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Do Tasting Notes Add Value? Evidence from Napa Wines*

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Abstract

This paper evaluates whether tasting notes—the brief testimony that describes the sensory properties of wines—add value. The analysis is based on a sample of over 2700 recent-vintage cabernet sauvignon wines evaluated by *Wine Spectator*. I estimate a dynamic wine price model to evaluate the marketing effect of the note, controlling for quality measures as well as other wine characteristics. The results indicate that the length of the tasting note exerts a strong positive influence on the wine's price, even after controlling for quality. A 10 percent increase in the number of characters in the tasting note (about 23 additional characters) contributes about two to four dollars to the price of the wine. Further analysis reveals that the value of the tasting note does not come from the "analytical" words contained in the note but rather, from the more subjective component of it. (JEL Classification: L66, L11, C23)

I. Introduction

Tasting notes—the brief testimony that describes the sensory qualities of a particular wine—are ubiquitous. Much shelf space in bookstores and wine stores just about everywhere is occupied by wine journals, reviews, books, and guides full of wine assessments and descriptions. So a natural question to ask is: Do these notes influence wine prices? At the outset, the answer would appear to be fervently positive. How can they not? With so many varieties of wine available, it is hard for consumers to make a selection without relying on ratings and descriptions. A customer debating whether to purchase wine A or wine B (say, two very similar wines) may be persuaded to go for A if its reviews appear to be more enthusiastic than those of wine B.

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But there is another side to this question. First, we have the natural limitations of language (Lehrer, 1983; Lehrer and Lehrer, 2008). Using words to try to convey how a wine really tastes is not easy. Sometimes the sensory characteristics of the wine are so rare that appropriate words may not exist to describe it (Peynaud, 1987). Second, a fair amount of research suggests that the language of tasting, describing the sensory properties of wine, relies at best on the use of jargon and a vocabulary so esoteric and often so hard to grasp that only professionals or experienced wine drinkers can understand it. Thus, for the tasting notes to be effective, the consumer must have been able to have acquired some minimum level of understanding about wine tasting (Peynaud, 1987). At worst, notes are pretentious assessments that may sound impressive but are ultimately uninformative (Quandt, 2007). Thus, they are of little or no value.

The purpose of this paper is to use a sample of tasting notes from *Wine Spectator* to try to assess whether those notes exert an independent influence on the price of a bottle of wine. Answering this question is tantamount to investigating whether tasting notes add value. The most direct test of the hypothesis that they do is to run a regression of the retail price of a wine on the standard set of control variables (such as ratings, production, and maturity of the wine) and, in addition, include quantifiable variables that somehow capture the effect of tasting notes. There are at least two challenges with this test. First, tasting notes are obviously language based and therefore hard to quantify. Second, tasting notes are normally written after the current vintage prices have been set.[1]

Neither challenge is easy to overcome. But they should not deter researchers from trying. If one does not take a stance on this issue, little or no progress can be made. To address the first challenge, I construct a straightforward metric, which is simply the length of the tasting note—that is, the number of characters it contains. Although crude, this measure can tell us whether wine prices are a function of the length of the professional wine taster's written opinion and analysis. Intuitively, one would think that the better the wine, the longer the opinion has to be (within reason, of course) because more words are necessary to fully convey to the reader the full spectrum of the wine's sensory characteristics. Thus, for good wines, there is a lot to say, whereas mediocre ones tend to be much less inspiring.

Although the length of the tasting note can be a useful measure for quantifying the effect of the note, it has limitations. For example, it does not really control for how "analytical" the note is. According to authorities such as Peynaud (1987) and Bender (2008), part of the objective of professional wine tasters is to use their expertise to identify, through analysis and contemplation, sensory qualities of the wine that are ultimately grounded in the wine's chemical characteristics. Making this identification should be an objective, hence analytical, exercise. Thus, for example, when the wine taster detects overtones of "vanilla" or

[1] A possible third challenge is the issue of causality. This concern stems from the possibility that prices may influence what is written in the tasting note. This issue may not be as relevant here because I am relying on tasting notes from *Wine Spectator*, and, according to their website, "The tasters are told only the general type of wine (varietal and/or region) and the vintage. No information about the winery or the price of the wine is available to the tasters while they are tasting." http://www.winespectator.com/display/show/id/tasting-format.

tinges of "cedar box" in a particular wine, that probably means the wine was aged in an American oak barrel (Shanken, 1999).

Analytical tasting often relies on the use of "wine vocabulary"—particular words and terms commonly used in tasting rooms (Peynaud, 1987). Because of the widespread use and importance of these words, many wine glossaries have been created to help standardize the words' meanings for experts and laypeople alike. In this paper, since I am using a sample of tasting notes from *Wine Spectator*'s Web site, I also make use of *Wine Spectator*'s wine glossary to identify the analytical words used in the sample of tasting notes.[2] This procedure enables me to compute, for each tasting note, the total number of characters devoted to analytical words. The remaining characters in the note are then labeled the "non-analytical" words. I then examine whether the number of characters in the tasting note that are devoted to analytical words influence the wine's price.

As indicated above, there is a second challenge when modeling the effect of the tasting note on prices: prices are normally set before the wine is reviewed. To overcome this challenge, I make use of a dynamic hedonic wine price model that includes current and lagged quality-related variables as well as current and lagged metrics of the tasting note. The intuition behind this modeling strategy is straightforward. Wine prices are typically thought of being an increasing function of quality. Better wines command higher prices, at least up to a point. But quality variables, over time, may operate to influence consumer perception about the wine in future years. For example, a very enthusiastic wine review may create an overly positive image of the wine and/or the winery, thereby shifting the price elasticity of demand for that wine. This effect is more likely to occur if the note is from a well-known reviewer. A shift in the price elasticity of demand would allow producers to charge higher prices. As a result, wine prices this year may be affected by past reviews. I define this effect as the "marketing" effect of the note.[3]

The main results suggest that longer wine descriptions are associated with higher prices in the current year and in the following year. The positive effect of the tasting note in the current year's price can be explained by quality: great wines, which on average, tend to be more expensive, also inspire reviewers to write a more positive and enthusiastic note. The positive effect of the tasting note on next year's wine price can be explained by the "marketing" effect of the review.

In terms of the magnitude, I find that 10 percent increase in the length of a wine description (adding about 23 characters) is associated with a statistically significant increase of two to four dollars in the price of the bottle (a 3 to 6 percent increase), in the current year

[2] The words in the glossary, minus the meanings attached to them, are listed in the appendix of this paper, along with the frequency of their occurrence in my sample.

[3] That marketing can affect the price elasticity of demand is neither novel nor surprising. Researchers have found this to be the case for various products, most notably for prescription drugs. See, for example, Windmeijer, De Laat, Douven and Mot (2005).

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as well as in the following year. This result is robust to the inclusion of control variables such as the rating, the number of wine cases produced, and the length of time the wine is expected to stay at its peak level for consumption. This result support the contention that wine reviews, over time, can influence prices through marketing.

The regression results also suggest that the influence of analytical words on wine prices is very limited. Instead, it is the non-analytical and more-subjective component of the tasting note that appears to add monetary value to the wine. This result is both interesting and intuitive. It is interesting because it indicates that the use of metaphorical language in the tasting note, as opposed to the use of purely analytical words, does indeed get priced. It is intuitive because this is precisely what one would expect tasting notes to do: a consumer reading a tasting note may find the writer's use of metaphors more persuasive than the use of purely analytical words.

The relationship between tasting notes and prices has not gone unnoticed in the wine economics literature. In a recent paper, Krumme (2009) investigates whether the use of particular words in the tasting note is correlated with wine prices. Many of her results are intriguing. For example, she finds that descriptors such as "chocolate" or "tobacco" tend to show up more frequently tasting notes of expensive wines, while descriptors such as "fruity," "clean," "tasty," or "juicy" are more likely to show up in the notes of cheaper wines. Although her findings are interesting, her empirical test does not control for other quality characteristics, such the wine's rating. Thus, it is difficult to draw any firm conclusions from her findings.

The rest of this paper is organized as follows: Section II discusses in more detail the data underlying this investigation, Section III presents the empirical methodology and the results, and Section IV offers some concluding remarks. An appendix lists the analytical words used in this research, together with their frequency of occurrence.

II. Data

As noted in the introduction, the purpose of this paper is to empirically evaluate whether tasting notes affect wine prices. But tasting notes are, in turn, influenced by many factors, such as the *vitis vinifera* type, the geographical region of the vineyards, weather variations, enologist experience, and even the taster. One can control for many of these factors by concentrating the sample to a common grape variety, a common region, and a common taster. To that end, I rely on 2734 descriptions of cabernet sauvignon wines from Napa Valley published by *Wine Spectator* for wines from the 2000 through 2006 vintages. Although *Wine Spectator*'s database contains thousands of tasting notes for wines from all over the world over many years, narrowing down the sample to this level helps isolate some of the effects mentioned above, including the effects of multiple tasters.[4] In the regressions, I include a year dummy variable to control for the effect of weather.

[4] James Laube, Senior Editor for *Wine Spectator* and an expert on Napa wines, is the author of the vast majority of all tasting notes for Napa's cabernet sauvignon wines.

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A. *The Components of the Standard Note*

To probe more deeply the influence of the tasting note on price, we can dissect the note's text. According to Bender (2008), the standard wine-tasting note has three key components: (1) a sensory description, (2) an aesthetic description, and (3) an overall evaluation and other supplemental information, which includes the rating.

Sensory description

The sensory description of the wine is meant to convey to the reader the particular or unique qualities of the wine. In theory, these qualities are based on the wine's underlying chemical composition and characteristics. For example, the process of aging a cabernet sauvignon wine in an American oak barrel imparts particular characteristics that critics and experts generally note in their tastings (Garde-Cerdán and Ancín-Azpilicueta, 2006). Thus, words like "cedary," "oaky," "smoky," "toasty," and so forth are typically used when the sensory characteristics of such wines are being described (Shanken, 1999). The region in which the grape is harvested can also affect the sensory qualities of the wine (Jackson and Lombard, 1993). This effect may be due to differences in the mineral content of the soil or even to climate variations (Haeger and Storchmann, 2006; Jones and Davis, 2000; and others). Because sensory words are supposed to be grounded in the underlying chemical characteristics of the wine and not in subjective perceptions, critics often consider them to be analytical or scientific descriptive words (Bender, 2008; Dilworth, 2008). Indeed, wine critics and experts have developed glossaries of sensory terminology. Among the most popular glossaries are Ann Noble's Aroma Wheel,[5] Robert Parker's,[6] and Wine Spectator's.[7]

Aesthetic description

The second key component of the standard wine-tasting note is the aesthetic description of the wine. When describing aesthetic properties, writers often rely on metaphors to elucidate their impressions of a wine. Often, a variety of fruits and vegetables are used to express such aesthetic or sensory properties. Here subjectivity almost inevitably plays a crucial role because different tasters simply have different appreciations of wine features and properties. For example, it is possible that a wine critic characterizes a particular wine as sublime, while another one can characterize the very same wine as mundane. In addition, if one considers wine consumption to be ultimately an aesthetic experience, much like listening to music or appreciating art, individual preferences are bound to make a difference.[8]

[5] See www.winearomawheel.com.

[6] See http://www.erobertparker.com/info/glossary.asp.

[7] See http://www.winespectator.com/Wine/Free/WS_Learn_Wine/0,4520,,00.html.

[8] Whether wine consumption is ultimately an aesthetic experience is subject to considerable debate. See, for example, Charters and Pettigrew (2005).

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Overall evaluation and other supplemental information

The third key component of the standard tasting note is a brief, summary evaluation of the wine. Normally, after the writer has considered all components (both sensory and aesthetic), he or she then expresses an opinion and follows it with supplemental information; for *Wine Spectator*'s notes, this information consists of the expected maturity length and a rating.

B. *Dissecting the Tasting Note*

Given that wine descriptions follow the three-part structure, it is possible to explore the importance of the analytical component vis-à-vis the other two components in explaining wine prices. How? As indicated in the discussion of the sensory description, analytical words are supposed to be grounded in the underlying chemical characteristics of the wine and not on subjective interpretations. Wine glossaries standardize the meanings of these sensory words. Thus, an analytical word can be defined as a word that appears in the glossary. To assess the effect of these analytical words on wine prices, I cross-searched all the words in the tasting notes with the *Wine Spectator* glossary and then defined the analytical component of the tasting note as the total number of characters in the note attributable to analytical words. Thus, for example, if the words "buttery" (7 characters), "round" (5 characters), "spicy" (5 characters), and "tannin" (6 characters)—all of which appear in the *Wine Spectator* glossary—appear in a particular tasting note, the total number of "analytical" characters in that note is 23. By implication, tasting note words that do not appear in the glossary are then labeled the non-analytical words of the tasting note.

An example

In order to gain a better grasp of how the procedure adopted in this study disentangles the analytical words from the tasting note, I present a couple of examples below. The same reviewer wrote both notes, and both wines received a similar rating. The main difference between these two notes is that the first one contains more characters from analytical words than the second one. (Analytical words are underlined.):

Tasting Note 1:

"Austere but well-balanced, with dry tannins wrapped around dried currant, anise, sage and mineral flavors. Gains complexity, depth and nuance, with a clean yet chewy finish. Decant. Drink now through 2012. 580 cases made. –JL"

Wine ID 982: Rating 89; Total number of characters: 225; characters from analytical words: 56; characters from non-analytical words: 169

Tasting Note 2:

"More like a cabernet-shiraz crossbreed, with dry mint, anise, sage and herbal notes and dried currant and berry flavors that don't remind me much of Napa cabernet. More fun if considered as a hybrid. Drink now through 2011. 475 cases made. –JL"

Wine ID 2090: Rating 88; Total number of characters: 243; characters from analytical words: 3; characters from non-analytical words: 240

Undoubtedly, different readers will have different opinions as to which of the two tasting notes presented above is more "informative." Nonetheless, it appears to me that the second note carries more information than the first one, especially for a layperson unfamiliar with standard wine vocabulary. The first one appears more technical, while the second one informs us that the wine being evaluated does not appear to taste as a traditional Napa cabernet does or perhaps should.

Admittedly, opinions related to which note is more informative is decidedly subjective. Thus, it is important to perform a more formal test of this procedure. This is done in Section III further below.

C. *Other Variables used in the Model*

From *Wine Spectator*'s Web site, for each of the 2734 wines in the sample, I obtained the wine's label, the wine's price, the text of the tasting note, the number of cases produced, the expected number of years the wine is likely to stay mature (its maturity), and the rating. In fact, the last three variables are all reported within the tasting note itself. All of these variables except the maturity variable are easy to understand. The maturity variable is worth a bit more discussion.

Besides writing on the attributes and characteristics of a particular wine, critics often report their opinion about the length of time the wine is expected to be at its peak for consumption. In particular, critics regularly discuss whether the wine being tasted is or is not mature at the time of the tasting. If it is not, they indicate the future year, t, by which the wine is expected to reach its full potential. They also indicate the number of additional years, n, during which the wine is expected to remain at this peak. After $t+n$ years, therefore, the wine will be past its prime. In tasting notes, $t+n$ is usually reported as, for instance, "best from 2015 through 2021." For this particular example, the wine being tasted is expected to have a maturity length of seven years. This is how "maturity" is defined.

D. *Summary Statistics*

Table 1 reports the summary statistics for the wines in the sample. The median price is $65 and the mean price $75. Hence, these wines are not exactly cheap. Indeed, Table 1 also indicates that the most expensive bottle was released at $750.[9] The summary statistics indicate that virtually all of the control variables considered—the length of the tasting note, its

[9] This wine is the 2005 Screaming Eagle, a Napa vineyard well known for producing some of the most expensive cult wines in the United States.

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analytical component, its non-analytical component, the rating, and the maturity—have mean and median values very close to each other. The closeness suggests that the distribution of these variables can be characterized as approximately normal. The normal distribution is worth highlighting because it suggests that the regression results (presented in the next section) are not driven by extreme observations (outliers). The only variable that does not have its mean close to its median is the number of cases made. But this is not very surprising since, on one hand, there are several wine producers in the Napa area that make large quantities of a particular wine, and, on the other hand, there are also many small wine producers.

Table 1
Summary Statistics for Wines in the Sample

Variable	*N*	*Median*	*Mean*	*Std Dev*	*Max*	*Min*
Price, $	2,623	65	75.61	50.93	750	10
Tasting notes length, number of characters	2,734	226	226.93	58.63	425	56
Analytical words length, number of characters	2,734	22.5	23.27	11.26	63	0
Non analytical words length, number of characters	2,734	202	203.67	59.57	403	14
Rating, 0–100 scale	2,635	88	87.36	4.69	99	59
Cases made, number	2,615	917	3,966.47	11,154.8	165,000	23
Maturity, years	2,470	7	6.78	2.22	14	0

Source: www.winespectator.com (wine database). N is the number of observations. Price is in dollars per 750 ml bottle. "Tasting notes length" is the total number of characters in the tasting note. "Analytical words length" is the number of characters in words in the tasting note that also appear in the *Wine Spectator* glossary. "Non-analytical words" is defined as the "Tasting notes length" minus the "analytical words length." "Rating" is a number between 0 and 100 that corresponds to the *Wine Spectator* score awarded to each wine. "Cases made" is the reported total number of cases produced for the particular label. "Maturity" is the number of years the wine is expected to stay at its prime for consumption.

III. Empirical Methodology

This section presents the details of the model specification (subsections A and B) and discusses the results (subsections C and D).

A. *Model Specification*

To investigate whether wine-tasting notes influence wine prices, I follow the common practice in the literature and estimate a hedonic regression where the dependent variable is the release price of the bottle, and the independent variables include quantifiable factors known to affect prices.[10] These factors ought to be quality-related since quality is generally thought to influence wine prices. Some of most common measures of quality include ratings, yield

[10] The use of hedonic equations for examining factors that affect wine prices has a long history in the literature. Oczkowski (1994) is an early example. For a more complete overview, see Lecocq and Visser (2006).

(controlled for via the number of cases made), expected maturity of the wine, and year effects to capture the influence of the weather. In this study, I augment this set of variables by also including a measurement of the tasting note. Thus, the regression equation takes the following form:

$$\log(p_{i,t}) = \alpha_0 + \alpha_1 \log(dl_{i,t}) + \alpha_2 \log(r_{i,t}) + \alpha_3 \log(cm_{i,t}) + \alpha_4 \log(1 + m_{i,t}) + \beta\ (\textit{Year Dummies}) + \varepsilon_i \quad (1)$$

In equation (1), log stands for the logarithm of a variable; $p_{i,t}$ stands for the release price of wine i at time t (for a 750 ml bottle); $dl_{i,t}$ stand for description length for wine i at time t. It is computed as the total number of characters contained in the tasting note. The remaining control variables are: $r_{i,t}$ which stands for the contemporaneous *Wine Spectator* rating; $cm_{i,t}$ which stands for the number of cases made; and lastly, $m_{i,t}$ which stands for the number of years the wine will stay mature. A "1" is added to the maturity measure before the log transformation is computed. This is done because of the possibility that the wine is fully mature at the time of the tasting and is not expected to stay mature much longer. In such a case, the maturity measure is 0. Adding a 1 to this measure ensures that, when the log transformation is done, the value of this variable is indeed zero. Year dummies are indicator variables that control for weather effects. The model is estimated in logs to facilitate the interpretation of the coefficients as elasticities.

If better wines sell for higher prices, then one would expect the coefficient for the ratings variable, α_2, to be positive. However, many researchers argue that the relationship between ratings and price is far from perfect (Lecocq and Visser, 2006). Thus, the issue of whether this coefficient is positive, negative, or statistically indistinguishable from zero is purely empirical.

Another indicator of quality is the number of cases made. All else constant, a larger supply of a particular wine should be associated with a lower price per bottle (Haeger and Storchmann, 2006). Hence, the coefficient for the number of cases made, α_3, is expected to be negative. However, this variable may not be materially important in explaining prices if the effect of the number of cases produced is already controlled for with the other quality variables.

In equation (1), α_4 picks up the effect of maturity length on wine prices. This coefficient is expected to be positive, for at least a couple of reasons. First, the maturity length can be an important aspect of the quality of the wine. Despite the fact that the rating is included in equation (1), it is possible that maturity length picks up a quality dimension not fully captured by the rating. If this aspect of quality does affect price, then it follows that this coefficient should be positive. Second, wines with longer maturities clearly have longer cellar storage capacity. A longer maturity may therefore make a wine more attractive as an "investment commodity" (Jones and Storchmann, 2001).

Equation (1) also includes the description length of the tasting note. The contemporaneous effect is, in all likelihood, also a function of quality. As argued earlier, better wines tend

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to be more inspiring, perhaps inciting the reviewer to write a longer, more positive evaluation. Therefore, one would expect to observe a positive relationship between the length of the note and the price of the wine.[11] This effect is captured by α_1, the coefficient of the logarithm of the total number of characters in the tasting note.

B. *An Augmented Model*

The model represented by equation (1), although helpful for understanding a basic form of the price-quality relationship, it is insufficient for assessing a dynamic and more complex price-quality structure. The complexity stem from the possibility that some, if not all of the quality-related variables, over time, can influence wine prices through what can be called "marketing." For example, as argued above, the tasting note should be a function of quality. Great wines will tend to get very positive and enthusiastic reviews. But an enthusiastic review, over time, can lead to a price increase through its marketing effect. How? Overly enthusiastic reviews can shift perceptions about particular wines in future years. There are two plausible mechanisms through which this can happen. First, the wine producer himself (or herself) may feel that, given the positive reviews (especially from a relatively well-known reviewer), his/her wine can command higher prices. Thus, the producer may adjust his/her prices upwards in the following vintage. Second, particularly favorable reviews may influence consumers by altering their quality perception of the wine, thereby shifting the price elasticity of demand for that wine. A profit-maximizing producer will respond to this shift by increasing prices. Either way, the review may end up influencing the price in the future. If so, one would expect to observe a positive relationship between this year's review, and next year's wine price, holding all else constant.

This argument applies to all the other quality variables, and most clearly to the wine rating variable. Hence, equation (1) can be modified to test for the influence of "marketing" as follows:

$$\log(p_{i,t}) = \alpha_0 + \alpha_1 \log(dl_{i,t}) + \alpha_2 \log(r_{i,t}) + \alpha_3 \log(cm_{i,t}) + \alpha_4 \log(1+m_{i,t}) + \beta_1 \log(dl_{i,t-1}) + \beta_2 \log(r_{i,t-1}) + \beta_3 \log(cm_{i,t-1}) + \beta_4 \log(1+m_{i,t-1}) \; \check{\beta}(\textit{Year Dummies}) + \varepsilon_i \qquad (2)$$

Notice that equation (2) allows all explanatory variables (except the year dummies) to enter contemporaneously (i.e. at time *t*) as well as with a lag (*t-1*). The coefficients for the contemporaneous variables are α_1 through α_4. As indicated above, these coefficients test the more basic price-quality relationship. The coefficients for the lagged variables are β_1 through β_4. These test for the "marketing" effect.

[11] According to Wine Spectator and James Laube himself (by private e-mail communication), all tastings are done blindly. The reviewers are told no information about the wines they taste. This implies that the price cannot influence the tasting note. Thus, reverse causality should not be a concern in equation (1).

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The simultaneous inclusion of both the contemporaneous and the lagged variable in the regression is not inappropriate (from an econometric perspective), so long as they are not collinear, or nearly so. Researchers often look at simple correlations to gauge whether multicollinearity may be a problem. This method is may be sufficient for detecting collinearity between two specific variables, as in this case. Values in the range of 0.8 or higher may be a cause for concern (Kennedy, 2003; p.209). Table 2 lists the correlation between the contemporaneous and lagged explanatory variables. A glance at the table reveals that there is only one case where the correlation coefficient is higher than 0.8. This is for the number of cases made and its lag ($cm_{i,t}$ and $cm_{i,t-1}$). A high correlation between these two variables should not be surprising. Wine production does not tend to vary too much from one year to the next, as the vineyard area dedicated for grape harvesting is more or less constant.

Table 2
Correlation Between Contemporaneous and Lagged Explanatory Variables

		Desc. Length Contemp.	*AW Length Contemp.*	*NAW Length Contemp.*	*Ratings Contemp.*	*Cases Made Contemp.*	*Maturity Contemp.*
Desc. Length	*Lagged*	0.339	0.064	0.349	0.270	−0.178	0.166
AW Length	*Lagged*	0.134	0.063	0.127	0.112	−0.075	0.108
NAW Length	*Lagged*	0.329	0.056	0.340	0.259	−0.168	0.150
Ratings	*Lagged*	0.356	0.087	0.360	0.427	−0.264	0.221
Cases Made	*Lagged*	−0.160	−0.011	−0.165	−0.216	0.949	−0.169
Maturity	*Lagged*	0.172	0.080	0.167	0.164	−0.180	0.185

This table presents simple correlations between the contemporaneous explanatory variables and the lagged ones. For example, the correlation between the contemporaneous "Desc. Length" variable and the lagged "Desc. Length" variable is 0.339. "Desc. Length" refers to the log of the number of characters of the wine description reported in *Wine Spectator*. "AW Length" refers to the log of the number of characters from analytical words used in the wine description. "NAW Length" refers to the log of the number of non-analytical characters used in the wine description. "Rating" is the log of the *Wine Spectator* score. "Cases Made" is the log of the number of cases made. "Maturity" is the log of the expected maturity.

The normal procedure for dealing with variables that are nearly collinear is to simply drop one of them. In this case, because $cm_{i,t}$ and $cm_{i,t-1}$ are highly correlated, including one of them is almost as if one included the other one. Thus, when estimating equation (2), I do not include $cm_{i,t-1}$ in the specification. As a robustness check, I also estimate the effect of the contemporaneous variables separately from the effects of the lagged variables. I discuss those results in more detail in the following section.

C. *Regression Results*

Table 3 presents the basic regression results. There are 9 regressions, split by specification (contemporaneous only, lagged only, and combined effects), and within each of these sets, the regressions are split by controls included. The purpose of the first breakdown

Table 3

Price Regressions Measuring the Value of Wine Descriptions

Variable	*Contemporaneous Effect*			*Lagged Effect*			*Combined Effect*		
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7	Reg. 8	Reg. 9
Desc. Length (t)	0.840**	0.539**	0.465**				0.669**	0.381**	0.316**
	(0.040)	(0.052)	(0.057)				(0.062)	(0.079)	(0.085)
Rating (t)		1.541**	3.250**					1.262**	2.173**
		(0.290)	(0.341)					(0.401)	(0.479)
Cases Made (t)		−0.147**	−0.134**					−0.154**	−0.135**
		(0.007)	(0.007)					(0.009)	(0.010)
Maturity (t)			0.085**						0.073**
			(0.025)						(0.029)
Desc. Length(t−1)				0.892**	0.476**	0.418**	0.621**	0.372**	0.285**
				(0.072)	(0.091)	(0.092)	(0.069)	(0.084)	(0.091)
Rating (t−1)					1.951**	4.109**		0.955+	2.123**
					(0.508)	(0.555)		(0.458)	(0.558)
Cases Made (t−1)					−0.151**	−0.134**			
					(0.010)	(0.011)			
Maturity (t−1)						0.083+			0.104**
						(0.038)			(0.036)
Year Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-2	0.188	0.328	0.357	0.164	0.323	0.368	0.243	0.400	0.439
F-stat	74.95	129.68	129.28	33.15	66.15	72.09	48.76	72.43	72.28
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. Obs	2623	2604	2446	1211	1191	1142	1211	1192	1089

Dependent variable: log of wine price. Independent variables. "Desc. Length" refers to the log of the number of characters of the wine description reported in *Wine Spectator*. "Rating" is the log of the *Wine Spectator* score. "Cases Made" is the log of the number of cases made. "Maturity" is the log of the expected maturity range. Time t is the contemporaneous effect. Time t−1 refers to the lagged effect. Standard errors are included in parentheses, under the estimated coefficients. Significance levels 1% (**), 2% (*), 5% (+).

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(contemporaneous, lagged, and combined) is to evaluate the effect of quality variables on prices, and compare it to the marketing effect, as described in the previous section. The purpose of the second breakdown (different controls within each set) is to evaluate the robustness of the tasting note coefficient across different specifications.

Regressions 1, 2, and 3, evaluate equation (2) when only the contemporaneous effect of the tasting note is included (which is tantamount to evaluating equation (1)). Regression 1 includes only the description length variable, besides the year effects. The point estimate indicates that the description length appears to be positively associated with price, as hypothesized above. The estimated coefficient is 0.84 and it is statistically significant at a level better than 1 percent level. Thus, the relationship between the length of the review and the price is strong. Since, as pointed out above, the reviewers are presumably given no information about the wine they taste, it cannot be argued that the reviewer is being influenced by the price when writing the note. Instead, what is more likely to be the case is that the wine's quality is driving both the length of the note and the price.

That quality is the driver can be partly confirmed by the inclusion of the other variables that also measure quality: ratings, maturity, and the number of cases produced. After these other control variables are included, the coefficient for the description length drops significantly in magnitude—by nearly 50 percent (from 0.84 to 0.465 in regression 3). The largest drop takes place between regressions 1 and 2. This suggests that ratings and the number of cases produced appear to be important when controlling for quality and quantity. But even after controlling for all quality and quantity metrics (including maturity), the description length continues to be an important determinant of prices. Evidently, there are quality aspects of the wine that cannot be fully captured by ratings, production, or the expected number of years the wine is expected to last (maturity).

The next three regressions share the same specification format as the first three, but they are estimated with the variables lagged by one period. Regression 4 estimates the influence of the lagged description length only, while regressions 5 and 6 systematically include the remaining quality and quantity variables, also lagged. The results are quite similar to those obtained for the contemporaneous set. In fact, the only major difference between the first set of regressions (regressions 1, 2, and 3) and the second set (regressions 4, 5, and 6) is the relatively large difference in the number of observations. In the first set, there are approximately 2400 to 2600 vintage-wine observations, while in the second set, there are approximately 1100 to 1200 observations. This decline in the number of observations is attributable to the fact that the second set of regressions necessarily drops from the sample all observations (unique wine labels) that do not have at least 2 consecutive vintages (years). If the wine label is not observed for 2 consecutive years or more, the lagged effect cannot be estimated.

It is quite remarkable that despite the significant loss in the number of observations, the estimated coefficients for this lagged set is very similar to those obtained in the contemporaneous set. For example, the description length coefficient starts out at 0.892 (not far from the 0.84 as reported in regression 1), and drops again by about 50 percent (from 0.892 to

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0.418 in regression 6). In addition, the remaining control variables retain similar magnitudes as well as statistical significance.

The last three regressions in Table 3 report the results for equation (2), which includes both the contemporaneous as well as the lagged variables with the exception of $cm_{i,t-1}$. Regression 7 includes the description length variable only (both the contemporaneous and the lagged one), and the other regressions systematically introduce the remaining quality variables. Observe that once again there is an approximately 50 percent decline in the description length coefficient for both the contemporaneous as well as the lagged one (when comparing regressions 7 and 8, or even 9). But perhaps more importantly, the lagged quality variables retain statistical significance in regression 9, even after including the contemporaneous variables. This results gives empirical support to the hypothesis that "marketing", in addition to quality, does influence wine prices.

D. *Measurement of the Value of Analytical Words*

Table 4 and 5 present the regression results of the analytical and non-analytical words of the tasting notes. The estimated regressions are the same as those presented in Table 3, but with the total-number-of-characters variable (description length) being replaced by either the total number of analytical characters (in Table 4) or the total number of non-analytical characters (in Table 5). A comparison of the results from Table 4 with those from Table 5 reveals a striking difference: the contribution of analytical words in the tasting notes is minimal at best. Instead, it appears that the value of the tasting note is coming from the non-analytical words.

The results in Table 4 show that only a few of the analytical-words coefficients are statistically different from zero. And even when they are significant, the magnitudes are rather small. For example, regression 1 shows that the "length" of analytical words (the number of characters in the note that come from analytical words) is statistically significant at a level better than 1%. But the coefficient of 0.209 is barely one-quarter of the size of the corresponding coefficient estimated for the total description length, which is 0.84 (Regression 1, Table 3). More importantly, the estimated coefficient for the analytical words in regression 1 does not appear to be very robust to the inclusion of other quality and quantity variables. When all other control variables are included, the coefficient drops to a statistically insignificant 0.03 (regression 3). A similar pattern can be discerned when looking at the coefficients in the lagged effect regressions (regressions 4, 5, and 6).

Interestingly, the results for the full combined effect (regression 9) indicates that the lagged analytical description length is not important for explaining wine prices, while the contemporaneous version of this variable does, at least at the 10% confidence level. Given this result, it is tempting to argue that the use of analytical words may still reflect some (but very minimal) quality aspects of the wine (picked up in the contemporaneous coefficient of 0.053), but they are of little use for marketing purposes (since the estimated lagged coefficient is not statistically different from zero).

Table 4

Price Regressions Measuring the Value of Analytical Words in Wine Descriptions

Variable	*Contemporaneous Effect*			*Lagged Effect*			*Combined Effect*		
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7	Reg. 8	Reg. 9
AW Length(t)	0.209**	0.054**	0.030				0.180*	0.067**	0.053
	(0.021)	(0.019)	(0.019)				(0.031)	(0.028)	(0.028)
Rating (t)		3.466**	4.656**					2.432**	2.944**
		(0.242)	(0.304)					(0.328)	(0.436)
Cases Made (t)		−0.145**	−0.134**					−0.155**	−0.136**
		(0.007)	(0.007)					(0.010)	(0.011)
Maturity (t)			0.125**						0.097**
			(0.027)						(0.031)
AW Length(t−1)				0.201**	0.062	0.031	0.187**	0.055	0.014
				(0.036)	(0.032)	(0.312)	(0.036)	(0.030)	(0.029)
Rating (t−1)					3.388**	5.351**		2.209**	3.253**
					(0.417)	(0.493)		(0.406)	(0.503)
Cases Made (t−1)					−0.152**	−0.134**			
					(0.011)	(0.011)			
Maturity (t−1)						0.105*			0.106**
						(0.041)			(0.039)
Year Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R−2	0.065	0.299	0.334	0.055	0.304	0.352	0.081	0.377	0.420
F-stat	24.04	103.85	109.49	10.35	55.35	63.12	13.05	58.00	57.51
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. Obs	2581	2563	2414	1202	1182	1134	1188	1169	1072

Dependent variable: log of wine price. Independent variables: "AW Length" refers to the log of the number of characters of the analytical words in the wine description reported in *Wine Spectator*. "Rating" is the log of the *Wine Spectator* score. "Cases Made" is the log of the number of cases made. "Maturity" is the log of the expected maturity range. Time t is the contemporaneous effect. Time t−1 refers to the lagged effect. Standard errors are included in parentheses, under the estimated coefficients. Significance levels 1% (**), 2% (*), 5%(*).

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Table 5

Price Regressions Measuring the Value of Non-Analytical Words in Wine Descriptions

Variable	*Contemporaneous Effect*			*Lagged Effect*			*Combined Effect*		
	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7	Reg. 8	Reg. 9
NAW Length (t)	0.800**	0.483**	0.414**				0.635**	0.329**	0.260**
	(0.038)	(0.048)	(0.052)				(0.059)	(0.074)	(0.079)
Rating (t)		1.785**	3.441**					1.479	2.356**
		(0.279)	(0.330)					(0.387)	(0.465)
Cases Made (t)		–0.147**	–0.134**					–0.154	–0.134**
		(0.007)	(0.007)					(0.010)	(0.010)
Maturity (t)			0.093**						0.080**
			(0.025)						(0.030)
NAW Length(t–1)				0.821**	0.395**	0.361**	0.559**	0.301**	0.245**
				(0.068)	(0.082)	(0.083)	(0.064)	(0.076)	(0.083)
Rating (t–1)					2.241**	4.301**		1.178**	2.238**
					(0.491)	(0.538)		(0.448)	(0.543)
Cases Made (t–1)					–0.151**	–0.134**			
					(0.010)	(0.010)			
Maturity (t–1)						0.090*			0.109**
						(0.038)			(0.036)
Year Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.181	0.325	0.356	0.153	0.320	0.367	0.229	0.395	0.436
F-stat	75.39	128.21	128.80	32.31	63.79	70.56	47.51	70.19	71.69
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. Obs	2623	2604	2446	1211	1191	1142	1211	1192	1089

Dependent variable: log of wine price. Independent variables: "NAW Length" refers to the log of the number of characters of the non-analytical words in the wine description reported in *Wine Spectator*. "Rating" is the log of the *Wine Spectator* score. "Cases Made" is the log of the number of cases made. "Maturity" is the log of the expected maturity range. Time t is the contemporaneous effect. Time t–1 refers to the lagged effect. Standard errors are included in parentheses, under the estimated coefficients. Significance levels 1% (**), 2% (*).

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The results in Table 5, by contrast, indicate that the non-analytical-words coefficients are all positive and statistically significant at the 1 percent level or better. The estimated coefficients hover between 0.25 and 0.8, not far from the coefficients for the total description length reported in Table 3. In fact the pattern in Table 5 mimics very closely the pattern observed in Table 3. This result suggests that the informative part of the tasting note appears to be the note's expressive component and not so much from the note's use of analytical words. Moreover, because the lagged variables are statistically significant, they suggest that marketing effects of the note are also an important element influencing wine prices.

IV. Concluding Remarks

The objective of this paper is to investigate whether tasting notes influence wine prices. I augment a traditional price-quality model (a hedonic price equation) and allow marketing aspects, modeled as lagged quality variables, to also influence prices. I use a sample of tasting notes written for cabernet sauvignon wines from the Napa region for the 2000 to 2006 vintages. James Laube, senior editor of *Wine Spectator*, and a well-recognized expert on wines from California reviewed virtually all the wines in the sample. This is important to point out, because it implies that the price-quality or price-marketing relationships are being examined over a relatively homogeneous set of conditions (same type of wine, same reviewer, same region, etc).

The main results indicate that the length of the tasting note is contemporaneously associated with the wine's price, even after controlling for ratings, production, and the length of time the wine is expected to stay mature. More importantly, the lagged quality variables appear to also influence wine prices. In particular, the magnitude of the (lagged) length of the tasting note coefficient indicates that a 10 percent increase in the number of characters leads to a 3 to 6 percent increase in the price of the bottle. Thus, the influence of the tasting note on prices takes place through marketing effects.

Further, I decompose the length of the tasting note into two components: an analytical one, based on the use of "wine vocabulary," and a non-analytical one, which is computed as the difference between the total length of the tasting note and the size of the note's analytical component. The empirical results indicate that it is the non-analytical component of the tasting note that appears to add value. Evidently, therefore, the use of metaphors, with or without the use of purely analytical words, does exert an influence on the price of a wine. However, it must be stressed that although longer, non-analytical tasting notes are associated with higher prices, it does not follow that rambling on about a wine will increase its value arbitrarily. Like everything else in life, the influence of tasting notes is all a matter of balance.

This research can be extended in several ways. Perhaps one of the most interesting questions to investigate next is to identify which non-analytical words from the tasting note appear to enhance the marketing effect of the note. This is an issue of obvious interest not just to wine consumers, but to wine producers as well.

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Appendix

List of Analytical Wine Words and Their Frequency in the Sample

Word	*Frequency*	*Word*	*Frequency*
acetic acid	0.00%	browning	0.00%
acid	2.16%	brut	0.00%
acidic	0.00%	burnt	0.00%
acidity	2.05%	buttery	0.04%
acrid	0.00%	carbonic maceration	0.00%
aeration	0.73%	cask number	0.00%
aftertaste	9.03%	cedary	19.39%
aggressive	0.04%	cellared by	0.00%
alcohol by volume	0.00%	chaptalization	0.00%
alcohol	0.37%	charmat	0.00%
alcoholic	0.15%	chewy	9.29%
american oak	0.00%	cigar box	0.48%
american viticultural area (ava)	0.00%	clean	0.91%
ampelography	0.00%	clone	0.00%
appearance	0.04%	closed	0.40%
appellation d'origine controlee (aoc)	0.00%	cloudiness	0.00%
appellation	0.11%	cloying	0.04%
aroma	9.44%	coarse	0.26%
astringent	0.22%	cold stabilization	0.00%
austere	4.21%	complexity	6.33%
awkward	0.18%	corked	0.00%
backbone	1.10%	crush	0.11%
backward	0.22%	cuvee	0.04%
balance	13.28%	decanting	0.99%
balthazar	0.00%	delicate	0.88%
barrel fermented	0.00%	demi-sec	0.00%
bin number	0.00%	dense	6.84%
bite	0.07%	depth	10.02%
bitter	1.94%	dirty	0.33%
blanc de blancs	0.00%	disgorgement	0.00%
blanc de noirs	0.00%	dosage	0.00%
blunt	0.00%	dry	17.26%
body	0.33%	drying out	0.07%
botrytis cinerea	0.00%	dumb	0.07%
bottle sickness	0.00%	early harvest	0.00%
bottled by	0.00%	earthy	13.50%
bouquet	0.00%	elegant	10.02%
brawny	0.66%	empty	0.00%
briary	0.04%	enology	0.00%
bright	0.29%	estate-bottled	0.00%
brilliant	0.07%	ethyl acetate	0.00%
brix	0.00%	extra-dry	0.00%

Continued

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Word	*Frequency*
extract	1.13%
fading	0.00%
fat	0.04%
fermentation	0.00%
field blend	0.00%
filtering	0.00%
fining	0.04%
finish	43.45%
flabby	0.00%
flat	0.07%
fleshy	5.01%
flinty	0.04%
floral (also flowery)	0.00%
fortified	0.00%
foxy	0.00%
free-run juice	0.00%
french oak	0.00%
fresh	7.39%
fruity	0.77%
graceful	2.71%
grapey	1.13%
grassy	0.04%
green harvest	0.00%
green	3.95%
grip	1.39%
grown, produced and bottled	0.00%
half-bottle	0.00%
hard	1.13%
harmonious	3.22%
harsh	0.11%
hazy	0.00%
heady	0.04%
hearty	0.29%
herbaceous	0.51%
hollow	0.33%
hot	0.15%
imperial	0.00%
jeroboam	0.00%
late harvest	0.00%
leafy	0.04%
lean	4.10%
lees	0.00%
legs	0.00%
length	2.19%
limousin	0.00%

Word	*Frequency*
lingering	2.08%
lively	2.12%
lush	5.08%
maceration	0.00%
made and bottled by	0.00%
maderized	0.00%
magnum	0.00%
malic	0.00%
malolactic fermentation	0.00%
mature	0.26%
meaty	0.29%
mercaptans	0.00%
meritage	0.00%
methode champenoise	0.00%
methuselah	0.00%
murky	0.29%
must	0.29%
musty	0.07%
nebuchadnezzar	0.00%
negociant (negociant-eleveur)	0.00%
noble rot	0.00%
nonvintage	0.00%
nose	0.07%
nouveau	0.00%
nutty	0.18%
oaky	0.51%
off-dry	0.00%
oxidized	0.04%
peak	0.15%
perfumed	0.48%
ph	1.61%
phylloxera	0.00%
potent	1.24%
press wine (or pressing)	0.00%
private reserve	0.00%
produced and bottled by	0.00%
pruny	0.22%
puckery	0.00%
pungent	0.15%
racking	0.00%
raisiny	0.11%
raw	2.41%
reduced	0.22%
rehoboam	0.00%
residual sugar	0.00%

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Word	*Frequency*
rich	32.85%
robust	0.11%
round	5.34%
rustic	4.57%
salmanazar	0.00%
smoky	3.00%
soft	0.77%
spicy	11.30%
stale	0.29%
stalky	0.95%
stemmy	0.29%
structure	9.29%
subtle	2.30%
supple	14.19%
sur lie	0.00%
tanky	0.00%
tannin	46.74%
tart	3.18%
tartaric acid	0.00%
tartrates	0.00%
terroir	0.00%
thin	1.98%
tight	18.73%
tinny	0.04%
tired	0.59%
toasty	6.77%
vegetal	0.15%
velvety	0.07%
viniculture	0.00%
vinous	0.00%
vintage date	0.00%
vinted by	0.00%
vintner-grown	0.00%
vintner	0.00%
viticultural area	0.00%
viticulture	0.00%
vitis vinifera	0.00%
volatile (or volatile acidity)	0.00%
yeast	0.07%

This table lists words (without their definitions) from *Wine Spectator*'s wine glossary and, for each, gives the number of times the particular word was observed in the sample of tasting notes, expressed as a percentage. For example, the word "fresh" was used in 202 of the 2734 tasting notes (=7.39%).

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