Ithaca 2018 Abstract Submission

Title
Impacts of Expert Information on Prices for an Experience Good across Product Quality Segments: Tasting Notes and Wine Prices

I want to submit an abstract for:
Conference Presentation

Corresponding Author
Kuan-Ju Chen

E-Mail
kuan718.chen@wsu.edu

Affiliation
Washington State University

Co-Author/s

Name	E-Mail	Affiliation
Jill J. McCluskey	mccluskey@wsu.edu	Washington State University

Keywords
Expert information, wine, tasting notes

Research Question
Do expert information from tasting notes affect prices? Do tasting notes impact different across product quality segments?

Methods
We use the hedonic price model to evaluate how wine tasting notes influence wine prices across market segments.

Results
Ratings, aging, reserve, and AVAs as wine characteristics have positive effects on prices. Spice and berry sensory terms have significant negative effects but tannin has significant positive effect on prices.

Abstract
Understanding the process of price formation is difficult in the case of experience goods, which have the property that consumers cannot observe their quality prior to consumption. Hence, many consumers rely on information from expert evaluations in making purchasing choices. The use of (unbiased) expert information should depend on the benefits from product knowledge versus expending time acquiring and processing information. Since consumers have heterogeneous preferences for quality and face different costs to acquiring and processing information, expert information will not impact all shoppers but may be very useful to specific market segments. One should expect for consumers who are paying high prices for quality to acquire more information. The objective of this article is to quantify how expert information impacts prices across product segments. We accomplish this objective using the case of the wine market by measuring the effects of tasting note content on wine prices across price categories.

Wine experts and critics provide not only quantitative information by assigning rating scores, but also qualitative

information in the form of verbal notes on taste and smell (Storchmann 2012). Thus, we would like to understand the qualitative information value of wine tasting notes from wine experts. Lehrer (1975), Lawless (1984), and Weil (2007) analyze the value and function of wine words in the context of consumer perception. They concluded that the majority of people will rely on experts when choosing wines. Understanding the impact of the format of expert information is similar to what is currently being studied in nutrition information. Researchers are interested in how detailed information affects choice versus how summary information (such as the traffic light system) affects choice. We examine whether expert descriptive information has an influence on the price wine by using a sample of tasting notes from the Wine Spectator. We extend previous work done by Ramirez (2010) and show that keywords other than technical words contained in the tasting notes will deliver significant effect on wine price.

In the wine industry, name and reputation are crucial to consumers. Costanigro, McCluskey, and Goemans (2010) showed that reputation price premiums tend to migrate from collective (regional) names to specific (firm) name as wine prices increase by studying how names and reputations nest within each other. Some studies (Schamel and Anderson 2003; Steiner 2004; Costanigro, McCluskey, and Mittelhammer 2007; Carew and Florkowski 2010) have found that particular regions of production have a ceteris paribus premium capturing production cost differential and the value of the collective reputation of a product district.

The current article contributes to this literature in a few ways. First, we estimate differential impacts to expert information across price segments. We include both quantitative (summary) ratings and qualitative evaluations in the analysis. Finally, in the case of wine, we quantify the effects of specific terms used in expert tasting notes on prices.

We use the hedonic price model to evaluate how wine tasting notes influence wine prices. The hedonic price equation regresses wine prices on a set of wine characteristics in order to determine which characteristics have a significant effect (Lecocq and Visser 2006; Costanigro, McCluskey, and Mittelhammer 2007). Following Costanigro, McCluskey, and Mittelhammer (2007), we divided the sample into four market segments: commercial wines (price less than $13), semi-premium (between $13 and $21), premium (between $21 and $40), and ultra-premium (greater than $40). The sample sizes associated with these market segments are 684, 1268, 2,818 and 1,315 products, respectively.

Within the hedonic pricing model, we evaluate functional forms by comparing linear, log-linear, power transformation, and optimal Box-Cox transformations of dependent variable (prices) in the model to find the best performing Box-Cox transformation used in other hedonic wine literatures where parameters maximizing a likelihood function based on a normality assumption (Box and Cox 1964; Cleveland and Devlin 1988; Landon and Smith 1997; Costanigro and McCluskey 2011). A power transformations of price from the estimated Box-Cox parameter λ where $\lambda = -0.069$ is implemented for pooled and segmented models. The goodness-of-fit (Jarque–Bera) test is tested in our inverse transformation model and the sample data has the skewness and kurtosis matching a normal distribution. The covariance matrix of the parameters was estimated using White's consistent heteroskedasticity-robust estimator in order to correct heteroskedastic residuals.

We collected descriptions of 6,085 red wines published by the Wine Spectator magazine on 1997 through 2013 vintages in the State of Washington. Experts use adjective terms for the attributes and characteristics of a particular wine. Following Durham, Pardoe, and Vega-H (2004), we chose six common sensory characteristics of red wines with over 10% frequency keywords from the text of the tasting notes. We control for some common factors that may affect prices, such as weather variations, a geographical region of the vineyards, enologist experience, and constancy.

Our first finding is that ratings, rating squared, aging, reserve, and AVAs as wine characteristics have significant positive effects on wine prices. Particularly, rating has a significant positive impact on prices across price segments. In addition, prices increase in rating at an increasing rate, implying wines with higher ratings have additional premium values. Aging has a significant positive effect on the wine prices almost across market segments. However, prices increase in aging at a decreasing rate, indicating there are diminishing marginal returns to aging wines.

The number of cases produced of the wines shows a significant negative effect on wine prices, which means the

price of wines decreases in rarity. This is consistent with previous findings (Costanigro, Mittelhammer and McCluskey 2007), and there is a term “cult wines,” or “trophy wines,” which refers to rare wines that consumers will pay a lot for and are hard to get. The number of cases produced of the ultra-premium wines has an insignificant impact on wine prices.

In addition, the spice and berry sensory characteristics have a significant negative effect on the price of wines, but the tannin sensory characteristic has a significant positive effect on the price of wines in the pooled results. It seems that the tannin sensory characteristic could increase the values of wines, especially for high-end (ultra-premium and premium) wines. The cherry sensory characteristic has a significant positive effect on prices in the premium wines, but the spice sensory characteristic has a significant negative effect on wine prices in the premium price segment. Moreover, the finish sensory characteristic has a significant negative effect on the prices of wines in the semi-premium price category.

Comparatively, the vintages have mixed effects on wine prices in the model as expected. The years 1997 through 2010 all have a negative effect on wine prices for the pooling results, and they are largest in magnitude and have a significant effect on wine prices for the commercial wines. This might be unexpected weather affecting regions and grape varieties used for commercial wines in those vintages. Thus, this might cause less quality wines from unexpected weather. However, the year 2011 and 2012 are only two years, having a positive effect on wine prices in the pooled model. Especially, we can see that year 2012 has a positive impact on wine prices for the middle class (semi-premium and premium) wines.

This article investigates how expert information impacts prices across product segments. Specifically it quantifies how expert tasting notes information affects wine prices. We use tasting notes written for red wines by the Wine Spectator in the State of Washington among the 1997 to 2013 vintages. For higher-end products, consumers have the incentive to invest more time in research prior to purchase. Thus, we expected for expert evaluations to have a greater impact on the price of higher-end segments. We estimate pooled and segmented hedonic pricing models to test the mixed effects of tasting notes and choice impact of wine characteristics on wine prices by controlling for the same region, weather variation, enologist experience, and reviewer. We find that a model accounting for the existence of wine categories has greater explanatory power in the variability of the data.

This article extends previous work done by Ramirez (2010) and finds that certain keywords other than the length of the tasting notes will deliver a significant effect on wine price. For example, spice and berry as wine sensory characteristics have significant negative impacts on wine prices, which mean many consumers do not prefer the taste of spice and berry in red wines. However, it seems that consumers prefer wines in which experts discuss tannins. For instance, the cost of a bottle of wine with “tannin” in the tasting note is higher than the cost of a bottle of wine with “spice” in the tasting note. The other wine characteristics such as rating, aging, reserve, and AVA variables have a significant positive impact on wine prices.

This research is useful for other researchers, policy makers, and industry participants to better understand how tasting note information affects prices. A wine producer can benefit from tasting terms that are specific information compared to a numerical score, which provides summary information, to maximize its profit margin.

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Appendix

Table 1: Summary Statistics of the Quantitative Explanatory Variables

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
Price^	30.17	27	17.341	5	185
Rating^^	88.88	89	2.992	68	98
Aging^^^	3.05	3	0.772	1	7
Cases_Produced^^^^	5503.91	495	29697.280	17	580000

Note: Source: www.winespectator.com (database). 6,085 observations.
^ In US dollars per 750 ml bottle and adjusted to year 1997 by a consumer price index (CPI).
^^ A number between 0 and 100 that corresponds to the *Wine Spectator* score awarded to each wine.
^^^ The number of years aging before commercialization.
^^^^ The reported total number of cases produced for each wine.

Table 2: Descriptions of the Variables used for the Explanatory Variables

Predictor	Short description
Rating	Rating score from the *Wine Spectator* centred by subtracting its mean
Rating2	Rating squared
Aging	Years of aging before commercialization centred by subtracting its mean
Aging2	Aging squared
Cases_Produced	Number of cases produced
Log(produced)	Natural logarithm of cases produced
Columbia Valley	Region of production
Horse Heaven Hills	
Red Mountain	
Walla Walla Valley	
Yakima Valley	
Cherry	Sensory characteristics of red wines
Spice	
Tannin	
Currant	
Finish	
Berry	
Reserve	"Reserve" was reported on the label
′97,…, ′13	Vintage

Table 3: Ordinary Least Square Estimates for Pooled and Segmented Hedonic Functions

	Pooled	Segmented			
Adjusted R^2	0.61	0.89^			
		Commercial	Semi-premium	Premium	Ultra-premium
		0.34	0.21	0.13	0.13
Observations	6,085	684	1268	2,818	1,315
Covariate	Coefficient x 10^2				
Constant	74.800***	81.530***	80.670***	78.480***	75.910***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.003)
Rating	-0.409***	-0.282***	-0.105***	-0.086***	-0.108***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rating2	-0.022***	-0.013***	-0.006***	-0.007***	-0.015***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Aging	-0.638***	-0.177***	-0.039	-0.161***	-0.319***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Aging2	0.220***	0.046	0.027	0.065***	0.069*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Reserve	-0.571***	-0.666	-0.236***	-0.016	-0.551***
	(0.001)	(0.005)	(0.001)	(0.001)	(0.001)
Columbia Valley	-0.450***	-0.872***	0.028	-0.053	-0.005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Horse Heaven Hills	-0.700***	-1.335***	0.068	0.060	-0.121
	(0.001)	(0.004)	(0.001)	(0.001)	(0.002)
Red Mountain	-1.391***	-1.019*	0.282**	-0.425***	-0.056
	(0.001)	(0.005)	(0.001)	(0.001)	(0.002)
Walla Walla Valley	-1.463***	-1.156	-0.187*	-0.315***	-0.272
	(0.001)	(0.009)	(0.001)	(0.001)	(0.002)
Yakima Valley	-0.813***	-0.748***	-0.005	-0.296***	-0.225
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Cherry	0.012	-0.132	0.015	-0.084**	0.093
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Spice	0.193***	0.053	0.042	0.078*	0.024
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Tannin	-0.328***	-0.019	0.024	-0.060*	-0.155**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Currant	0.021	-0.130	0.016	0.039	0.028
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Finish	0.016	0.038	0.115***	0.030	0.104
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Berry	0.107*	0.082	-0.013	-0.033	0.020
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)

Note: Standard errors are presented in parentheses. * p<0.1 ** p<0.05 *** p<0.01.

^ Calculated stacking the segmented datasets in a single (block diagonal) design matrix and estimating the segmented hedonic model all at once, with a single constant.

Table 3 (Cont): Ordinary Least Square Estimates for Pooled and Segmented Hedonic Functions

	Pooled	Segmented			
		Commercial	Semi-premium	Premium	Ultra-premium
Covariate			Coefficient x 10^2		
Log(produced)	0.756***	0.275***	0.190***	0.123***	-0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
97’	2.973***	2.285***	0.393*	0.379	-
	(0.004)	(0.005)	(0.002)	(0.005)	-
98’	2.558***	2.004***	0.059	0.568	1.502***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.005)
99’	2.170***	1.953***	-0.035	0.678	1.510***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.004)
00’	1.791***	1.686***	0.064	0.601	1.362***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.004)
01’	1.664***	1.843***	0.152	0.636	1.053***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.004)
02’	1.597***	1.887***	0.246	0.596	0.584*
	(0.004)	(0.005)	(0.002)	(0.005)	(0.003)
03’	1.298***	1.858***	0.066	0.370	0.895***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.003)
04’	1.351***	1.671***	-0.014	0.407	1.183***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
05’	0.900**	1.842***	-0.247	0.325	0.910***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
06’	1.048**	1.504***	0.070	0.332	0.692***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
07’	1.016**	1.504***	0.196	0.410	0.876***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
08’	0.706*	1.085**	-0.014	0.260	0.692***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
09’	0.734*	1.604***	0.030	0.274	0.733***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
10’	0.309	1.360***	0.067	0.141	0.517***
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
11’	-0.197	1.093**	0.074	0.016	0.326*
	(0.004)	(0.005)	(0.002)	(0.005)	(0.002)
12’	-0.250	0.783	-0.095	-0.247	-
	(0.004)	(0.005)	(0.002)	(0.005)	-

Note: Standard errors are presented in parentheses. * p<0.1 ** p<0.05 *** p<0.01.
- Variable not present in a segment
^ Omitted variable: year 2013.

Table 4: Marginal Effect Estimates for Pooled and Segmented Hedonic Functions

	Pooled	Segmented			
Adjusted R^2	0.61	0.89^			
		Commercial	Semi-premium	Premium	Ultra-premium
Observations	6,085	684	1268	2,818	1,315
Rating	1.911	0.923	1.443	2.142	2.917
Rating2	0.104	0.050	0.079	0.117	0.159
Aging	2.979	1.438	2.250	3.340	4.547
Aging2	-1.029	-0.497	-0.777	-1.153	-1.571
Reserve	2.665	1.287	2.013	2.987	4.067
Columbia Valley	2.102	1.015	1.587	2.356	3.208
Horse Heaven Hills	3.269	1.578	2.469	3.665	4.990
Red Mountain	6.494	3.136	4.905	7.280	9.912
Walla Walla Valley	6.832	3.299	5.160	7.658	10.427
Yakima Valley	3.795	1.832	2.866	4.254	5.792
Cherry	-0.057	-0.027	-0.043	-0.064	-0.087
Spice	-0.903	-0.436	-0.682	-1.012	-1.378
Tannin	1.531	0.739	1.156	1.716	2.336
Currant	-0.099	-0.048	-0.075	-0.111	-0.151
Finish	-0.073	-0.035	-0.055	-0.081	-0.111
Berry	-0.499	0.241	-0.377	-0.559	-0.761
Log(produced)	-3.532	-1.705	-2.668	-3.959	-5.391
97’	-13.882	-6.702	-10.485	-15.560	-21.187
98’	-11.943	-5.766	-9.020	-13.387	-18.228
99’	-10.131	-4.891	-7.651	-11.356	-15.462
00’	-8.365	-4.039	-6.318	-9.376	-12.767
01’	-7.770	-3.751	-5.868	-8.709	-11.859
02’	-7.459	-3.602	-5.634	-8.361	-11.385
03’	-6.060	-2.926	-4.577	-6.793	-9.249
04’	-6.309	-3.046	-4.765	-7.072	-9.630
05’	-4.204	-2.030	-3.175	-4.712	-6.416
06’	-4.893	-2.362	-3.695	-5.484	-7.468
07’	-4.742	-2.290	-3.582	-5.316	-7.238
08’	-3.297	-1.592	-2.490	-3.696	-5.032
09’	-3.425	-1.654	-2.587	-3.839	-5.228
10’	-1.444	-0.697	-1.090	-1.618	-2.203
11’	-0.918	0.443	0.693	1.028	1.400
12’	-1.167	0.563	0.881	1.308	1.781

Note: Omitted variable: year 2013.

^ Calculated stacking the segmented datasets in a single (block diagonal) design matrix and estimating the segmented hedonic model all at once, with a single constant.

Table 5: Chow Test-Testing the Hypothesis of Parameters' Equality across Market Segment

	Semi-premium	Premium	Ultra-premium
Commercial	82.09***	197.29***	125.62***
	(0.000)	(0.000)	(0.000)
Semi-premium		161.23***	225.26***
		(0.000)	(0.000)
Premium			165.99***
			(0.000)

Note: P-values are presented in parentheses * p<0.1 ** p<0.05 *** p<0.01

Table 6. List of Common Sensory Words for Red Wines and their Frequency in the Sample

Word	*Frequency*
Berry	57.65%
Body	0.03%
Cherry	32.29%
Chocolate	3.29%
Currant	28.30%
Finish	61.72%
Oak	3.96%
Rich	6.90%
Spice	20.07%
Tannic	36.88%
Vanilla	0.82%

Note: This table lists red wine common sensory words (without their definitions) from the Wine Spectator 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 "rich" was used in 420 of the 6085 tasting notes (=6.90%).

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