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From Gurus to Geeks? The Role of Customer and Expert Ratings in a Hedonic Analysis of French Red Wine Prices

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Abstract

Wine is an experience good whose true quality can only be known by consuming it. This characteristic provides a rationale for recourse to experts who provide information on wine quality and reduce the information asymmetry for the consumer. Consumers may come to rely more on the comments and ratings of other consumers or peers, rather than those of experts (guides, specialized journals, personalities). This tendency has been observed in the hospitality (restaurants, hotels) and cultural (movies, novels) markets where popular applications exist and allow information to be collected from peers.

We hypothesize that consumers' ratings will come to dominate expert ratings in the wine expertise market. We use the ratings posted by consumers on the Vivino online marketplace for 37,960 French red wines. We employ a hedonic regression framework which includes the usual attributes of the wines as well as the ratings from both recognized experts and those of consumers on the Vivino platform. 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.

JEL: Q11, E71, D12, C01.

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Abstract

Wine is an experience good whose true quality can only be known by consuming it. This characteristic provides a rationale for recourse to experts who provide information on wine quality and reduce the information asymmetry for the consumer. Consumers may come to rely more on the comments and ratings of other consumers or peers, rather than those of experts (guides, specialized journals, personalities). This tendency has been observed in the hospitality (restaurants, hotels) and cultural (movies, novels) markets where popular applications exist and allow information to be collected from peers.

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1. INTRODUCTION

Wine is an experience good: its quality is only known with certainty at the moment that it is consumed. The absence of information about the product means that purchasing an experience good entails taking a risk for the consumer. Producers will 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 analysed by Akerlof (1970). Since the supply of a given wine vintage is perfectly inelastic, shifts in demand as a result of 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 indicate region, appellation, vintage, producer, brand, alcohol content, and grape varieties used. There are also aspects of the appearance of the product including the label design, the seal (cork or screw top, use of wax) and the form 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 industry and marketing organisations aim to diffuse producers' own views on the quality of their wines, but there still remains an information asymmetry.

One consequence of this asymmetry for consumers has been the prominence given to expert evaluations such as the ratings given by 'wine gurus' such as Robert Parker and Jancis Robinson. These ratings are based on tasting the wine while it is young and are often made in relation to previous vintages of the same 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; Dubois & Nauges, 2010; Gibbs et al., 2009; Jones & Storchmann, 2001;

Landon & Smith, 1997; Lecocq & Visser, 2006; Oczkowski, 1994; Schamel, 2003). 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 behaviour 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 formalised – and sometimes called an electronic word-of-mouth. 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' for whom there is financial gain.

The emergence of wine applications and platforms such as Vivino has permitted the formalisation of peer or consumer ratings of wines. This additional, significant source of information on a wine's quality has become more relevant for consumers for a number of reasons. The first is a 'push' factor which is not confined to purchases of wine, and is due to technological advances and the almost universal access to the internet. This has enabled consumers to express themselves in a costless, 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 reduced confidence in experts in many markets, and especially so for wine where there are many producers with limited resources for advertising. This reduced confidence is due to a number of developments in the last ten years such as the

withdrawal of one of the main players (Robert Parker) in 2015. Furthermore, a lack of consistency and consensus has been identified among experts prior to the withdrawal of Parker (see Ali et al., 2010). Expert reviews have also been criticised for being subjective and relying on solicited samples (Cardebat et al., 2014; Castriota et al., 2013; Steinberger, 2008). Furthermore, there is evidence of opportunistic behaviour on the part of certain experts and even grade inflation and the censorship of negative reviews (Bessy & Chauvin, 2013; Gans & Kaplan, 2017; Reuter, 2009). It is therefore germane to inquire whether peer reviews on online platforms and cell phone applications provide information in which prospective consumers have more confidence than expert ratings.

In this paper we compare the effect of expert opinions and peer ratings on French red wine prices. 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; Landon & Smith, 1997; Lecocq & Visser, 2006; Oczkowski, 1994; Schamel, 2003) and a small number examining the effect of consumer ratings on prices (Kwak et al., 2021), to our knowledge there are only two papers – one experimental (Thrane, 2019) and one empirical (Oczkowski & Pawsey, 2019) – that seek to compare the relative importance of the two forms of quality evaluation of wines. Thrane (2019) presents results from an experiment involving Norwegian wine consumers and how expert quality reviews and recommendations from peers affect their decisions to buy red wine. He finds that for highly priced red wines, positive expert quality reviews 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 that in quantitative terms the impact of a positive expert review is larger. 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 scores (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).

The main contributions of the paper are related to the fact that compared to these initial studies in this emerging literature, we use a large number of French red wines. It is not obvious why the hypothesis that consumer ratings matter more than expert evaluations would apply to these wines which have traditionally been the bastion of experts. These wines are widely known and are purchased by consumers throughout world and so there is less of a home-bias effect in their evaluation by consumers. French red wines are the most prestigious wines and are therefore rated by a larger number of experts than is the case with other wine-producing countries. Furthermore the organisation of the market for these wines is traditional, and associated with a particular culture and terminology; it is not evident that online consumer ratings will have a greater impact compared to the role played by expert evaluations. 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 scores. 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. The influence of experts in this segment and in these regions dates back to the 1980s and a large literature has demonstrated that their ratings have 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 a strong and new

result, and in view of the size of the sample used here is firmly established. This marks a real 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 paper is organised 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 scores and consumer ratings of nearly 37,000 French red wines. In the third section we present our hedonic price analysis. Several robustness checks are then undertaken in section four before concluding.

2. THE VIVINO DATASET

2.1 The Vivino platform

Vivino is an application for cell phones and an internet site (www.vivino.com). It has been in existence in one form or another since 2010. It is presented as a marketplace for wines which serves a community of wine enthusiasts. It has entries for more than 15 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 scores 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 five-star ratings together 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 'crawled' Vivino and collected data on wines from a large number of countries for the period November 2016 to March 2017, with the aim of assessing consumers' appreciations of wines. This analysis was undertaken not only on the basis of the numerical ratings but also in terms of consumer reviews, using textual analysis and user biographies. They use regression and classification methods to be able 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), they combine Vivino consumer ratings with expert scores for a sample of Australian wines in order 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 score for the wine in question at the date the sample was taken, and the mean of the average scores 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 score (based on previous vintages) has twice the impact of average consumer rating for a wine (of a specific vintage) on the market price of a wine. These effects are slightly higher than the price effect of expert score and the equivalent expert score-based reputation variable (taken from Halliday (2017)). Including both consumer ratings and expert scores together produces results which vary according whether the variables are entered as the simple average

evaluation or as averages for past vintages (reputation), but they find that peer ratings have a larger impact on price than expert scores.

Recent unpublished conference presentations have used data from the Vivino application to analyse the determinants of consumer ratings (Mazzoli & Palumbo, 2022; Schamel & Gastaldello, 2022).

2.2 The Vivino data used

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

The current study uses a snapshot of the database on the Vivino platform for given date in November 2021. The consumer ratings of a wine are the average score out of five, and only wines with ten or more evaluations are included. Scores made by various experts such as Robert Parker are also available for most of the wines. Although Parker himself withdrew from rating wines in 2015, his trademark Wine Advocate was sold and scores continue to be issued under this name. Since we wish to compare the effects of expert and peer ratings, only wines with at least one expert and ten peer scores are included. The price of the wine is the median price of purchases made via the platform. In addition to the name of the wine, the database provides the name of the producer, the region of origin, alcohol content and the vintage. While information about grape variety and tasting notes are available to prospective customers on the platform, this information is absent from the database used here.

3. EXPERT SCORE AND PEER RATINGS

In the current study we examine the relative importance of expert scores and consumer ratings in determining the price of French red wines. Wines with prices below 3 euros and above 1,500 euros are excluded. We also exclude vintages prior to the year 2000 since these wines will have rarity value. Finally, four wine-producing areas are excluded (such as Champagne) since there are only a small number of red wines produced. The resulting sample consists of 36,970 wines and descriptive statistics are provided in Appendix table A.1.

3.1 Descriptive statistics

The average and median prices are 68.61 euros and 34 euros, respectively. The distribution of prices is positively skewed and has a very long tail (Figure 1). Expert scores have been normalised to range from 50 to 100. In practice in the sample used they are in the range [70,100] – see Figure 2. 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 3 (we only use wines that have at least one expert evaluation). 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 (Figure 4). The box-and-whiskers plot (covering 98% of the range of scores) indicates that when there are three of 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 1). 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.

3.2 Harmonisation of the scale for expert scores and consumer ratings

Since most experts score out of 100 and generally do not go below 70 (some go down as far as 50, 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. For example, if the wine with the lowest consumer rating has an average score of 2.1 and then this will be converted to 70 if that is the lowest score given by experts. Table 2 provides an idea of what the conversion entails. 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 not 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. The resulting scales for consumer and expert scores are ordinally equivalent with equal means and medians.

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

Each type of 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 score for a wine, from 89 to 90 say, increases its price by 6.3% and by around 11% 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 5.5% in the case of expert scores and 9.1% 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 specification.

These overall effects cover wines ranging from table wines to the most prestigious wines in Bordeaux and Burgundy. Figures 5 and 6 present the coefficients estimates for wine area and

vintage respectively. The coefficient for wine area is the effect relative to non-classified Bordeaux wines. The largest coefficient is for the top 5 Bordeaux reds from the 1855 classification, followed by Bourgogne wines grand, premier and non-classified. 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 rate is gross. In net terms, 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 wine grand cru classé wines.

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 A.2, 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 7 which confirms that consumer ratings are always quantitatively larger effect on price than expert scores, but their relative importance is less for higher priced wines. In fact, the effect on price of expert evaluations increases with price especially above the median, while the role of consumer ratings remains roughly constant from the first quartile upwards.

There are a number of 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 & 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). Third, 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).

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 3, column 6 are the relevant benchmark.

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 4, column 1). 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 4, 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 4, 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 Appendix table A.1) 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 4, column 4). Finally, in column 5 the sample is confined solely to Bordeaux and Burgundy 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 wine prices than expert scores.

A final issue considered here is the nature of the effect of consumer ratings on prices. It is possible that the rating includes 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 in the database one or more variables correlated with potentially

endogenous explanatory variable and uncorrelated with 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 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. A Hausman test however suggests that the resulting instrumental variable (IV) estimates are not significantly different from the least squares regression estimates in Table 1 at conventional significance levels (p value = 0.13). Thus while there is no scientific way of rigorously concluding that consumer ratings are not affected by value for money considerations (and therefore price), these IV results suggest that our initial estimates do capture consumers' assessments of quality.

This tentative conclusion is in line with the results of the study Oczkowski & Pawsey (2019) for Australian wines. They 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). Interestingly, 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).

6. CONCLUSIONS

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 on the wine sector 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 37,000 French red wines in the sample is almost twice as high as the impact of the evaluations made by traditional experts. Since wine supply is inelastic, this impact on price directly reflects the upstream impact on demand. Other consumers' opinions increase sales of French red wine more than experts' opinions do.

This result leads us to conclude that we are likely to witness a paradigm shift in the wine information market. Dominated since the 1960s by experts who were sometimes elevated to the rank of stars or gurus, such as Robert Parker, this information market is on a trajectory of digitization that gives pride of place to peers. Such a trajectory has already been seen in the hospitality information market. In this sense, one could speak of a standardization of the wine market. One of the advantages with peers is their ability to taste and rate an almost unlimited number of wines. In an experience market like wine, the increase in the number of wines receiving ratings should increase the efficiency of the market.

This paradigm shift will strongly impact wine marketing. For sellers it will be better to put forward a Vivino score rather than an expert score. Informal discussions with wine export professionals have confirmed this trend. There is no scientific basis for these assertions, but French exporters and US importers to whom we have submitted this idea have all told us that the 4.0 Vivino score is the new benchmark in business relationships. Just as there have

been studies on the '100/100 Parker' benchmark (Storchmann, 2012), there will certainly be studies on the '4.0 Vivino'.

Among other positive developments, the study should also be extended 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 exist, such as bloggers, friends and family. However, all of these information vectors seem to be less important. They do not have the same universality as an application that rates tens of thousands of wines and has more than fifty million users.

There are other aspects that need to be studied in greater depth based on the data available on Vivino. What is the level of influence of peers, their level of activity on the site? What is the influence of the first evaluations and ratings published on subsequent ones? What is the profile and geographical origin of the people who post the ratings? In particular, is there a local bias that leads local wines to be rated higher? Answering all these questions requires a more detailed, longitudinal capture of the data on Vivino, which we do not have at this point in time.

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TABLES & FIGURES

Table 1 - Consumer ratings of wines

	Average	Maximum value
One star	0.9	31.8
Two stars	2.9	46.2
Three stars	24.8	85.7
Four stars	55.4	100
Five stars	16.0	92.9
Average consumer rating	3.98	4.96 (minimum: 2.38)

Table 2 - Conversion of five star rating to comparable normalised rating

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 3 - Regression estimates: all red wines*

	Semilog			Log-log		
Expert score	0.105 (0.001)	-	0.064 (0.001)	9.03 (0.01)	-	5.60 (0.08)
Consumer rating	-	0.132 (0.001)	0.108 (0.001)	-	11.39 (0.08)	9.41 (0.08)
R^2	0.59	0.66	0.697	0.59	0.65	0.698
Test of equality of coefficients			27.9 $(p < 0.001)$			27.2 $(p < 0.001)$
n = 36,970						

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

Table 4 - Robustness checks

	Include drinking criteria	Use maximum expert score	Exclude Grand, Classified and Premier Crus	Exclude all Bordeaux and Burgundy	Bordeaux and Burgundy 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 A.1 - Sample means and standard deviations

	Mean	Standard Deviation
log(price)	3.652	0.957
log(consumer rating)	4.493	0.040
log(expert score)	4.493	0.040
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
Burgundy	0.096	0.295
Burgundy Grand Cru	0.053	0.224
Burgundy 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
Vintage		
2000	0.018	0.135
2001	0.019	0.138
2002	0.015	0.123
2003	0.021	0.143
2004	0.020	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	0.250
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 A.2 - Quantile regression estimates: log-log specification

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.

Figure 1 - Median price

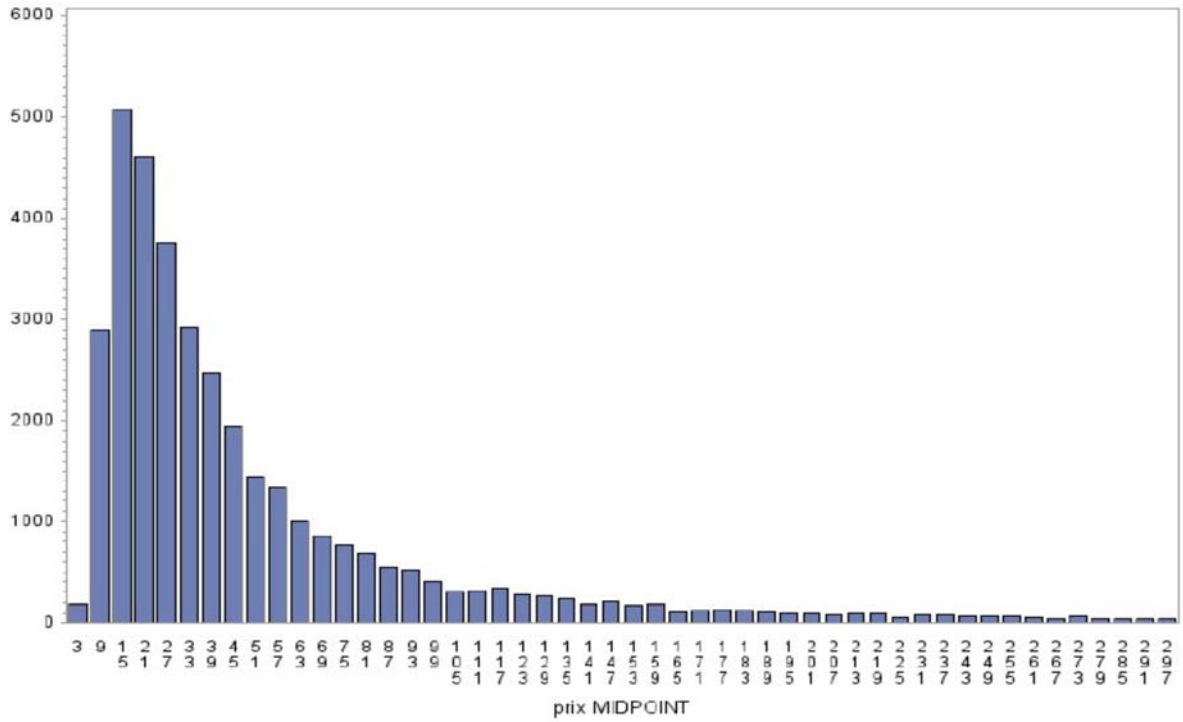


Figure 2 - Expert scores

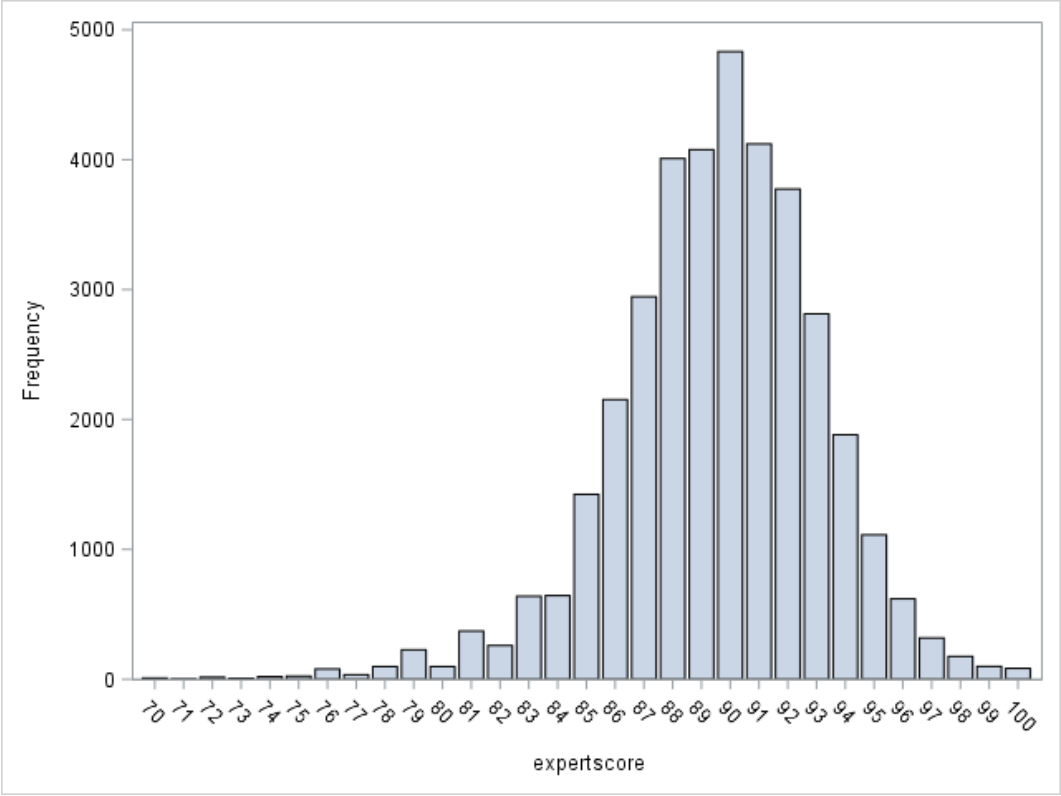


Figure 3 - Number of expert evaluations per wine

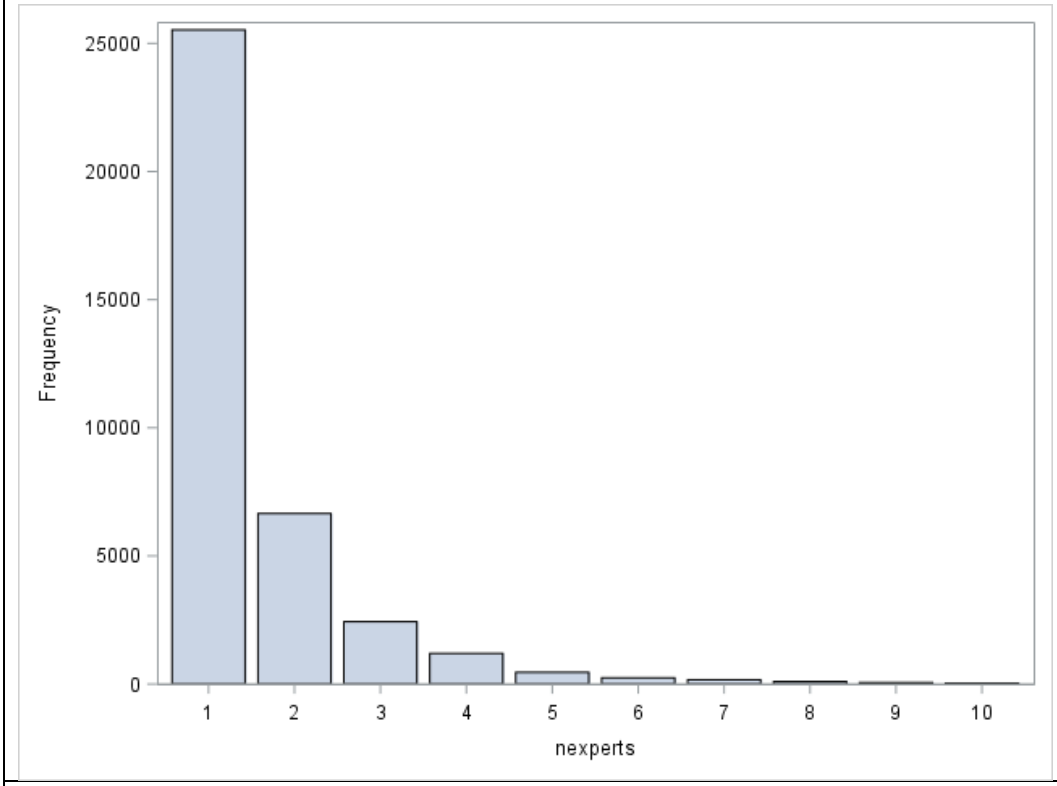


Figure 4 - Dispersion of expert scores by number of experts
(98% coverage box-and-whishers plot)

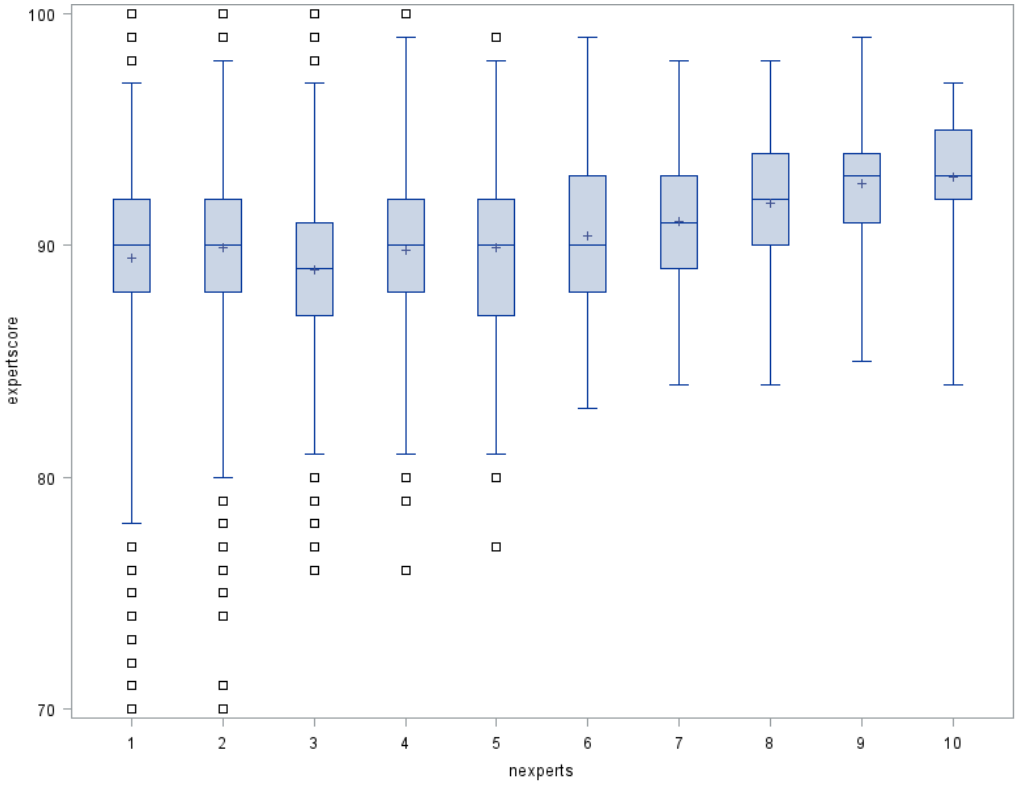


Figure 5 - The effect of wine area on price

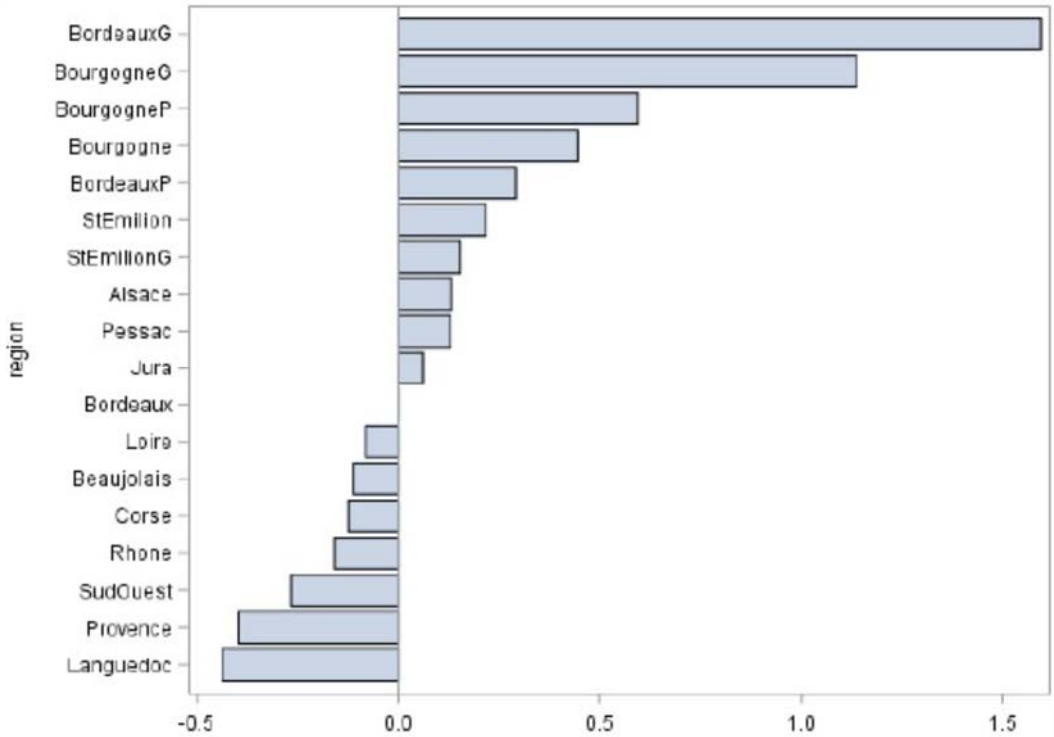


Figure 6 - The effect of vintage on price

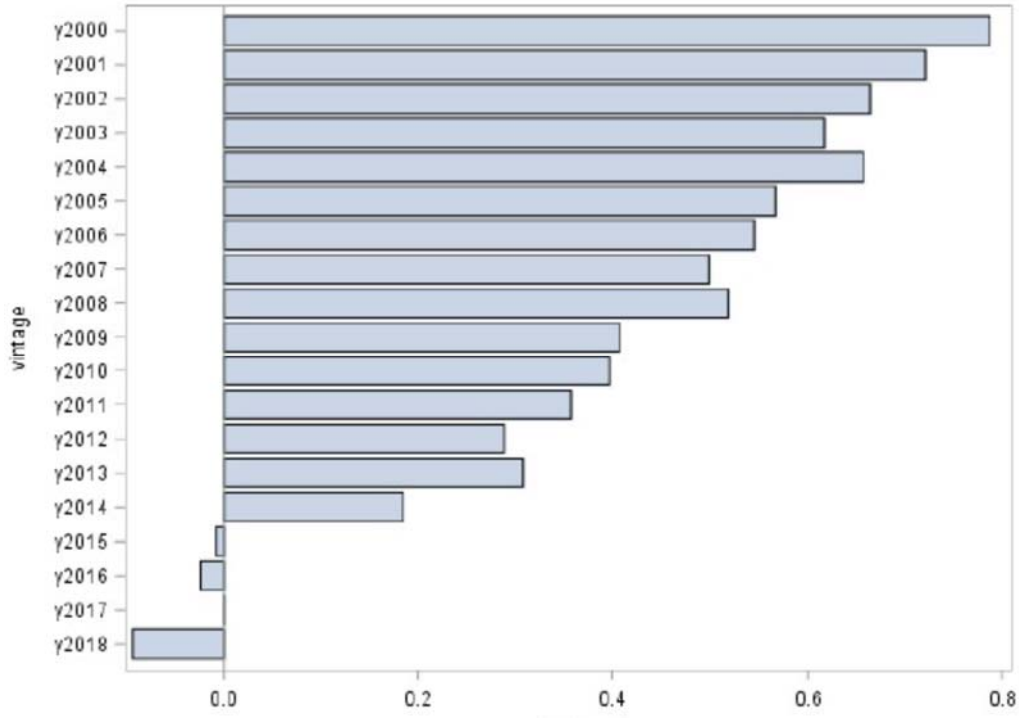
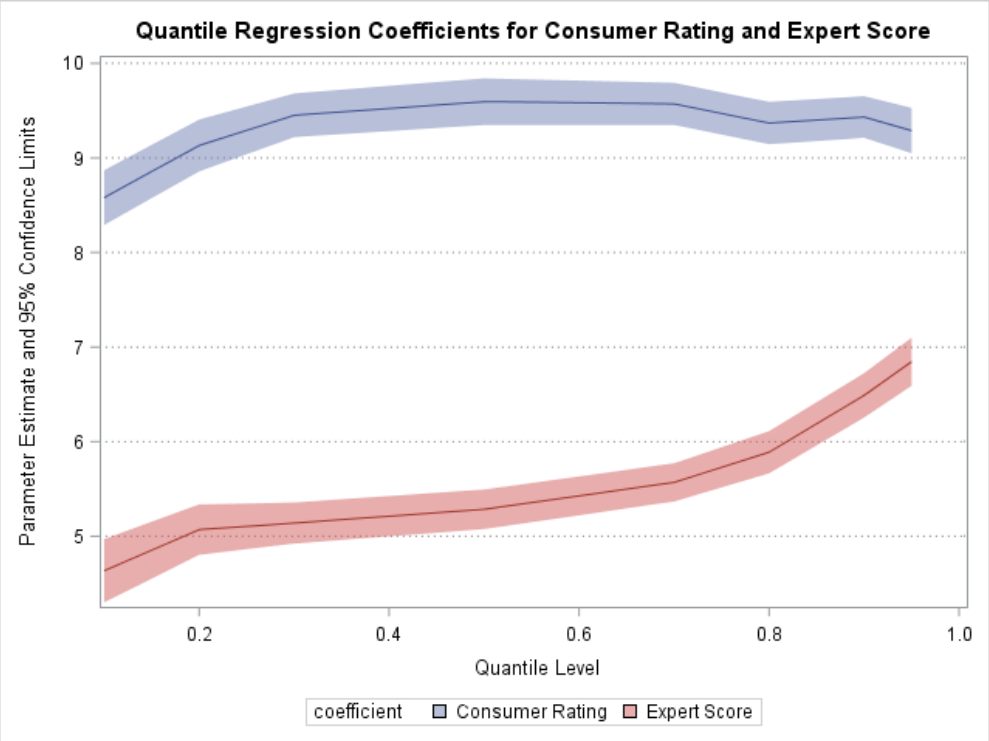


Figure 7 - Quantile regression coefficients



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