



**AMERICAN ASSOCIATION
OF WINE ECONOMISTS**

AAWE WORKING PAPER
No. 252
Economics

**IMPACT OF CROWD-SOURCED WINE
RATINGS ON PURCHASING BEHAVIOR
IN A RETAIL ENVIRONMENT**

Christopher P. Cheng and Martin R. Reyes

June 2020

www.wine-economics.org

AAWE Working Papers are circulated for discussion and comment purposes. They have not been subject to a peer review process. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the American Association of Wine Economists AAWE.

© 2020 by the author(s). All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Impact of Crowd-Sourced Wine Ratings on Purchasing Behavior in a Retail Environment

Christopher P. Cheng, PhD, CSW¹ and Martin R. Reyes, MW²

¹Stanford University, 450 Serra Mall, Stanford, CA 94305, USA

cpc@stanford.edu

²The Institute of Masters of Wine, 6 Riverlight Quay, Kirtling Street, London, SW11 8EA, UK

martin@reyes.com

Corresponding Author:

Christopher Cheng, PhD, CSW

cpc@stanford.edu

+1 650-799-6338

1731 Holt Avenue, Los Altos, CA 94024, USA

Abstract

Crowd-sourced ratings are becoming pervasive in the wine industry with 100M+ 5-star reviews accessible online. An online exercise simulating the retail environment collected data from 21,636 wine “purchases” from 1202 participants. Using discrete choice modeling and regression analysis, this study investigated the influence of crowd-sourced ratings relative to rating-volume, shopper demographics, and wine attributes. Results show that crowd-sourced ratings influence wine purchasing decisions for all wine categories, although to varying degrees, and even surpass the influence of professional ratings with sufficient rating-volume. Younger generations with middle to high incomes, greater wine knowledge, who purchased wine at higher-than-average volumes and prices were generally more likely to be influenced by crowd-sourced ratings. The relative influence of the rating is correlated to a combination of familiarity of the wine variety/origin, price, and the manner in which wines are arranged on a shelf (i.e. mixed vs pre-sorted shelving). The quantitative findings open powerful possibilities for new marketing strategies for retailers, producers, distributors, and restaurants/bars.

Keywords:

Crowd-sourced wine ratings, professional wine ratings, retail simulation, discrete choice modeling, demographic effects, product attributes

CSR – crowd-sourced wine rating

PWR – professional wine rating

RED-CA: Cabernet Sauvignon, Pinot Noir, Zinfandel, Red Blends from California and Napa

RED-FN: Cabernet Sauvignon, Pinot Noir, Merlot, Red Blends from France and Napa Valley

WHITE: Chardonnay, Sauvignon Blanc, Pinot Gris, Rosé from France, California, South Africa

SPARK: Cava (Spain), Prosecco (Italy), Champagne (France), California Sparkling (USA)

1. INTRODUCTION

Selecting wine in a physical or online retail wine environment can be challenging for the average consumer, where there are hundreds to thousands of choices and no opportunity to sample products prior to purchase [2]. Shoppers often turn to heuristic methods by using external cues such as price, variety, origin, brand, and external opinions [20]. The literature is consistent across several industries in that consumers are influenced by both crowd-sourced [12,19] and professional ratings [16] in conditions where low information exists about an experience-good or the consumer displays risk-aversion [6].

Studies specific to retail wine consumers have generally investigated professional wine rating (PWR) influence due to the perceived importance of critics within the wine culture [10], whereas studies on the influence of consumer opinions is extremely scarce. The only studies to investigate consumer opinions have been related to influence on perceived quality [1] and the comparison of amateur and professional narrative reviews [9]. However, since the turn of the decade, a confluence of factors such as mobile-phone camera ubiquity, rapid label-ID technology and a growing popularity of on-demand “socially-proofed” reviews [17] has made numerical crowd-sourced wine ratings (CSRs) incipient in the wine industry. Indeed, a 2015 survey shows 90% of wine consumers have a smartphone, with 26% using a wine app to help decide on purchases [21]. In particular, the digital traffic for a globally popular wine app, Vivino.com, with over 33 million downloads and a database of 110 million 5-star-scale ratings of over 10 million wines [4] can be considered a sufficiently large digital wine marketplace with potentially substantial commercial impact.

Discovering a measurable impact from CSRs on wine purchasing behavior has important implications for producers, marketing and distribution bodies, merchants, and hospitality programs. This study leverages discrete choice modeling on prospectively acquired consumer choices to investigate the influence of numerical CSRs on consumer purchasing decisions in a retail

environment, and how its influence compares to that of PWRs. In addition, the relative influence of CSRs is quantified in the context of consumer demographics and traditional wine attributes including variety, origin, and price.

2. METHODS

2.1. Survey Design

An online survey was designed to simulate a retail environment and to measure and forecast consumer purchasing behavior within four distinct simulated shelf exercises that represent popular wine categories. Each exercise represented a minimum of 60% US market share by volume within their category to provide findings of broad commercial relevance [3]:

RED-CA: Cabernet Sauvignon, Pinot Noir, Zinfandel, Red Blends from California and Napa Valley (representing 89% market share of US retail red wine sales; includes 24 labels)

RED-FN: Cabernet Sauvignon, Pinot Noir, Merlot, Red Blends from France and Napa Valley (representing 83% market share of US retail red wine sales; includes 24 labels)

WHITE: Chardonnay, Sauvignon Blanc, Pinot Gris, Rosé from France, California, and South Africa (representing 63% market share of US retail white wine sales; includes 36 labels)

SPARK: Cava (Spain), Prosecco (Italy), Champagne (France), and California Sparkling (USA) (representing 72% market share of US retail sparkling wine sales; includes 12 labels)

Five CSR values (3.4, 3.7, 4.0, 4.2, and 4.4 stars) were selected to represent a credible range of ratings derived from real-world 5-star distribution data from a leading wine app [4], and five PWR values (85, 88, 90, 92, and 94 points) were selected based on review of past ranges utilized by studies

with similar methodology [15]. Both CSR and PWR values were displayed generically to control for influence of well-known providers like Delectable, Vivino, Wine Spectator, Wine Advocate, etc. To account for the substantial effect of “crowd-size” on the influence of crowd-sourced ratings [12,19], three rating-volumes (14, 173, and 852 ratings) were assigned to all five CSR values for a total of 15 variable combinations. These volumes were derived from a histogram analysis of the full ratings database of a leading CSR wine app [4]. Bottle prices were clustered around the US\$15, \$20, and \$25 price points because wines \leq \$10 are driven more by price and brand, while wines $>$ \$30 comprise less than 10% of wines sold and purchases are more likely to be driven by brand and prestige [3].

Each survey task comprised a randomized assortment of six bottle images sourced from a given wine category, accompanied by variety, origin, and price. In addition, occasional random CSRs and rating-volumes, PWRs, and price discounts were displayed with the wine selections (Figure 1).

2.2. Data Collection and Discrete Choice Modeling

An independent third-party research firm (Strategic Insights, New York, NY, USA) sourced 1202 US residents of legal drinking age with online access from a national consumer database of six million people. The respondents were pre-selected and confirmed to represent a realistic cross-section of wine consumers with respect to demographics including age, gender, and income [21,22]. Each respondent was exposed to a series of on-screen simulated store shelves and were asked which one of the wines shown, if any, they would buy. All 1202 respondents were evenly assigned to two of four categories based on the types of wines they reported buying in the past year to ensure a realistic shopping experience; thus, 601 respondents were exposed to each wine category. Each simulated exercise comprised nine randomized shelves, so there were 18 individually “bought bottles” for each of the 1202 respondents, producing 21,636 buying opportunities from a total of 151,452 options (six wines per shelf, plus a “NONE” option) (Figure 1).

By using discrete choice modeling, a variant technique of conjoint analysis, Client Conjoint Simulator (Sawtooth Software, Provo, UT, USA) was used to measure and quantify changes in purchasing behavior in the context of CSR and PWR values [11,14,18]. The software performed iterative virtual shelf scenarios without the original respondents having to be present, executing 200,000 computer-generated simulated purchases for each iteration of CSR value, rating-volume, and PWR value for all demographic segment, brand (96 total), and product attribute (grape variety, origin, and price) variants. The population segments investigated were gender (M, F), age (21-29, 30-37, 38-49, 50-59, 60-68, 69+ years), income (<\$50k, \$50-100k, >\$100k/year), purchasing quantity (0-2, 3-5, 6+ bottles/month), average price per bottle (<US\$15, \$15-20, \$20-25, \$25-30, >\$30), self-reported wine knowledge (novice, intermediate, advanced, connoisseur), and self-reported importance of CSR (important, not important). From this massive data set, the influence on purchasing behavior for each given rating could be determined in isolation.

2.3. Statistical Analysis

Once the predicted share changes under each rating were calculated for each wine category (average of all individual wines in each category), linear regression analysis was applied to all CSR and PWR values for each of the four categories. The slope of each system was found, CSR and PWR slopes were normalized based on rating scales [4], and compared against each other in context of R-value strength. ANOVAs and paired two-tailed t-tests were used to compare CSR vs. PWR influence and between demographic groups (with all individual wine labels), while ANOVAs and unpaired two-tailed t-tests were used to compare different wine varieties, origins, and prices. P values < 0.05 were considered statistically significant and Bonferroni-Holm corrections were applied for multiple comparisons [8].

3. RESULTS

3.1. Crowd-sourced Wine Rating Influence on Purchasing Behavior

CSR influence on wine purchasing behavior (predicted share) was demonstrated in 12 distinct experiments – four wine categories with three rating-volumes each (Table 1). For example, for RED-CA, predicted share increased from 10.2% to 28.1% as CSR with 852 ratings rose from 3.4 to 4.4 stars, producing a slope of 17.7% per star, i.e. the average wine was chosen 1.77% more often with each 1/10 star increase.

3.2. Comparison of Crowd-sourced and Professional Wine Ratings Influence

The influence of PWRs on predicted share was calculated, normalized, and compared to the influence of CSRs (Table 2). CSRs with 173 and 852 ratings exhibited equal or greater magnitude of influence (higher slope) than PWRs for RED-CA, RED-FN, and WHITE, while PWRs exhibited greater influence than CSRs with 14 ratings. CSRs consistently exhibited greater impact for SPARK compared to PWRs regardless of rating-volume. For CSRs the R values for eleven of twelve simulated exercises were above 0.90, while for PWRs, all four simulated exercises exhibited R values above 0.90.

3.3. Crowd-sourced Wine Rating Influence by Consumer Demographics

Increase in CSR exhibited a general trend of positive influence on purchasing behavior for all consumer segments, however, there was heterogeneity in influence among the respondents based on demographics. Men were more influenced by CSR than women for all still wines ($P < 0.001$ for all still wines), however, there was no significant gender bias towards CSR in sparkling wines. There was decreasing CSR influence on predicted-share with increasing age: Millennials (21-37y) > Gen-

Xers (38-59y) > Baby Boomers & Traditionalist (60+) ($P < 0.001$) for still wine categories and Millennials & Gen-Xers (21-59y) > Baby Boomers & Traditionalist (60+) ($P < 0.001$) for sparkling wines. Middle-income (\$50-100k/year) shoppers were generally more influenced by CSR for RED-CA, WHITE, and SPARK categories as compared to low-income (<\$50k/year) and high-income (>\$100k/year) respondents ($P < 0.05$ for most), however, high-income shoppers were most influenced by CSR for RED-FN ($P < 0.05$ for all).

Shoppers purchasing 3+ bottles/month were more influenced by CSR than those purchasing <3 bottles/month ($P < 0.02$ for all), however, influence plateaued for purchasers of 6+ bottles/month. CSR influence depended on the amount shoppers self-reported spending per bottle on average (ANOVA: $P < 0.001$ for all wine categories) with a consistent increase from <US\$15/bottle to US\$15-20/bottle to US\$20-25/bottle ($P < 0.02$ for all wine categories). There was a dip in influence from US\$20-25/bottle to US\$25-30/bottle with the exception of the RED-FN group, which showed an upward trend for one higher price level. Greater self-reported wine knowledge corresponded with increased CSR influence on predicted-share for all wine categories (ANOVA: $P < 0.001$ for all) and self-reported importance of CSR contributed to greater influence from CSR ($P < 0.001$ for all).

3.4. Crowd-sourced Wine Rating Influence by Wine Attributes

When the choice was among mixed wine styles, CSR influenced predicted share more for some wine categories than others. For example, in RED-CA, predicted share increased for Cabernet Sauvignon more than for the other varieties (Table 3). When shelves were sorted by varietal (each variety on its own shelf), there was no significant difference in CSR influence on predicted share among varieties. From the perspective of wine origin, domestic-origin wine purchases were more influenced by CSR compared to international-origin wines for RED-FN and WHITE when the wine

styles were mixed ($P < 0.05$ for both), but there was no difference in pre-sorted shelves. CSR influence was not different among different price categories for any wine category when the prices were mixed, however, on pre-sorted shelves, CSR influence was generally greater for higher-priced wines for RED-CA, RED-FN, and SPARK categories ($P < 0.01$ for most) while there was no difference for WHITE.

4. DISCUSSION

4.1. Crowd-sourced Wine Rating Influence on Purchasing Behavior

In general, a wine's predicted share increased with higher CSR and this influence was strengthened with a higher rating-volume. In some cases, a lower CSR with higher rating-volume yielded more predicted share than a higher CSR with lower rating-volume. For example, 4.0 stars with 852 ratings for RED-FN drove more sales (20.4% predicted share) than 4.4 stars with 14 ratings (13.3% predicted share) (Table 1). This feature – CSR influence strengthened by rating-volume – was most pronounced for RED-FN and WHITE shoppers. However, in the case of SPARK, CSR displayed a smaller influence (lower slope) on shoppers relative to still wine categories, and that influence did not monotonically rise with rating-volume.

The notion of familiarity offers a key to understanding how rating-volume impacts CSR influence. In cases in which shoppers may be less familiar with a particular region or variety, they would need greater confirmation that a CSR is not a fluke, i.e. a higher rating-volume. Whereas a more familiar wine category would elicit less dependency on crowd-affirmation; shoppers therefore place less reliance on rating-volume to confirm their choice. Evidence in all four wine categories support this framework. RED-FN, with 50% international wines – suggests a lower chance of familiarity than RED-CA in this study's US-only respondents. As expected, RED-FN shoppers are

more sensitive to CSRs with higher rating-volumes and less sensitive to CSRs with low rating-volumes when compared to RED-CA (Table 1). The WHITE category, with 66% international wines, including two less commercially-sought origins (Alsace and South Africa) [3], presents a very unfamiliar shopping scenario and CSRs with low rating-volumes are the least influential on buying behavior. Indeed, CSRs with 14 ratings for WHITE exhibited the lowest slope of influence and is the only instance with R-value below 0.90. Finally, SPARK, which includes a significant percentage of US sparkling wines and very familiar wine types such as Prosecco and Champagne, behaves exactly as expected for a high-familiarity wine category. Here, a low slope of predicted share relative to other wine categories indicates a modest need for shoppers to confirm pre-existing stylistic preferences with CSRs. In addition, shoppers appear to take CSRs casually, without concern for crowd-size of the rating, i.e. the effect of CSR on predicted share is independent of rating-volume.

4.2. Comparison of Crowd-sourced and Professional Wine Ratings Influence

The influence of PWRs on predicted share from this study echoed findings from a recent study by Paris et al. [15], namely, there was powerful and consistent (R values > 0.90) influence of PWRs on retail purchasing behavior. A new finding is that CSRs not only influence consumer wine purchasing behavior, but also compete for attention with established PWR influence and even surpass PWR influence with sufficient rating-volume (Table 2). This is consistent with non-wine industry findings that have investigated the power of CSR and the role of rating volumes on consumer choice [12,13,19]. In general, the tipping point of when CSRs have more influence than PWRs on wine retail purchasing is approximately 50 to 150 ratings, depending on the familiarity of the product. Specifically, the less familiar the wine category, the higher the CSR rating-volume needed to match the influence of PWRs.

There are powerful retail implications here. For example, shops can selectively display professional or crowd-sourced ratings depending on the numerical ratings and rating-volumes available in order to drive sales. In addition, while rating-volume is an important consideration for CSR for still wine categories, it does not appear to be the case for sparkling wines, which benefit from CSRs regardless of number of ratings. This is because sparkling wine purchasing is often occasion-driven, and the high familiarity of sparkling wine types reduces perceived financial risk. Furthermore, since many people purchase different types of sparkling wine interchangeably, the effects of CSR are muted.

4.3. Crowd-sourced Wine Rating Influence by Consumer Demographics

In general, men and younger adults are more influenced by CSRs than women and older adults. This is consistent with the findings of PWRs [15], suggesting that men are more driven by numerical ratings, and younger, tech savvy adults are more inclined to access and trust online CSRs. The outlier is with sparkling wines, where there are no statistical differences between men and women in CSR influence, which is perhaps explained by greater influence of recognition of US sparkling wines, Cava, Prosecco, and Champagne relative to CSR. Similarly, the influence of CSRs on sparkling wine purchasing was depressed for all age groups, and parity of influence for ages between 21 and 59 years suggests that other drivers may dominate purchasing behavior, such as occasion and price.

The fact that the middle-income group (US\$50-100k) was most influenced by CSRs for RED-CA, WHITE, and SPARK categories suggests a convergence of risk-reduction and prestige-seeking. While low-income consumers have a proportionally greater financial risk of a mistaken bottle purchase [15], high-income consumers more deliberately seek the prestige of a high-scoring wine [5,7]. Effectively, wines with high CSR scores likely fulfill both demands for middle-income consumers, a segment that may have enough disposable income to buy on aspiration but not

sufficiently wealthy for mistakes not to matter. Supporting evidence for the logic oddly enough lies in the RED-FN outlier results, where predominantly prestige appellations (Burgundy, Bordeaux, Napa) drove increased CSR sensitivity for the highest-income rather than middle-income shoppers.

Consumers who purchased at least three-times the volume “average” monthly US-per capita consumption (3+ bottles/month) were more likely to be influenced by CSR. This makes sense because the need for more purchasing may instigate greater reliance on external opinions. The plateau of CSR influence for purchasers of 6+ bottles/month also makes sense as high-frequency buyers may be driven by other factors, such as volume-discounting or brand-dependability, as was similarly discovered with PWR influence [15]. Plus, these ultra-frequent buyers may be so familiar with wine they do not need increased help from CSRs. The finding that the largest CSR influence was on consumers typically who purchased wines in the US\$20-25/bottle price range echoes the income-segment results and reinforces the middle-income “bump” rationale. In fact, the outlier for this segment, RED-FN, also matches the related high-income-shopper logic by exhibiting an increase of CSR influence for shoppers buying wines priced at US\$25-30/bottle.

Self-assessed wine knowledge and inclination to trust CSRs both correlate to stronger CSR influence across all wine categories. At first, the fact that self-reported “connoisseurs” were among the most substantially influenced by CSR seems counterintuitive; one might easily assume this wine-educated group would require less external input. However, this finding makes sense upon consideration, as it aligns precisely with the demographic findings where higher income, average-bottle spend, and purchasing volume align with wine knowledge, and suggest that connoisseurs first and foremost seek quality wine. Interestingly, even shoppers who explicitly reported not relying on CSR in the survey were still influenced by them, a result that should not be lost on wine producers and retailers considering the pros and cons of promoting CSRs.

4.4. Crowd-sourced Wine Rating Influence by Wine Attributes

In the context of mixed shelves, more familiar wine varieties/styles and origins exhibited the most CSR influence (e.g. Cabernet for RED-CA, Cabernet and Pinot Noir for RED-FN, Chardonnay for WHITE, Champagne for SPARK), while in the pre-sorted shelves the variation of influence disappeared (Table 3). This means that wine consumers employ CSR differently depending on their familiarity with the entirety of a wine shelf, as demonstrated by the consistency of CSR influence on familiar varieties and origins with pre-sorted shelving configuration but not with mixed shelves. In other words, when familiarity on a single shelf is uneven, consumers are likely to reduce purchase risk by: 1) more often purchasing what is familiar, and 2) utilizing CSR more strongly to validate that selection.

With regard to wine prices, the influence of CSR is also affected by familiarity, but this time in the form of budgetary comfort. With mixed-price shelves, consumers select budget first, then consider CSR to help finalize their decision [21]. Consequently, CSR's influence by price is not altered. With like-price shelves, the increased influence of CSR for more expensive shelves reveals its role in assuring quality in the face of greater financial commitment when shoppers cannot select a preferred budget. For the white wine category, not unexpectedly, there is no difference between mixed-price and like-price shelves. This outcome suggests that white wine shoppers may be more partial to low prices or perhaps more precisely, they are accustomed to less financial risk since the category is generally less expensive than reds for a similar quality level.

4.5. Implications and Future Opportunities

CSRs are natural extensions to traditional PWRs and narrative wine reviews, but with the distinct appeal of harnessing millions of data points on-demand to provide “socially-proofed” quantitative references. Taking the findings from this study, retailers can devise situation-specific marketing

strategies for moving certain products for various demographic groups. For example, in a shop located in a neighborhood with high incomes, expensive Cabernet Sauvignon sales may be facilitated by displaying high CSRs with high-rating volumes on a shelf with mixed varieties but similar prices, whereas lower-priced Merlot with lower CSRs may do better by only displaying PWR on a shelf only with other Merlots of mixed price.

While this research focused on the retail environment because it is the largest wine sales channel in the US, comprising 78.75% market share of a US\$62 billion industry [22], CSRs will likely affect purchasing behavior in other market channels (e.g. on-premise, auction) and other parts of the value chain. For example, CSRs can be used to improve strategies for producers (e.g. encourage customers to rate their wines to increase rating-volume), distributors (e.g. highlight sufficiently high CSR in sparkling wines regardless of rating-volume), and restaurants (e.g. displaying high CSRs for lesser-known producers of popular styles).

This research was conducted in a virtual retail environment, which means respondents did not face contextual inputs like shelf-talkers, interaction with sales people, or decision-making with real money. Thus, data from real-life purchases and on-premise environments would be a natural extension to this research. More granular study of populations by cross-referencing demographic groups (e.g. a Gen-X, female, connoisseur with high-income), could uncover new findings. Also, it was observed that the relationship between CSR and predicted share are often better described by a quadratic correlation as compared to a linear one (i.e. quadratic R values > linear R values), suggesting that CSR impacts choice more dramatically as scores escalate; this is deserving of further investigation. Finally, the fact that all of the respondents of this study are from the US, with greater familiarity with US-produced wines, means the influence of CSR on purchasing behavior is likely to be different on the international stage.

5. CONCLUSIONS

CSRs are influential in wine purchase decisions, and with sufficient rating-volume, can match and exceed the influence of professional ratings. While CSRs influence all consumer demographic groups, wine styles, and prices, the influence varies significantly, with greater impact on middle- to high-income younger generations with greater wine familiarity. Segmentation analysis also intimates the presence of specific drivers among wine categories, notably prestige in red wines from France and Napa, value in white wines, and the standardized style perception of sparkling wines. The influence of CSR with respect to the attributes of wine variety, origin, and price depends largely on whether the shelves are mixed or pre-sorted by these attributes.

6. ACKNOWLEDGEMENTS

The authors would like to acknowledge Michael Sauter of Strategic Insights for performing the survey data collection, Mary Gorman-McAdams MW for advising, and Keely Schlesinger and Becky Spencer for proof-reading.

7. REFERENCES

- [1] 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.
- [2] Atkin, T., Thach, L. (2012). Millennial wine consumers: Risk perception and information search. *Wine Economics and Policy*, 1(1), 54-62.

- [3] Brager, D. (2017). State of the Industry - What's Selling. In: Unified Wine Symposium. Sacramento: The Nielsen Company.
- [4] Cebulla, B. (2017). Vivino, Inc.
- [5] Cuellar, 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.
- [6] Dewenter, R., Heimeshoff, U. (2015). Do expert reviews really drive demand? Evidence from a German car magazine. *Applied Economics Letters*, 22(14), 1150-1153.
- [7] 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. <http://dx.doi.org/10.2139/ssrn.1343732>.
- [8] Holm A. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, 6, 65–70.
- [9] Knowles, S. (2015). What is the relative importance when using a member's (amateur's) positive review vs an expert's positive review on sales within The Wine Society? Master of Wine Dissertation. Institute of Masters of Wine.
- [10] Lockshin, L., Corsi, A. (2012). Consumer behaviour for wine 2.0: A review since 2003 and future directions. *Wine Economics and Policy*, 1(1), 2-23.
- [11] Lockshin, L., Mueller, S., Louviere, J. (2010). The influence of shelf information on consumers' wine choice. In: 5th international Academy of Wine Business Research Conference. Auckland, New Zealand.
- [12] Luca, M. (2016). Reviews, Reputation, and Revenue: The Case of Yelp.Com. Harvard Business School Working Paper, 12-016. <http://dx.doi.org/10.2139/ssrn.1928601>.
- [13] Millwood, A. (2017). How Star Ratings Influence Customers' Behavior. Yotpo. <https://www.yotpo.com/blog/star-ratings-influence-customers/>.

- [14] Mueller, S., Osidacz, P., Francis, I., 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.
- [15] Paris, N. (2014). Wine Scores and Consumer Purchasing Behavior: The Level of Influence of Numerical Scores on Consumer Wine Purchasing Behavior in the US Off-Trade. Master of Wine Dissertation. Institute of Masters of Wine.
- [16] Reinstein, D., Snyder, C. (2005). The Influence of Expert Reviews on Consumer Demand for Experience Goods: A Case Study of Movie Critics. *Journal of Industrial Economics*, 53(1), 27-51.
- [17] Sahin, S. (2015). Social proof & the psychology of consumer reviews. GetApp Lab. <https://lab.getapp.com/social-proof-the-psychology-of-consumer-reviews/>
- [18] Sánchez, M., Gil, J. (1998). Consumer Preferences for Wine Attributes in Different Retail Stores: A Conjoint Approach. *International Journal of Wine Marketing*, 10(1), 25-38.
- [19] Spiegel Research Center, Northwestern University (2014). Star Ratings and Review Content: How do star ratings and review content influence purchase? <http://spiegel.medill.northwestern.edu/studies/online-reviews.html>.
- [20] Taylor, D., Dodd, T., Barber, N. (2008). Impact of Wine Education on Developing Knowledge and Preferences: An Exploratory Study. *Journal of Wine Research*, 19(3), 193-207.
- [21] Thach, L., Chang, K. (2015). 2015 Survey of American Wine Consumer Preferences. Winebusiness.com. <https://www.winebusiness.com/news/?dataid=160722&go=getArticle>.
- [22] Wines Vines Analytics (2017). Domestic table and sparkling wine sales on-premise and off-premise: 12 months through October 2017. Excludes Cider. Wines Vines Analytics, San Rafael, CA: Wine Communications Group, Inc. Available through <http://bw166.com>.

Table 1. Crowd-sourced wine rating (CSR) influence on predicted share in each wine category

852 Ratings		RED-CA	RED-FN	WHITE	SPARK
3.4 stars	Predicted Share	10.2±2.3%	9.5±3.9%	6.7±5.4%	6.5±3.3%
3.7 stars		10.8±4.8%	7.6±2.7%	4.8±3.5%	7.2±3.4%
4.0 stars		14.7±3.9%	20.4±4.6%	15.2±7.8%	11.3±3.3%
4.2 stars		21.0±4.7%	24.6±5.1%	18.8±6.8%	10.8±3.6%
4.4 stars		28.1±4.2%	32.0±5.3%	24.7±7.6%	15.2±3.9%
Slope of CSR		17.7, R=0.93	24.3, R=0.94	19.6, R=0.94	8.2, R=0.94
ΔShare per $\Delta\frac{1}{10}$ star		1.77%	2.43%	1.96%	0.82%
173 Ratings		RED-CA	RED-FN	WHITE	SPARK
3.4 stars	Predicted	8.4±3.1%	3.3±2.0%	5.4±4.0%	5.8±3.0%
3.7 stars		8.5±2.2%	9.0±4.4%	8.6±5.8%	5.9±3.2%
4.0 stars		18.3±3.9%	19.9±4.8%	18.5±7.8%	9.7±4.2%
4.2 stars		16.6±4.7%	17.7±4.3%	17.4±6.9%	13.9±3.5%
4.4 stars		24.2±4.5%	23.4±4.5%	23.6±7.0%	15.7±4.1%
Slope of CSR		15.8, R=0.93	20.0, R=0.96	18.2, R=0.97	10.9, R=0.96
ΔShare per $\Delta\frac{1}{10}$ star		1.58%	2.00%	1.82%	1.09%
14 Ratings		RED-CA	RED-FN	WHITE	SPARK
3.4 stars	Predicted Share	7.8±2.8%	7.1±3.0%	7.8±5.5%	4.4±2.8%
3.7 stars		8.9±3.5%	5.9±2.1%	9.5±6.8%	4.9±2.7%
4.0 stars		12.5±4.4%	9.3±3.0%	14.7±6.0%	7.5±2.7%
4.2 stars		16.4±3.3%	12.6±4.4%	10.1±5.6%	10.5±3.3%
4.4 stars		18.8±4.8%	13.3±3.9%	12.0±5.1%	13.0±3.9%
Slope of CSR		11.6, R=0.97	7.4, R=0.91	4.0, R=0.60	8.9, R=0.96
ΔShare per $\Delta\frac{1}{10}$ star		1.16%	0.74%	0.40%	0.89%

RED-CA: California Reds; **RED-FN**: French and Napa Reds; **WHITE**: French, California, South African Whites; **SPARK**: Champagne, Cava, Prosecco, US Sparkling;

Predicted Share = mean±standard deviation predicted share of simulated purchases; **Slope of CSR** = linear correlation between Predicted Share and CSR; **R** = Pearson correlation coefficient;

ΔShare per $\Delta\frac{1}{10}$ star = change in Predicted Share with 0.1 star change

Table 2. Comparison of crowd-sourced wine rating (CSR) and professional wine rating (PWR) influence on predicted share in each wine category

Slope of CSR	RED-CA	R	RED-FN	R	WHITE	R	SPARK	R
852 ratings	17.7	0.93	24.3	0.94	19.6	0.94	8.2	0.94
173 ratings	15.8	0.93	20.0	0.96	18.2	0.97	10.9	0.96
14 ratings	11.6	0.97	7.4	0.91	4.0	0.60	8.9	0.96
ANOVA P Values								
ALL CSR rating-volume	<0.001		<0.001		<0.001		0.008	
Normalized Slope of PWR	15.4	0.95	12.8	0.91	13.1	0.99	7.3%	0.95
t-test P Values								
PWR vs CSR - 852 ratings	0.001		<0.001		<0.001		0.002	
PWR vs CSR - 173 ratings	NS		<0.001		<0.001		<0.001	
PWR vs CSR - 14 ratings	<0.001		<0.001		<0.001		<0.001	

RED-CA: California Reds; **REDS-FN:** French and Napa Reds; **WHITE:** French, California, South African Whites;
SPARK: Champagne, Cava, Prosecco, US Sparkling; **Slope** = linear correlation between Predicted Share and CSR or PWR; **R** = Pearson correlation coefficient; **Bolded P values** indicate significance

Table 3. Crowd-sourced wine rating influence by variety in mixed and pre-sorted scenarios

RED-CA	Mixed Shelving	Pre-sorted Shelving	RED-FN	Mixed Shelving	Pre-sorted Shelving
1) Cabernet Sauv.	1.81±0.18	1.61±0.12	1) Cabernet Sauv.	1.82±0.37	1.64±0.17
2) Pinot Noir	1.44±0.13	1.65±0.12	2) Pinot Noir	1.81±0.20	1.67±0.11
3) Red Blends	1.20±0.11	1.62±0.17	3) Red Blends	1.60±0.23	1.78±0.12
4) Zinfandel	1.54±0.17	1.50±0.13	4) Merlot	1.67±0.13	1.71±0.10
1 > (2 & 3 & 4)	<0.001	NS	(1 & 2) > (3 & 4)	0.015	NS
WHITE-I	Mixed Shelving	Pre-sorted Shelving	SPARK-W	Mixed Shelving	Pre-sorted Shelving
1) Chardonnay	1.53±0.37	1.71±0.19	1) Champagne	1.10±0.07	0.98±0.02
2) Sauvignon Blanc	1.37±0.25	1.68±0.14	2) Prosecco	0.95±0.02	0.95±0.06
3) Pinot Gris/Grigio	1.39±0.19	1.65±0.18	3) Cava	0.72±0.06	0.97±0.02
4) Rosé	1.33±0.18	1.66±0.18	4) USA Sparkling	0.99±0.02	0.82±0.03
1 > (2 & 3 & 4)	0.046	NS	1 > (2 & 3 & 4)	0.035	NS

Values are % change in predicted share per 1/10 star increase = mean±standard deviation in each wine category;
RED-CA: California Reds; **REDS-FN**: French and Napa Reds; **WHITE-I**: French, California, South African Whites;
SPARK-W: Champagne, Cava, Prosecco, US Sparkling; **Bolded P values** indicate significance

If these were your only options, which would you choose?

						<p>NONE: I would not choose any of these.</p>
Clos du Caillou Red Blend	Franciscan Merlot	Bennett Reserve Cabernet Sauvignon	Chateau Pimorin Cabernet Sauvignon	Sean Minor Red Blend	Ca Momi Pinot Noir	
Côtes du Rhône Villages France	Napa Valley California	Napa Valley California	Haut-Médoc France	Napa Valley California	Napa Valley California	
\$22.99 Sale (Reg. \$24.99)	\$21.99	\$26.49 Sale (Reg. \$28.99)	\$13.99 Sale (Reg. \$16.99)	\$16.99	\$18.99 Sale (Reg. \$22.99)	
	Rating of 3.7 stars based on 173 consumers		Rating of 4.4 stars based on 852 consumers		Rating of 3.7 stars based on 14 consumers	
				Rated 90 points by leading wine publication	Rated 88 points by leading wine publication	

▶

0% 100%

Figure 1. Example French and Napa red wine shelf scenario from consumer survey. The respondent must select one of the six wine choices or “NONE” option. Discounts, crowd-sourced ratings (and rating-volumes), and professional scores are occasionally added to wines.