Moreover, combined with descriptive data collected from consumers such as those obtained with free-comment or CATA, it is possible to compute individual hedonic valences of sensory descriptions. The results presented in this study show that hedonic valences of sensory descriptions are moderately correlated with stated liking. The two measures allow the products to be discriminated in a comparable (but not completely equivalent) way. Based on these conclusions, it seems that hedonic valences of sensory

descriptions can be considered indirect measures of liking. The hedonic valences of sensory descriptions mostly rely on “objective” descriptive properties; thus, it could be interesting to measure the “sensory component” of liking freed from effects or bias inherent to direct measures, especially in unblinded conditions in at-home studies. However, further comparisons involving more studies and different food categories are necessary to confirm these promising results.

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References of the appendices

- Adams, J., Williams, A., Lancaster, N., & Foley, M. (2007). Advantages and uses of check-all-that-apply response compared to traditional scaling of attributes for salty snacks. *7th Pangborn Sensory Science Symposium. Minneapolis, USA, 12–16 August, 2007*.
- Amerine, M. A. (Maynard A., & Roessler, E. B. (Edward B. (1976). *Wines, their sensory evaluation*. 230.
- Ares, G. (2018). Methodological issues in cross-cultural sensory and consumer research. *Food Quality and Preference*, *64*, 253–263. <https://doi.org/10.1016/J.FOODQUAL.2016.10.007>
- Ares, G., Alcaire, F., Antúnez, L., Vidal, L., Giménez, A., & Castura, J. C. (2017). Identification of drivers of (dis)liking based on dynamic sensory profiles: Comparison of Temporal Dominance of Sensations and Temporal Check-all-that-apply. *Food Research International*, *92*, 79–87. <https://doi.org/10.1016/J.FOODRES.2016.12.016>
- Ares, G., Bruzzone, F., Vidal, L., Cadena, R. S., Giménez, A., Pineau, B., Hunter, D. C., Paisley, A. G., & Jaeger, S. R. (2014). Evaluation of a rating-based variant of check-all-that-apply questions: Rate-all-that-apply (RATA). *Food Quality and Preference*, *36*, 87–95. <https://doi.org/10.1016/J.FOODQUAL.2014.03.006>
- Ares, G., Varela, P., Rado, G., & Giménez, A. (2011). Identifying ideal products using three different consumer profiling methodologies. Comparison with external preference mapping. *Food Quality and Preference*, *22*(6), 581–591. <https://doi.org/10.1016/J.FOODQUAL.2011.04.004>
- Asioli, D., Mignani, A., & Alfnes, F. (2021). Quick and easy? Respondent evaluations of the Becker–DeGroot–Marschak and multiple price list valuation mechanisms. *Agribusiness*, *37*(2), 215–234. <https://doi.org/10.1002/AGR.21668>
- Becker, G. M., DeGroot, M. H., & Marschak, J. (1964). Measuring utility by a single-response sequential method. *Behavioral Science*, *9*(3), 226–232. <https://doi.org/10.1002/BS.3830090304>
- Bécue-Bertaut, M., Álvarez-Esteban, R., & Pagès, J. (2008). Rating of products through scores and free-text assertions: Comparing and combining both. *Food Quality and Preference*, *19*(1), 122–134. <https://doi.org/10.1016/J.FOODQUAL.2007.07.006>
- Bianchi, I., Branchini, E., Torquati, S., Fermani, A., Capitani, E., Barnaba, V., Savardi, U., & Burro, R. (2021). Non experts’ understanding of terms frequently used by experts to describe the sensory properties of wine: An investigation based on opposites. *Food Quality and Preference*, *92*, 104215. <https://doi.org/10.1016/J.FOODQUAL.2021.104215>

- Brard, M., & Lê, S. (2016). The Ideal Pair Method, an Alternative to the Ideal Profile Method Based on Pairwise Comparisons: Application to a Panel of Children. *Journal of Sensory Studies*, 31(4), 306–313. <https://doi.org/10.1111/JOSS.12214>
- Bruwer, J., & Buller, C. (2013). Product involvement, brand loyalty, and country-of-origin brand preferences of Japanese wine consumers. *Http://Dx.Doi.Org/10.1080/09571264.2012.717221*, 24(1), 38–58. <https://doi.org/10.1080/09571264.2012.717221>
- Bruwer, J., Burrows, N., Chaumont, S., Li, E., & Saliba, A. (2014). Consumer involvement and associated behaviour in the UK high-end retail off-trade wine market. *Http://Dx.Doi.Org/10.1080/09593969.2013.839464*, 24(2), 145–165. <https://doi.org/10.1080/09593969.2013.839464>
- Cadoret, M., & Husson, F. (2013). Construction and evaluation of confidence ellipses applied at sensory data. *Food Quality and Preference*, 28(1), 106–115. <https://doi.org/10.1016/J.FOODQUAL.2012.09.005>
- Candau, J., & Wathelet, O. (2011). The categories of odours are they real categories? *Langages*, 181(1). <https://doi.org/10.3917/LANG.181.0037>
- Cardello, A. V. (1994). Consumer expectations and their role in food acceptance. *Measurement of Food Preferences*, 253–297. https://doi.org/10.1007/978-1-4615-2171-6_10
- Cardello, A. V. (2007). Measuring consumer expectations to improve food product development. *Consumer-Led Food Product Development*, 223–261. <https://doi.org/10.1533/9781845693381.2.223>
- Carroll, J. D. (1972). Individual differences and multidimensional scaling. *Multidimensional Scaling. Theory and Applications in the Behavioral Sciences, Theory, 1*, 101–155.
- Castura, J. C., Antúnez, L., Giménez, A., & Ares, G. (2016). Temporal Check-All-That-Apply (TCATA): A novel dynamic method for characterizing products. *Food Quality and Preference*, 47, 79–90.
- Chen, B., Velchev, V., Palmer, J., & Atkison, T. (2018). Wineinformatics: A Quantitative Analysis of Wine Reviewers. *Fermentation 2018, Vol. 4, Page 82*, 4(4), 82. <https://doi.org/10.3390/FERMENTATION4040082>
- Chen, Z., Gurdian, C., Sharma, C., Prinyawiwatkul, W., & Torrico, D. D. (2021). Exploring Text Mining for Recent Consumer and Sensory Studies about Alternative Proteins. *Foods 2021, Vol. 10, Page 2537*, 10(11), 2537. <https://doi.org/10.3390/FOODS10112537>
- Cohen, J. (2013). Statistical Power Analysis for the Behavioral Sciences. *Statistical Power Analysis for the Behavioral Sciences*. <https://doi.org/10.4324/9780203771587>
- Coulon-Leroy, C., Symoneaux, R., Lawrence, G., Mehinagic, E., & Maitre, I. (2017). Mixed Profiling: A new tool of sensory analysis in a professional context. Application to wines. *Food Quality and Preference*, 57, 8–16. <https://doi.org/10.1016/J.FOODQUAL.2016.11.005>
- Croijmans, I., Hendrickx, I., Lefever, E., Majid, A., & van Den Bosch, A. (2019). Uncovering the language of wine experts. *Natural Language Engineering*, 26(5), 511–530. <https://doi.org/10.1017/S1351324919000500>
- Croijmans, I., & Majid, A. (2016). Not All Flavor Expertise Is Equal: The Language of Wine and Coffee Experts. *PLOS ONE*, 11(6), e0155845. <https://doi.org/10.1371/JOURNAL.PONE.0155845>
- Danner, L., Johnson, T. E., Ristic, R., Meiselman, H. L., & Bastian, S. E. P. (2020). Consumption Context Effects on Fine Wine Consumer Segments' Liking and Emotions. *Foods*, 9(12). <https://doi.org/10.3390/FOODS9121798>

- Deng, Z. H., Luo, K. H., & Yu, H. L. (2014). A study of supervised term weighting scheme for sentiment analysis. *Expert Systems with Applications*, 41(7), 3506–3513. <https://doi.org/10.1016/J.ESWA.2013.10.056>
- Erwig, M., & Gopinath, R. (2012). Explanations for regular expressions. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 7212 LNCS, 394–408. https://doi.org/10.1007/978-3-642-28872-2_27/COVER/
- Etzi, R., Girondini, M., Massetti, G., & Gallace, A. (2022). The impact of contextual information regarding the origin of food on consumers' judgments. *Current Research in Food Science*, 5, 423–431. <https://doi.org/10.1016/J.CRFS.2022.02.003>
- Francis, I. L., & Williamson, P. O. (2015). Application of consumer sensory science in wine research. *Australian Journal of Grape and Wine Research*, 21, 554–567. <https://doi.org/10.1111/AJGW.12169>
- Giacalone, D., Llobell, F., & Jaeger, S. R. (2022). “Beyond liking” measures in food-related consumer research supplement hedonic responses and improve ability to predict consumption. *Food Quality and Preference*, 97, 104459. <https://doi.org/10.1016/J.FOODQUAL.2021.104459>
- Grainger, Keith. (2009). *Wine Quality Tasting and Selection*. Wiley-Blackwell.
- Greenacre, M. J. (1988). Clustering the rows and columns of a contingency table. *Journal of Classification*, 5(1), 39–51. <https://doi.org/10.1007/BF01901670>
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit Social Cognition: Attitudes, Self-Esteem, and Stereotypes. *Psychological Review*, 102(1), 4–27. <https://doi.org/10.1037/0033-295X.102.1.4>
- Grosselin, A., Sevos, J., Gay, A., Pellet, J., & Massoubre, C. (2018). Subjective evaluations of emotional and hedonic valences, subjective nutritional value, and familiarity on 201 “food words” in French population. *Annee Psychologique*, 118(2), 99–171. <https://doi.org/10.3917/ANPSY1.182.0099>
- Hamilton, L. M., & Lahne, J. (2020). Fast and automated sensory analysis: Using natural language processing for descriptive lexicon development. *Food Quality and Preference*, 83, 103926. <https://doi.org/10.1016/J.FOODQUAL.2020.103926>
- Harrington, R. J. (2008). *Food and wine pairing: A sensory experience*. John Wiley.
- Hayward, L., Jantzi, H., Smith, A., & McSweeney, M. B. (2020a). How do consumers describe cool climate wines using projective mapping and ultra-flash profile? *Food Quality and Preference*, 86, 104026. <https://doi.org/10.1016/J.FOODQUAL.2020.104026>
- Hayward, L., Jantzi, H., Smith, A., & McSweeney, M. B. (2020b). How do consumers describe cool climate wines using projective mapping and ultra-flash profile? *Food Quality and Preference*, 86, 104026. <https://doi.org/10.1016/J.FOODQUAL.2020.104026>
- Hughson, A. L., & Boakes, R. A. (2002). The knowing nose: The role of knowledge in wine expertise. *Food Quality and Preference*, 13(7–8), 463–472. [https://doi.org/10.1016/S0950-3293\(02\)00051-4](https://doi.org/10.1016/S0950-3293(02)00051-4)
- INRAE. (n.d.). *TimeSens© software 2.0*.
- Jaeger, S. R., & Ares, G. (2015). RATA questions are not likely to bias hedonic scores. *Food Quality and Preference*, 44, 157–161. <https://doi.org/10.1016/J.FOODQUAL.2015.04.011>
- Jaeger, S. R., Giacalone, D., Roigard, C. M., Pineau, B., Vidal, L., Giménez, A., Frøst, M. B., & Ares, G. (2013). Investigation of bias of hedonic scores when co-eliciting product attribute information using CATA questions. *Food Quality and Preference*, 30(2), 242–249. <https://doi.org/10.1016/J.FOODQUAL.2013.06.001>

- Jockers, M. (2020). *Introduction to the Syuzhet Package*. <https://cran.r-project.org/web/packages/syuzhet/vignettes/syuzhet-vignette.html>
- Josse, J., Pagès, J., & Husson, F. (2008). Testing the significance of the RV coefficient. *Computational Statistics & Data Analysis*, 53(1), 82–91. <https://doi.org/10.1016/J.CSDA.2008.06.012>
- Kapferer, J. -N, & Laurent, G. (1993). Further evidence on the consumer involvement profile: Five antecedents of involvement. *Psychology & Marketing*, 10(4), 347–355. <https://doi.org/10.1002/MAR.4220100408>
- Kuiper, P. K., & Hood, K. M. (2019). Examining Sentiment Analysis When Evaluating Survey Responses. *Proceedings - 13th IEEE International Conference on Semantic Computing, ICSC 2019*, 412–415. <https://doi.org/10.1109/ICOSC.2019.8665581>
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4(NOV), 863. <https://doi.org/10.3389/FPSYG.2013.00863/ABSTRACT>
- Lamote, S., Hermans, D., Baeyens, F., & Eelen, P. (2004). An exploration of affective priming as an indirect measure of food attitudes. *Appetite*, 42(3), 279–286. <https://doi.org/10.1016/J.APPET.2003.11.009>
- Lawless, H. T. (1984). Flavor Description of White Wine by “Expert” and Nonexpert Wine Consumers. *Journal of Food Science*, 49(1), 120–123. <https://doi.org/10.1111/J.1365-2621.1984.TB13686.X>
- Lawrence, G., Symoneaux, R., Maitre, I., Brossaud, F., Maestrojuan, M., & Mehinagic, E. (2013). Using the free comments method for sensory characterisation of Cabernet Franc wines: Comparison with classical profiling in a professional context. *Food Quality and Preference*, 30(2), 145–155. <https://doi.org/10.1016/J.FOODQUAL.2013.04.005>
- Lehrer, A. (1975). Talking about Wine. *Language*, 51(4), 901. <https://doi.org/10.2307/412700>
- Lesschaeve, I., & Noble, A. C. (2022). Sensory analysis of wine. *Managing Wine Quality*, 243–277. <https://doi.org/10.1016/B978-0-08-102067-8.00010-5>
- Liapakis, A., Tsiligiridis, T., & Yialouris, C. (2020). A Sentiment Lexicon-based Analysis for Food and Beverage Industry Reviews. The Greek Language Paradigm. *International Journal on Natural Language Computing*, 9(2), 21–42. <https://doi.org/10.5121/IJNLC.2020.9203>
- Lim, J. (2011). Hedonic scaling: A review of methods and theory. *Food Quality and Preference*, 22(8), 733–747. <https://doi.org/10.1016/J.FOODQUAL.2011.05.008>
- Lockshin, L., & Corsi, A. M. (2019). Consumer Research For Wine. *Handbook of Eating and Drinking*, 1–18. https://doi.org/10.1007/978-3-319-75388-1_162-1
- Lohéac, Y., & Issanchou, S. (2007). Using auctions to estimate prices and value of food products. *Consumer-Led Food Product Development*, 471–491. <https://doi.org/10.1533/9781845693381.3.471>
- Losó, V., Tóth, A., Gere, A., Heszberger, J., Székely, G., Kókai, Z., & Sipos, L. (2012). Methodology problems of the industrial preference mapping. *Acta Alimentaria*, 41(Supplement-1), 109–119. <https://doi.org/10.1556/AALIM.41.2012.SUPPL.11>
- Luc, A., Lê, S., & Philippe, M. (2020). Nudging consumers for relevant data using Free JAR profiling: An application to product development. *Food Quality and Preference*, 79, 103751. <https://doi.org/10.1016/J.FOODQUAL.2019.103751>
- Luc, A., Lê, S., Philippe, M., Mostafa Qannari, E., & Vigneau, E. (2022). A machine learning approach for analyzing Free JAR data. *Food Quality and Preference*, 99, 104581. <https://doi.org/10.1016/J.FOODQUAL.2022.104581>

- Lunardo, R., Saintives, C., & Chaney, D. (2021). Food packaging and the color red: How negative cognitive associations influence feelings of guilt. *Journal of Business Research*, *134*, 589–600. <https://doi.org/10.1016/J.JBUSRES.2021.05.052>
- Macfie, H. (2007). Preference mapping and food product development. *Consumer-Led Food Product Development*, 551–592. <https://doi.org/10.1533/9781845693381.3.551>
- Mahieu, B. (2021). *MultiResponseR*. <https://github.com/MahieuB/MultiResponseR>
- Mahieu, B., Schlich, P., Visalli, M., & Cardot, H. (2021). A multiple-response chi-square framework for the analysis of Free-Comment and Check-All-That-Apply data. *Food Quality and Preference*, *93*, 104256. <https://doi.org/10.1016/J.FOODQUAL.2021.104256>
- Mahieu, B., Visalli, M., & Schlich, P. (2022a). Identifying drivers of liking and characterizing the ideal product thanks to Free-Comment. *Food Quality and Preference*, *96*, 104389. <https://doi.org/10.1016/J.FOODQUAL.2021.104389>
- Mahieu, B., Visalli, M., & Schlich, P. (2022b). Identifying drivers of liking and characterizing the ideal product thanks to Free-Comment. *Food Quality and Preference*, *96*, 104389. <https://doi.org/10.1016/J.FOODQUAL.2021.104389>
- Mahieu, B., Visalli, M., Thomas, A., & Schlich, P. (2020a). Free-comment outperformed check-all-that-apply in the sensory characterisation of wines with consumers at home. *Food Quality and Preference*, *84*, 103937. <https://doi.org/10.1016/J.FOODQUAL.2020.103937>
- Mahieu, B., Visalli, M., Thomas, A., & Schlich, P. (2020b). Using Free-Comment with consumers to obtain temporal sensory descriptions of products. *Food Quality and Preference*, *86*, 104008. <https://doi.org/10.1016/J.FOODQUAL.2020.104008>
- Meiselman, H. L. (2021). The (gradual) development of emotion measurement for food. *Current Opinion in Food Science*, *40*, 187–191. <https://doi.org/10.1016/J.COFS.2021.03.017>
- Morata, A., Escott, C., Bañuelos, M. A., Loira, I., Del Fresno, J. M., González, C., & Suárez-lepe, J. A. (2020). Contribution of Non-Saccharomyces Yeasts to Wine Freshness. A Review. *Biomolecules*, *10*(1). <https://doi.org/10.3390/BIOM10010034>
- Moskowitz, H. R. (1972). Subjective ideals and sensory optimization in evaluating perceptual dimensions in food. *Journal of Applied Psychology*, *56*(1), 60–66. <https://doi.org/10.1037/H0032140>
- Moskowitz, H. R., & Krieger, B. (1995). The contribution of sensory liking to overall liking: An analysis of six food categories. *Food Quality and Preference*, *6*(2), 83–90. [https://doi.org/10.1016/0950-3293\(95\)98552-T](https://doi.org/10.1016/0950-3293(95)98552-T)
- Moskowitz, H. R., Muñoz, A. M., & Gacula, M. C. (2008). Viewpoints and Controversies in Sensory Science and Consumer Product Testing. *Viewpoints and Controversies in Sensory Science and Consumer Product Testing*. <https://doi.org/10.1002/9780470385128>
- Mueller Loose, S., Francis, I. L. F., & Lockshin, L. (2008). The relationship between wine liking, subjective and objective wine knowledge: Does it matter who is in your “consumer” sample? *4th International Conference of the Academy of Wine Business Research, Siena 17-19th July 2008*.
- Noble, A. C., Arnold, R. A., Buechsenstein, J., Leach, E. J., Schmidt, J. O., & Stern, P. M. (1987). Modification of a Standardized System of Wine Aroma Terminology. *American Journal of Enology and Viticulture*, *38*(2).

- Osterland, E. A. (2012). *Power entertaining: Secrets to building lasting relationships, hosting unforgettable events, and closing big deals from America's 1st master sommelier*. John Wiley & Son.
- Park, S. H., Lee, S. H., Seo, W. H., Shin, W., & Hong, J. H. (2022). Consumers better explained drivers of liking for products containing complex flavor with subtle differences than trained panelists: Comparison between consumer-driven free-comment analysis and descriptive analysis of tomato sauce with added garlic flavorings. *Journal of Sensory Studies*, 37(3), e12736. <https://doi.org/10.1111/JOSS.12736>
- Perrin, L., & Pagès, J. (2009). Construction of a product space from the ultra-flash profiling method: Application to 10 red wines from the loire valley. *Journal of Sensory Studies*, 24(3), 372–395. <https://doi.org/10.1111/J.1745-459X.2009.00216.X>
- Pineau, N., Schlich, P., Cordelle, S., Mathonnière, C., Issanchou, S., Imbert, A., Rogeaux, M., Etiévant, P., & Köster, E. (2009). Temporal Dominance of Sensations: Construction of the TDS curves and comparison with time–intensity. *Food Quality and Preference*, 20(6), 450–455.
- Piqueras-Fiszman, B., & Spence, C. (2015). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality and Preference*, 40(PA), 165–179. <https://doi.org/10.1016/J.FOODQUAL.2014.09.013>
- Plaehn, D., & Horne, J. (2008). A regression-based approach for testing significance of “just-about-right” variable penalties. *Food Quality and Preference*, 19(1), 21–32. <https://doi.org/10.1016/J.FOODQUAL.2007.06.003>
- R Core team. (2017). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Rajput, Q., Haider, S., & Ghani, S. (2016). Lexicon-Based Sentiment Analysis of Teachers' Evaluation. *Applied Computational Intelligence and Soft Computing*, 2016, 1–12. <https://doi.org/10.1155/2016/2385429>
- Rinker, T. (2015). *Dictionary based sentiment analysis that considers valence shifters: Trinker/sentimentr*.
- Robert, P., & Escoufier, Y. (1976). A unifying tool for linear multivariate statistical methods: The RV-coefficient. *Applied Statistics*, 25(3), 257. <https://doi.org/10.2307/2347233>
- Robert Parker Wine Advocate. (n.d.). <https://www.robertparker.com/>
- Robinson, E., & Higgs, S. (2012). Liking Food Less: The Impact of Social Influence on Food Liking Evaluations in Female Students. *PLOS ONE*, 7(11), e48858. <https://doi.org/10.1371/JOURNAL.PONE.0048858>
- Rodrigues, H., & Parr, W. V. (2019). Contribution of cross-cultural studies to understanding wine appreciation: A review. *Food Research International*, 115, 251–258. <https://doi.org/10.1016/J.FOODRES.2018.09.008>
- Romeo-Arroyo, E., Mora, M., Pazos, N., Deba-Rementeria, S., & Vázquez-Araújo, L. (2022). Effect of product properties and context on the perception of sweetness and liking: A case study with butter cookies. *Journal of Sensory Studies*. <https://doi.org/10.1111/JOSS.12740>
- Runnebaum, R. C., Boulton, R. B., Powell, R. L., & Heymann, H. (2011). Key constituents affecting wine body – an exploratory study. *Journal of Sensory Studies*, 26(1), 62–70. <https://doi.org/10.1111/J.1745-459X.2010.00322.X>
- Sáenz-Navajas, M. P., Alegre, Y., de-la-Fuente, A., Ferreira, V., García, D., Eizaguirre, S., Razquin, I., & Hernández-Orte, P. (2016). Rapid sensory-directed methodology for the

- selection of high-quality aroma wines. *Journal of the Science of Food and Agriculture*, 96(12), 4250–4262. <https://doi.org/10.1002/JSFA.7636>
- Sáenz-Navajas, M. P., Ballester, J., Pêcher, C., Peyron, D., & Valentin, D. (2013). Sensory drivers of intrinsic quality of red wines: Effect of culture and level of expertise. *Food Research International*, 54(2), 1506–1518. <https://doi.org/10.1016/J.FOODRES.2013.09.048>
- Sauvageot, F., Urdapilleta, I., & Peyron, D. (2006). Within and between variations of texts elicited from nine wine experts. *Food Quality and Preference*, 17(6), 429–444. <https://doi.org/10.1016/J.FOODQUAL.2005.05.007>
- Schifferstein, H. N. J. (1996). Cognitive factors affecting taste intensity judgments. *Food Quality and Preference*, 7(3–4), 167–175. [https://doi.org/10.1016/S0950-3293\(96\)00007-9](https://doi.org/10.1016/S0950-3293(96)00007-9)
- Schouteten, J. J., Gellynck, X., & Slabbinck, H. (2021). Do fair trade labels bias consumers' perceptions of food products? A comparison between a central location test and home-use test. *Sustainability (Switzerland)*, 13(3), 1–17. <https://doi.org/10.3390/SU13031384>
- Schüttler, A., Friedel, M., Jung, R., Rauhut, D., & Darriet, P. (2015). Characterizing aromatic typicality of Riesling wines: Merging volatile compositional and sensory aspects. *Food Research International*, 69, 26–37. <https://doi.org/10.1016/J.FOODRES.2014.12.010>
- Shapin, S. (2016). A taste of science: Making the subjective objective in the California wine world. *Social Studies of Science*, 46(3), 436–460. <https://doi.org/10.1177/0306312716651346>
- Shi, M., Stelick, A., Licker, S., & Dando, R. (2021). On the validity of longitudinal comparisons of central location consumer testing results prior to COVID-19 versus home use testing data during the pandemic. *Journal of Food Science*, 86(10), 4668–4677. <https://doi.org/10.1111/1750-3841.15905>
- Sørensen, L. B., Møller, P., Flint, A., Martens, M., & Raben, A. (2003). Effect of sensory perception of foods on appetite and food intake: A review of studies on humans. *International Journal of Obesity*, 27(10), 1152–1166. <https://doi.org/10.1038/SJ.IJO.0802391>
- Soussignan, R., & Schaal, B. (1996). Children's facial responsiveness to odors: Influences of hedonic valence of odor, gender, age, and social presence. *Developmental Psychology*, 32(2), 367–379. <https://doi.org/10.1037/0012-1649.32.2.367>
- Spence, C., & Wang, Q. J. (2018). What does the term 'complexity' mean in the world of wine? *International Journal of Gastronomy and Food Science*, 14, 45–54.
- Stone, Herbert., & Sidel, J. L. (1993). *Sensory evaluation practices*. Academic Press.
- ten Kleij, F., & Musters, P. A. D. (2003). Text analysis of open-ended survey responses: A complementary method to preference mapping. *Food Quality and Preference*, 14(1), 43–52. [https://doi.org/10.1016/S0950-3293\(02\)00011-3](https://doi.org/10.1016/S0950-3293(02)00011-3)
- Thach, L., & Chang, K. (2015). *2015 Survey of American Wine Consumer Preferences*. Wine Business. <https://www.winebusiness.com/news/article/160722/>
- Thach, L., & Olsen, J. (2015). Profiling the high frequency wine consumer by price segmentation in the US market. *Wine Economics and Policy*, 4(1), 53–59. <https://doi.org/10.1016/J.WEP.2015.04.001>
- Thomas, A., Visalli, M., Cordelle, S., & Schlich, P. (2015). Temporal Drivers of Liking. *Food Quality and Preference*, 40, 365–375.
- Tian, L., Lai, C., & Moore, J. D. (2018). *Polarity and Intensity: The Two Aspects of Sentiment Analysis*. 40–47. <https://doi.org/10.48550/arxiv.1807.01466>

- Trendel, O., & Werle, C. O. C. (2016). Distinguishing the affective and cognitive bases of implicit attitudes to improve prediction of food choices. *Appetite*, *104*, 33–43. <https://doi.org/10.1016/J.APPET.2015.10.005>
- Urdapilleta, I., Parr, W., Dacremont, C., & Green, J. (2011). Semantic and perceptive organisation of Sauvignon blanc wine characteristics: Influence of expertise. *Food Quality and Preference*, *22*(1), 119–128. <https://doi.org/10.1016/J.FOODQUAL.2010.08.005>
- Vidal, L., Ares, G., Machín, L., & Jaeger, S. R. (2015). Using Twitter data for food-related consumer research: A case study on “what people say when tweeting about different eating situations.” *Food Quality and Preference*, *45*, 58–69. <https://doi.org/10.1016/J.FOODQUAL.2015.05.006>
- Vidal, L., Giménez, A., Medina, K., Boido, E., & Ares, G. (2015). How do consumers describe wine astringency? *Food Research International*, *78*, 321–326. <https://doi.org/10.1016/J.FOODRES.2015.09.025>
- Vieira, P. C. (2016). T-Test with Likert Scale Variables. *SSRN Electronic Journal*. <https://doi.org/10.2139/SSRN.2770035>
- Vinino*. (n.d.). <https://www.vivino.com>
- Vinovae*. (n.d.). <https://www.vinovae.com>
- Visalli, M. (2022). A dataset about hedonic valence of descriptive sensory terms used to characterize red wines. *Mendeley Data*. <https://doi.org/10.17632/c7v4zj8vph.1>
- Visalli, M., Dubois, M., Schlich, P., Ric, F., Cardebat, J.-M., & Georgantzis, N. (2022a). A dataset on Bordeaux and Rioja red wines sensory and affective perception collected from French and Spanish consumers at home and international wine students in lab. *Data in Brief*.
- Visalli, M., Dubois, M., Schlich, P., Ric, F., Cardebat, J.-M., & Georgantzis, N. (2022b). Relevance of Free-Comment to describe wine temporal sensory perception: An application with panels varying in culture and expertise. *Food Quality and Preference*, *104*785. <https://doi.org/10.1016/J.FOODQUAL.2022.104785>
- Visalli, M., Mahieu, B., Thomas, A., & Schlich, P. (2020a). Automated sentiment analysis of Free-Comment: An indirect liking measurement? *Food Quality and Preference*, *82*. <https://doi.org/10.1016/j.foodqual.2020.103888>
- Visalli, M., Mahieu, B., Thomas, A., & Schlich, P. (2020b). Concurrent vs. Retrospective temporal data collection: Attack-evolution-finish as a simplification of Temporal Dominance of Sensations? *Food Quality and Preference*, *85*, 103956. <https://doi.org/10.1016/J.FOODQUAL.2020.103956>
- Wagner, S., Issanchou, S., Chabanet, C., Marlier, L., Schaal, B., & Monnery-Patris, S. (2013). Infants’ hedonic responsiveness to food odours: A longitudinal study during and after weaning (8, 12 and 22 months). *Flavour* *2013* 2:1, 2(1), 1–12. <https://doi.org/10.1186/2044-7248-2-19>
- Wang, Q. J., Niaura, T., & Kantono, K. (2021). How does wine ageing influence perceived complexity? Temporal-Choose-All-That-Apply (TCATA) reveals temporal drivers of complexity in experts and novices. *Food Quality and Preference*, *92*, 104230. <https://doi.org/10.1016/J.FOODQUAL.2021.104230>
- Werle, C. O. C., Trendel, O., & Ardito, G. (2013). Unhealthy food is not tastier for everybody: The “ healthy=tasty” French intuition. *Food Quality and Preference*, *28*(1), 116–121. <https://doi.org/10.1016/J.FOODQUAL.2012.07.007>
- Wine & Spirit Education Trust qualification*. (n.d.). <https://www.wsetglobal.com/qualifications/wset-level-2-award-in-wines/>

Appendices

- Worch, T. (2013). PrefMFA, a solution taking the best of both internal and external preference mapping techniques. *Food Quality and Preference*, 30(2), 180–191. <https://doi.org/10.1016/J.FOODQUAL.2013.05.009>
- Worch, T., Lê, S., Punter, P., & Pagès, J. (2013). Ideal Profile Method (IPM): The ins and outs. *Food Quality and Preference*, 28(1), 45–59. <https://doi.org/10.1016/J.FOODQUAL.2012.08.001>
- Yamamoto, T., Mizuta, H., & Ueji, K. (2021). Analysis of facial expressions in response to basic taste stimuli using artificial intelligence to predict perceived hedonic ratings. *PLOS ONE*, 16(5), e0250928. <https://doi.org/10.1371/JOURNAL.PONE.0250928>

Thesis promotion

Publications in peer-reviewed journals

- **The Role of Customers and Expert Ratings on French Red Wine Prices: from Gurus to Geeks?**
Bazen S., Cardebat J-M., Dubois M. (2023)
Applied economics, <https://doi.org/10.1080/00036846.2023.2257036>
- **Hedonic valence of descriptive sensory terms as an indirect measure of liking: a preliminary study with red wines**
Visalli M., Mahieu B., Dubois M., Schlich P. (2023)
Food Quality and Preference, 108, <https://doi.org/10.1016/j.foodqual.2023.104861>
- **A dataset on the sensory and affective perception of Bordeaux and Rioja red wines collected from French and Spanish consumers at home and international wine students in the lab**
Visalli M., Dubois M., Schlich P., Ric F., Cardebat JM., Georgantzis N. (2023)
Data in Brief, 46, <https://doi.org/10.1016/j.foodqual.2022.104785>
- **Relevance of Free-Comment to describe wine temporal sensory perception: an application with panels varying in culture and expertise**
Visalli M., Dubois M., Schlich P., Ric F., Cardebat JM., Georgantzis N. (2022)
Food Quality and Preference, 105, <https://doi.org/10.1016/j.foodqual.2022.104785>

Communications in international conferences

- **European Protected Wine Designations Seminar (EuAWE)**, 2023, Zaragoza, Spain
- **Wine Economics and Business Symposium**, 2022, Bordeaux, France
- **BSE** (Bordeaux School of Economics) inauguration, 2022, Bordeaux, France
- **AAWE** (American Association of Wine Economists) conference 2022, Tbilisi, Georgia
- **AWBR** (Association of Wine Business Research) 2022, Dijon, France
- **EuAWE** (European Association of Wine Economists) conference 2022, Vila Real, Portugal
- **DVW** (Deutscher Weinbauverband) International Congress - Wine Graduate Forum 2022, online
- **Wine & Spirits Economics Workshop**, 2022, Dijon, France
- **Larefi Seminar**, 2021, Bordeaux France
- **Lessac Seminar**, 2021, Dijon, France

Press

- [L'œnologie, une discipline en constante évolution](#) (2022) Dubois M., Chapuis C., Jacquet O., *The Conversation France*
- [Quelle est l'origine de l'éducation à la dégustation de vin ?](#) (2022) Dubois M., *The Conversation France*
- [Pourquoi les Anglo-saxons dominent la critique vinicole mondiale](#) (2021) Dubois M., *The Conversation France*
 - <https://www.revueconflits.com/magalie-dubois-vin-anglo-saxons-critique/> (2021) Dubois M., *Conflits*
- [Depuis quand note-t-on les vins ?](#) (2021) Dubois M., *The Conversation France*

Synthèse en Français

Motivation et objectifs de la thèse

L'étude du rôle des experts offre une perspective éclairante sur la question économique majeure qu'est la signalisation de la qualité des biens d'expérience. La nécessité d'une évaluation de la qualité par des tiers trouve son origine dans l'inefficacité informationnelle des marchés de biens d'expérience (asymétrie informationnelle, complexité, surcharge d'information) et dans l'incertitude qui en résulte pour les consommateurs. L'omniprésence des évaluations d'experts sur les sites de vente de vin en ligne et la croissance rapide des agrégateurs d'avis en ligne tels que Vivino interrogent sur le rôle présent et à venir des experts. La croissance des ventes de vin en ligne renforce la pertinence du sujet pour l'avenir du secteur. Selon Statista, en 2022, les ventes de vin sur internet ont atteint 69 milliards de dollars sur les 309 milliards de dollars générés par l'industrie au niveau mondial (la Figure 23 illustre l'évolution depuis 2017).

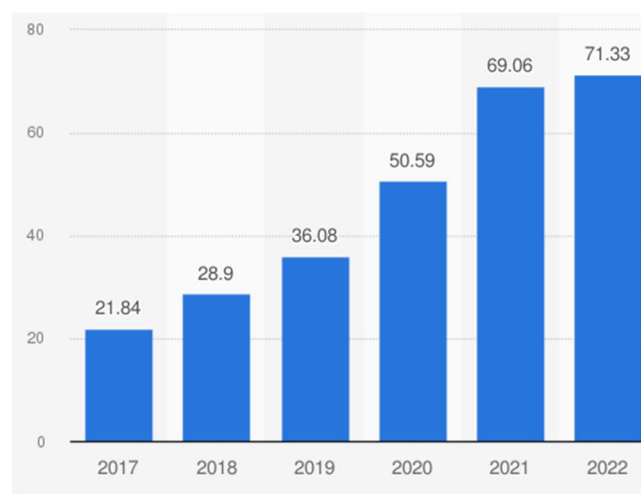


Figure 23 – Ventes de vin en ligne (en milliards de dollars)⁶⁹

Sur les sites des boutiques de vin en ligne les notes des experts sont omniprésentes. Parallèlement, les agrégateurs d'avis (de consommateurs) en ligne tels que Vivino connaissent

⁶⁹ Source: Statista market insights 2023

une croissance rapide. La concomitance de ces deux phénomènes est à l'origine des deux questions de recherche qui guident cette thèse :

- 1) Comment les signaux de qualité émis par les experts améliorent-ils l'efficacité informationnelle du marché du vin ?
- 2) Comment le rôle des experts est-il susceptible d'évoluer compte tenu de l'évolution de la dynamique du marché ?

Les experts sont un sujet central en économie du vin depuis plusieurs décennies. Cependant les évaluations par les pairs (consommateurs) n'ont que plus récemment attiré l'attention des chercheurs. Cette nouvelle source d'information apporte de l'hétérogénéité dans l'offre d'évaluations de la qualité. L'émergence de l'évaluation professionnelle des vins dans les années 1970 a généré des critères d'évaluation pour les vins fins, tout en laissant de côté les segments plus économiques. Les évaluations par les pairs couvrent désormais non seulement les catégories négligées par les experts, mais aussi le segment qui représente leur marché principal : les vins fins. Cette nouvelle source d'information est susceptible d'avoir un impact sur le rôle et l'avenir des experts sur le marché du vin. L'objectif de cette thèse est donc d'offrir une vision actualisée du rôle des experts en tenant compte des récents développements sur le marché.

Cadre et plan de la thèse

Cette thèse apporte un éclairage nouveau sur l'une des grandes questions de l'économie : la signalisation de la qualité des biens d'expérience. Elle traite des questions d'asymétrie informationnelle et de la théorie du signal pour les biens d'expérience. En 2012, Karl Storchmann, rédacteur en chef du *Journal of Wine Economics*, a identifié la finance, le changement climatique et le rôle de l'opinion des experts comme les trois principaux sujets de recherche en économie du vin. Dix ans plus tard, alors que d'autres sources d'information ont émergé et se sont rapidement développées en ligne, sa perspective est toujours d'actualité. De nombreuses publications soulignent que les opinions des experts sont discordantes, qu'ils ont des préjugés, qu'ils sont incohérents et biaisés, et que les modèles économétriques basés

sur la météo sont plus performants qu'eux pour prédire la qualité du vin (Ali & Nauges, 2007 ; Ashenfelter et al., 1995). Malgré les nombreuses publications s'attaquant aux biais des experts, leur survie jusqu'à aujourd'hui pose la question de leur utilité pour signaler la qualité et améliorer l'efficacité informationnelle du marché, et plus largement de l'évolution de leur rôle.

Deux pays européens ayant une longue tradition de production et de consommation de vin ont été sélectionnés comme terrain de recherche pour cette thèse. Tous les vins utilisés dans les expériences ou analysés dans l'analyse hédonique des prix sont des vins rouges français ou espagnols. Ce choix est particulièrement pertinent pour la filière car la France et l'Espagne sont deux grands pays producteurs de vin : ils sont respectivement le deuxième et le troisième pays producteur (après l'Italie) et totalisent conjointement 31% de la production mondiale. La France et l'Espagne sont également les deux principaux pays producteurs de vin rouge au monde. Leurs vins sont parmi les plus représentés sur les rayons du monde entier puisqu'ils occupent respectivement la première et la troisième place en volume d'exportation. Ils totalisent conjointement 33% des exportations de vin dans le monde. Ces aspects rendent très pertinent le choix des vins rouges français pour l'analyse des prix hédoniques. Ils justifient également le choix des vins rouges français et espagnols pour les expériences.

En ce qui concerne la consommation, la France et l'Espagne sont des pays traditionnellement consommateurs de vin qui partagent des modes de vie similaires. On peut s'attendre à un niveau convergent de familiarité avec le vin étant donné que, selon les données de l'OIV (Organisation internationale de la vigne et du vin), la France est le deuxième consommateur mondial de vin (en volume) après les États-Unis, tandis que l'Espagne se classe au septième rang après la Russie. Alors que le commerce électronique représente 9,9% de la valeur des ventes en France, il n'en représente que 3,1% en Espagne. Les similitudes et les différences rendent ces deux pays particulièrement intéressants pour mesurer l'influence des notes d'experts sur la préférence des consommateurs par le biais d'expériences transfrontalières. De plus, comme les participants des deux pays sont exposés à la fois aux vins rouges espagnols (Rioja) et français (Bordeaux), la deuxième expérience

nous permet également de vérifier si la familiarité est positivement corrélée aux préférences (effet du pays d'origine). Les régions viticoles emblématiques de Bordeaux et de la Rioja représentent un marché d'application particulièrement intéressant pour cette expérience.

Pour répondre de manière globale aux deux questions de recherche, il est nécessaire de mener une recherche multiméthode. Le soutien financier de l'Université de Bordeaux (département ECO), du projet Interreg SUDOE VinCi, de la Chaire Vin et Spiritueux de l'INSEEC et de Burgundy School of Business m'a offert une opportunité unique de mettre en place des expériences ambitieuses et innovantes. Cette thèse se compose de 4 chapitres, chacun d'entre eux étudiant un aspect du rôle des experts en vin en comparaison avec d'autres indices de qualité (voir Tableau 29).

Chapitre	Méthode	Analyse	Vins	Terrain	Rôle des experts
I	Revue de la littérature	Experts & Notes des pairs	Tous	Global	Sur le marché du vin
II	Expérience en laboratoire compatible avec des incitations	Notes d'experts, Indications Géographiques & Marques	Vins rouges Français & Espagnols	Espagne & France, lab	<i>Ex ante</i> Comparé à d'autres signaux de qualité
III	Analyse des prix hédoniques	Experts & Notes des pairs	Vins rouges Français	Global, en ligne ⁷⁰	<i>Ex post</i> Sur les prix des vins
IV	Expérience à domicile compatible avec des incitations	Experts & Notes des pairs	Vins rouges Français & Espagnols	Espagne & France, terrain	<i>Ex post</i> Comparé à celui des pairs

Tableau 29 – Cadre et plan de la thèse

Le chapitre I intègre la littérature sur l'évaluation de la qualité du vin dans un cadre de marché et développe une vision prospective. Le chapitre II mesure le contenu informatif *ex ante* des évaluations d'experts par rapport aux indications géographiques et aux marques de vin. Il conclut que les évaluations des experts l'emportent sur les autres indices de qualité, tant en France qu'en Espagne. Le chapitre III compare la relation relative entre les évaluations de la

⁷⁰ The community ratings used in our hedonic price regression have been produced by Vivino prosumers globally

communauté (Vivino) et les évaluations des experts avec les prix des vins rouges français à l'aide d'un vaste ensemble de données et conclut que les évaluations de la communauté l'emportent sur les évaluations des experts. Le chapitre IV présente une preuve de faisabilité pour la première expérience à domicile sans contact compatible avec l'incitation utilisant le vin comme objet d'étude. Nous étudions le contenu informationnel *ex post* des évaluations d'experts par rapport aux évaluations des pairs.

Un aperçu plus détaillé de la structure de la thèse est présenté ci-dessous.

Chapitre I - Dynamique de l'information sur le marché du vin

Le chapitre I est une revue intégrative de la littérature. Il vise à décrire le rôle des intermédiaires d'évaluation sur le marché du vin. Il distingue deux sources principales d'information sur la qualité du vin : les experts et les pairs (par exemple Vivino). Les agrégateurs d'avis en ligne fournissent désormais des informations gratuites sur la qualité de tous les segments du marché du vin, y compris les vins plus économiques, un segment traditionnellement délaissé par les experts. Je fais la lumière sur l'existence d'un marché de l'évaluation des vins et je décris à la fois sa structure (offre et demande) et sa dynamique. La revue de littérature suggère l'existence d'une structure de marché biface en expansion. Les médias spécialisés dans le vin qui transmettent des évaluations d'experts sous la forme de critiques, de notations ou de prix subventionnent les lecteurs et gagnent de l'argent grâce aux annonceurs ou aux droits d'entrée pour les compétitions. Les agrégateurs d'avis en ligne subventionnent l'offre d'avis de consommateurs en ligne gratuits en prélevant des commissions sur les ventes de leur place de marché, en vendant du vin à leurs utilisateurs et en vendant des services (et des données) à la filière. Les producteurs de contenu tels que le *Wine Advocate*, qui utilisent des structures unilatérales (les abonnements sont leur seule source de revenus) sont susceptibles d'être désavantagés par la concurrence sur le marché. Je prévois un déclin, et non une disparition, des experts, qui continueront à n'évaluer que les vins fins. Ils pourraient à terme être remplacés par des influenceurs ou des prosommateurs reconnus par leurs pairs.

Chapitre II - Le contenu informatif des indications géographiques, des avis d'experts et des marques : Preuves expérimentales en Espagne et en France

Le chapitre II est un travail conjoint avec Marco Costanigro, Azucena Gracia et Jean-Marie Cardebat. Il est en cours de révision dans l'*American Journal of Agricultural Economics*. Nous y étudions l'efficacité des évaluations d'experts en tant que signal de qualité et pour faciliter les choix des consommateurs. Deux expériences en laboratoire en Espagne (N=148) et en France (N=143) simulent une expérience d'achat de vin dans laquelle les participants choisissent entre quatre vins dans un environnement où l'information est limitée. Les notes attribuées par les experts, les informations sur l'Indication Géographique (IG) et les noms des domaines sont "achetés" dans le cadre d'une vente aux enchères à prix multiples. Nous constatons que les évaluations des experts génèrent un surplus compris entre 0,35 euro (Espagne) et 0,37 euro (France) pour chaque occasion d'achat, et que l'IG fournit un niveau d'information similaire. Ces résultats sont comparables dans les différents segments de prix (élevé : 13 à 17 euros, faible : 4 à 7 euros). Les noms des domaines ont un contenu informatif moyen plus faible mais sont plus utiles aux connaisseurs.

Chapitre III - Le rôle des évaluations des consommateurs et des experts dans une analyse hédonique des prix des vins rouges français : des gourous aux geeks ?

Le chapitre III est un travail conjoint avec Stephen Bazen et Jean-Marie Cardebat. Il a été publié dans *Applied Economics*⁷¹. Notre objectif est de déterminer la relation relative entre les évaluations des experts et de la communauté Vivino et les prix des vins. Nous disposons d'une base de données de 82 296 vins blancs, rouges et rosés de France, d'Espagne, du Portugal et d'Italie répondant à nos critères de sélection (au moins dix notes de consommateurs et une note d'expert). Nous limitons notre champ d'application à 36 970 vins rouges français pour le cadre de régression hédonique sur les attributs du vin. Notre analyse économétrique vise à saisir l'effet des évaluations des pairs et des experts sur les prix des vins à l'aide d'une

⁷¹ <https://doi.org/10.1080/00036846.2023.2257036>

méthode hédoniste. Selon nos résultats, les notes moyennes des consommateurs ont un effet plus important sur les prix des vins rouges français que les notes des experts. Ces résultats sont robustes aux valeurs atypiques et la prédominance des notes de pairs sur les notes d'experts demeure valide lorsque nous excluons les vins haut de gamme. Nous prévoyons d'analyser les vins rouges espagnols dans un prochain article.

Chapitre IV - Comment utiliser (ou ne pas utiliser) les tests d'usage à domicile sans contact (HUT) pour obtenir les préférences des consommateurs ?

Le chapitre IV est un travail conjoint avec Jean-Marie Cardebat, François Ric, Michel Visalli et Effrosyni Vasileiou. La récente crise sanitaire a créé un environnement difficile pour les études visant à déterminer les préférences des consommateurs en matière de vin habituellement menées en laboratoire. Une alternative aux tests en laboratoire est présentée ici : le test à domicile sans contact. Ce chapitre fait état des défis et des avantages associés à ces tests à domicile sans contact pour l'élicitation des préférences. Nous avons conçu une expérience "maximale" mobilisant plusieurs méthodes d'élicitation des préférences déclarées et révélées dans différentes conditions d'information. Notre objectif est de déterminer ce que nous pouvons et devons savoir pour relever les principaux défis de la recherche orientée sur les préférences lorsque le contact avec le consommateur est difficile ou impossible. Nous avons utilisé Qualtrics pour recruter et sélectionner 660 consommateurs français et espagnols et avons sélectionné 300 d'entre eux pour recevoir quatre échantillons de vin de 2 cl à domicile et participer à l'expérience en ligne. Nous avons évalué l'efficacité isolée et combinée des méthodes d'évaluation. De nombreux tests ont été mis en œuvre avec succès et ont permis d'obtenir des informations complètes et hétérogènes sur les réactions des participants à l'expérience de dégustation de vin, ainsi que sur l'influence de la source d'information (experts ou pairs) sur leurs préférences. L'enregistrement vidéo et le logiciel de reconnaissance automatique des émotions ont donné des résultats décevants, principalement en raison du non-respect des instructions par les participants. Seule l'appréciation déclarée et, en son

absence, la perception de l'acceptabilité sociale contribuent à expliquer la volonté à payer des consommateurs de vin.

Contributions

Dans le cadre théorique de l'économie de l'information, cette thèse mobilise différentes méthodes (revue intégrative de la littérature, expériences en laboratoire et à domicile avec des enchères expérimentales compatibles avec les incitations, et analyse des prix hédoniques utilisant des données en ligne) pour étudier le rôle des experts sur le marché du vin. Nous évaluons leur impact sur la dynamique du marché, leur contenu informatif pour les consommateurs et leur impact sur les prix du vin. Les principales contributions de la thèse sont les suivantes :

- L'introduction identifie les inefficacités informationnelles (asymétrie de l'information, complexité et surcharge d'information) sur le marché. Elles ont conduit à l'émergence de la critique écrite professionnelle orientée vers le consommateur dans les années 1970, et au développement de systèmes de notation pour signaler la qualité supérieure aux consommateurs.
- La revue intégrative de la littérature qui ouvre la thèse révèle la dépendance des experts et des agrégateurs de critiques en ligne à l'égard de la filière. Elle postule l'existence d'un marché de l'évaluation de la qualité du vin basé sur des stratégies bifaces.
- L'expérience présentée dans le deuxième chapitre est la première du genre à avoir abordé l'évaluation hédonique des vins en mettant les informations aux enchères à l'aide d'un mécanisme de liste de prix multiples au lieu de divulguer davantage d'informations à chaque tour et d'observer les variations de la volonté à payer pour la bouteille. Cela ouvre la voie à une nouvelle approche des enchères expérimentales pour les indices de qualité.
- Le troisième chapitre contribue à la littérature en confirmant, sur la base d'un échantillon beaucoup plus large, les conclusions du seul article à avoir effectué une analyse hédonique pour comparer le rôle des évaluations des clients et des experts sur les prix du vin.

- Le développement d'une nouvelle technique d'échantillonnage pour le vin, appliquée dans le cadre d'un plan expérimental entre sujets compatible avec l'incitation à distance, constitue la plus importante contribution du quatrième chapitre. Il s'agit de la première étude exploratoire développant un design expérimental entièrement à distance pour le vin. Notre étude interdisciplinaire contribue à présenter le premier protocole pour la réalisation d'un HUT combiné, d'une vente aux enchères en ligne (Becker-De Groot Marschak) ainsi que de mesures implicites (analyse des émotions à l'aide d'un lecteur de visage) et explicites (déclarées) de l'analyse sensorielle et hédonique.

Perspectives de recherche

Cette thèse aborde des questions économiques fondamentales telles que l'impact de l'information sur la dynamique du marché, sa valeur économique et son adaptation à l'évolution de la dynamique du marché. Elle soulève également plusieurs questions et opportunités de recherche. Par exemple, avec un budget plus important, l'expérience du chapitre I pourrait être élargie pour inclure des évaluations par les pairs parmi les sources d'information. Cela nous permettrait de comparer la valeur des signaux de qualité provenant de deux sources différentes, les experts et les pairs. Bien qu'il n'ait pas été possible de réaliser cette analyse, le quatrième chapitre de cette thèse a permis de répondre à un certain nombre de questions en comparant les réactions des consommateurs aux évaluations des pairs et des experts.

Une autre orientation naturelle de la recherche future serait de reproduire l'analyse des prix hédoniques du chapitre III en utilisant des vins espagnols en lieu et place des vins français. Cette analyse nous permettrait de généraliser davantage nos résultats. Au-delà du développement direct du travail expérimental présenté dans cette thèse, des projets de recherche plus avancés pourraient s'appuyer sur les questions soulevées par la thèse. Je conclurai ci-dessous par quelques réflexions préliminaires et des étapes vers la mise en œuvre d'autres recherches inspirées par cette thèse.

Les médailles reflètent-elles les goûts des consommateurs ?

Selon la littérature académique, les consommateurs de vin utilisent les médailles comme indicateur de qualité. Leur présence sur les bouteilles a un effet positif sur les ventes. Mais reflètent-elles les goûts des consommateurs ? Lors d'une dégustation à l'aveugle de six vins différents, les consommateurs seraient-ils capables de faire la différence entre les vins qui ont reçu une médaille d'or et les vins qui ont été écartées par le jury d'un concours de vins ? Plusieurs articles ont étudié les différences et les similitudes entre les experts et les novices au niveau sensoriel. Schiefer et Fischer (2008) étudient l'écart entre les évaluations des vins par les experts et les préférences des consommateurs, mais ils ne fondent pas leur analyse sur les médailles décernées lors de véritables concours de vins. Avec Jean-Marie Cardebat, Michel Visalli, Juliette Passebois-Ducros et Yilong Liang de l'Université de Bordeaux, nous avons conçu un protocole expérimental pour tester si les médailles reflètent le goût des consommateurs. Nous avons reçu le soutien de l'un des plus importants concours de vins au monde. Un panel de 120 participants a été recruté à Dijon (France) par une agence de recrutement de panels pour une dégustation à l'aveugle en laboratoire comprenant des commentaires libres, l'élicitation de la volonté à payer, la notation et l'évaluation hédonique des vins. Cette expérience nous permettra de tester la corrélation entre les évaluations des consommateurs et les perceptions sensorielles des caractéristiques des vins et des médailles décernés par un jury d'experts.

Commentaires générés par les utilisateurs, gamification et engagement sur les plateformes numériques

Sur Vivino, moins de 5 % des vins scannés sont notés. Les prosommateurs sont donc minoritaires au sein de la communauté Vivino. L'utilisation de Vivino varie selon les utilisateurs. Certains utilisent le site web ou l'application uniquement comme une source d'informations provenant d'autres consommateurs. D'autres l'utilisent plutôt comme un moyen de se souvenir de leur propre expérience des vins qu'ils ont dégusté, pour s'y référer ultérieurement (délestage cognitif). Comme le souligne l'analyse de la littérature, même si plusieurs études

sur les agrégateurs d'avis dans le marché du vin ont été présentées lors de conférences récentes, peu d'entre elles ont été publiées dans des revues à comité de lecture (par exemple Bazen et al., 2023). Il existe un besoin de recherche dans ce domaine, en particulier pour comprendre les motivations derrière l'utilisation d'applications comme Vivino et le profil des utilisateurs.

De nombreuses questions se posent : Qui sont les utilisateurs qui génèrent du contenu? S'agit-il d'aficionados qui scannent, notent et commentent les vins, mais qui interagissent également avec d'autres utilisateurs, en aimant et en commentant leurs publications? Combien d'utilisateurs sont des observateurs impartiaux et combien des représentants de la filière qui notent leurs propres vins (le problème de l'"astroturfing" a été bien documenté sur des sites tels qu'Amazon, Google Local et Yelp) ? Quel est le profil des principaux utilisateurs de Vivino dans chaque pays ? Ont-ils des points communs ? La gamification (classement des utilisateurs par pays) crée-t-elle une communauté qui se rencontre dans la vie réelle ? Vivino ne permet pas l'envoi de messages directs entre les utilisateurs ; cela est-il susceptible de changer ? Bien que nous nous attendions à ce que ce projet soit chronophage, nous prévoyons de réaliser une étude qualitative exploratoire ciblant les utilisateurs de Vivino les plus en vue (classés de 1 à 10) dans les principaux pays consommateurs de vin, afin de mieux comprendre ces utilisateurs et leur influence potentielle sur le marché mondial et local du vin.

Il existe de nombreuses autres possibilités de recherche sur ce sujet. La multiplication des concours de vins, par exemple, est un défi pour les producteurs de vin. Ils doivent établir un budget marketing et une stratégie pour déterminer à quels concours envoyer leurs vins. Des guides comme La Tulipe Rouge (en France) fondent désormais leur modèle économique sur le droit d'entrée perçu pour chaque vin envoyé pour être dégusté par leurs critiques (ils n'acceptent pas de publicité et fournissent les critiques gratuitement aux consommateurs). Il serait intéressant de comprendre comment les producteurs de vin orientent leurs choix. Jugent-ils la crédibilité des concours en observant les médailles décernées à des producteurs

de vin réputés ? Rationalisent-ils leur choix en maximisant la probabilité d'obtenir une médaille dans un concours ? Mesurent-ils l'impact sur les ventes ?

J'espère que cette thèse inspirera et encouragera de nouvelles collaborations entre chercheurs en économie, marketing, sciences sensorielles et psychologie qui réalisent le potentiel unique du vin comme révélateur du comportement des consommateurs.