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The Detrimental Effect of Expert Opinion on Price-Quality Dispersion Evidence from the Wine Market*

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Abstract

In this paper we analyze the effect of expert opinion on the price-quality dispersion of experience goods by referring to a large sample of wines produced in the U.S. When controlling for the number of past critical reviews and for past quality scores attained on the producer level, the following results emerge from our analysis: (1) Price-quality dispersion grows with the level of past critical exposure. (2) Price-quality dispersion grows with the level of past maximum scores obtained. This is particularly pronounced if the difference between maximum and average points is high. (3) Both effects mentioned above exert their largest spillover in the low-quality bracket resulting in significant overpricing of mediocre wines.

I. Introduction

In contrast to the classical Bertrand model of price competition, which assumes perfectly informed consumers and results in equilibrium prices at marginal cost, most markets exhibit considerable price dispersion. Price dispersion can arise from incomplete information about a product's price and/or quality. When obtaining

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information is costly and a fraction of consumers chooses to remain uninformed, price dispersion can persist in equilibrium.

It has long been assumed that lowering search costs may result in better-informed consumers and will thus lead to less price dispersion. Following this logic, many economists expected the expansion of the internet and e-commerce to cause significantly lower search cost resulting in prices to converge to the lowest possible level. (e.g., Bakos, 1997). Although this seems plausible, the empirical evidence of this effect appears to be equivocal. In fact, many analyses have shown that e-markets exhibit persistent price dispersion levels that are comparable with those observed in brick-and-mortar markets (e.g., Baylis and Perloff, 2002; Clemons et al., 2002; Pan et al., 2002).

Similarly, critical coverage and expert opinion may facilitate the search process and lower consumers' cost of becoming informed. Many economists stress the positive role of experts in the price convergence process. When a new product enters the market, little is known about its quality and its price can substantially deviate from goods of similar quality. As the market matures, the good is increasingly reviewed (e.g., by *Consumer Reports*) and quality assessments diffuse into the market. As a result, the percentage of informed consumers increases and the price converges toward the full information equilibrium (e.g., Bagwell and Riordan, 1991). Theoretically, , in a fully informed market, there would be no price dispersion.

This paper does not analyze price dispersion on homogenous goods markets but examines price deviations from the predicted quality-adjusted "full information" equilibrium for a differentiated product (wine). It studies the role of critical reviews in the price convergence process by analyzing almost all U.S. wines reviewed by *Wine Spectator* between 1984 and 2008. We examine whether a high level of past critical exposure results in a decline in the dispersion of quality-adjusted prices.

Our findings are surprising and contradict common beliefs. In a model that is stratified by the extent of past critical exposure, we find that expert evaluations inject more and not less noise into the price-quality relationship. Wineries with wines that have been reviewed extensively exhibit a significantly larger quality-adjusted price dispersion than those that have not been reviewed as much. In fact, price dispersion appears to be a positive function of past critical exposure. This result is robust and insensitive to various depreciation patterns of critical reviews.

When analyzing these effects for wines within various quality brackets we find that the positive effect of past wine reviews on price-quality dispersion is highest for low quality wines and lowest for the best quality. However, since the number of past reviews is correlated with a winery's past performance, as measured by maximum critical points received, exclusive reliance on the level of critical exposure only may be confounding. We, therefore, also analyze the impact of past performance on current price-quality relationships keeping the level of past critical exposure constant. We find that extensively reviewed wineries that received high maximum scores in the past tend to overprice their low-end wines more than their high-end wines. The over-pricing effect of low-quality wines appears to gradually increase with growing difference between past maximum and past average points (measured in standard deviations). Our results suggest that a well-reviewed firm that produces average quality may benefit from one high-quality outlier by increasing the prices of its low-end products in the next period. Therefore, even if critical coverage lowers price dispersion by increasing the ratio of informed consumers, its detrimental effect in the wine market significantly outweighs these benefits.

Our analysis of the adverse effects of expert opinion diverge from prior analyses that have exclusively focused on information overload and equivocal information (e.g., Van Zandt, 2004; Grover et al., 2006). The information-induced detriment we examine has its origin in the external effect of past expert opinion on inferior products of the reviewed producer's product line yielding growing price-quality dispersion. This effect may self-reinforce the demand for expert opinion. If price-quality dispersion is the reason for uninformed consumers to consult experts, and expert opinion causes price dispersion to grow, experts may create their own demand.

The remainder of this paper is organized as follows. Section II. Provides a brief overview theoretical and empirical literature that is relevant to our analysis. Section III describes the data set. In Section IV we examines the effects of critical exposure at the firm level and report our model results. Section V summarizes the main findings and provides an outlook.

II. Literature

A. Theoretical Literature

Beginning with Stigler (1961), a large body of information-theoretic literature has analyzed the circumstances under which prices of experience goods can remain above the full information level. In general, prices above the competitive level can persist if obtaining information is costly and some fraction of consumers remains uninformed (e.g., Diamond, 1971; Salop, 1976; Salop and Stiglitz, 1977).

However, as information about the good becomes publicly available and more consumers become informed about price and quality of the good, the price loses its function as a quality signal to uninformed buyers and converges toward the full information level. As a result, the ‘quality premium’ disappears (Bagwell and

Riordan, 1991). In other words, the remaining uninformed agents free-ride on the knowledge of informed agents (Grossman and Stiglitz, 1980).[1]

Even for homogeneous goods, imperfect information can result in price dispersion while zero price dispersion can only occur when all customers are fully informed (see, e.g., Salop, 1976; Salop and Stiglitz, 1977, 1982; Reinganum, 1979; Varian, 1980; Burdett and Judd, 1983; Carlson and McAfee, 1983; Stahl, 1989). Many economists agree that the provision of quality and price information by experts, such as *Consumer Reports*, increases welfare by lowering search costs and, as a result, prices (e.g., Salop, 1976; Ratchford, 1980; Tirole, 1988; Tellis and Wernerfelt, 1987; Bagwell and Riordan, 1991). That is, published quality and price reports by experts not only help some consumers to become informed but also exert positive externalities on all remaining uninformed consumers by lowering prices.

B. Empirical Literature

On the empirical side there are two strands of papers that relate to our analysis. The first group of studies analyzes the influence of information on price level and dispersion, the second group specifically examines the impact of expert opinion.

There are numerous marketing and economic papers that analyze the correlation between price and quality over time and across a large variety of consumer goods (e.g., Riesz, 1978; Geistfeld, 1982; Hjorth-Andersen, 1984; Gerstner, 1985). These

[1] More recently, Daughety and Reinganum (2007a, 2007b) modeled quality signaling via prices for markets with several competing sellers. For an oligopolistic market, they show that incomplete information about sufficiently horizontally differentiated products considerably softens price competition by firms and is consistent with price-induced quality signaling.

analyses are based on the assumption that the equilibrium correlation between price and quality increases with the number of informed consumers in the market. Theretically, when all consumers are fully informed about quality, prices are at marginal cost and the price-quality correlation equals one. Most of these studies are rather descriptive and the empirical findings are equivocal with a wide range of correlation coefficients (that occasionally even turning negative).

For instance, Tellis and Wernerfelt (1987) find that the correlation between price and quality is stronger in markets with a wide price spread. Assuming that more consumers search and are better informed as the spread in posted prices increases they infer that prices serve as quality signals on these markets.

Curry and Riesz (1988) show that -- for some goods -- prices converge and decline over a product's life cycle. Also, price-quality correlations tend to increase over time, presumably driven by accumulating public information about the good's quality. However, it is not clear whether this is due to an increasing fraction of informed buyers or to other reasons such as a decline in marginal costs over time.

Similarly, Caves and Greene (1996) assume that price-quality correlations are determined by the amount and type of information available to consumers. On the one hand, quality-price correlations were found to be higher for product categories that include more brands and presumably give greater scope for vertical differentiation. The authors infer that vertically differentiated markets stimulate consumer search and increase the level of information. On the other hand, price-quality correlations were found to be low for innovative and convenience goods. This suggests that prices signal quality and that consumer information levels are low in these markets.

Leaving the price-quality correlation path, Schnabel and Storchmann (2010) analyze the difference between two price lists for identical wines. The first list contains wholesale prices and is published at a wholesaler fair where all wines can be tasted and buyers are well informed about quality. The second list reports retail prices for mostly uninformed consumers. While the price difference is a positive function of wine quality, it declines with the wines' retail price. Given that the search cost is independent of a wine's price and the returns to search increase with the retail price, buyers of expensive wine are usually better informed.

Jaeger and Storchmann (2011) analyze wine retail prices in the U.S. and find higher price dispersion for expensive wines. These results are surprising since buyers of expensive wines are usually better informed. It is possible that, different time values, and price elasticities may offset the information advantage. In addition, if wine cannot be shipped across statelines as is true in many U.S. states, price dispersion may persist in equilibrium. Since there are fewer substitutes for high-end wines such as Chateau Margaux, this effect may be more prevalent for expensive wines than for everyday wines.

In two related papers on Bordeaux wine vintages, Ashenfelter et al. (1995) and Ashenfelter (2008) calculate a "full-information price" as a function of temperature and precipitation. They show that directly after the wines' release at auction, prices substantially deviate from their respective predicted full-information price. However, as more information about the wines' quality becomes publicly available,[2] auction prices steadily move towards the full-information equilibrium.

Most of the literature on the impact of expert opinion focuses on the price effect of a critical review based on its private information content, i.e., in addition to the good's objective quality (see, e.g., Ashenfelter and Jones (2012), Hadj Ali et al. (2008), Dubois and Nauges (2010) for the wine market or Reinstein and Snyder (2005) and Basuroy et al. (2003) for the film industry). In general, most of these papers find that positive reviews result in higher sales and/or prices.

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[2] Note that most Bordeaux *grands crus* are very tannic upon release and need to mature for five to eight years in order to be drinkable.

Sorensen and Rasmussen (2004) analyze how book sales respond to reviews in the NY Times and find that while positive reviews increase sales by an average of 64% in the week following the review, negative reviews increase sales as well (by 34%). They conclude that book reviews are not only persuasive, i.e., influence the book's perceived quality, but also informative, i.e., inform consumers about the book's existence.

In a similar vein, Roberts and Reagans (2007) investigate whether the amount of critical exposure influences the price-quality relationship of New World wines in the U.S. Employing various interaction variables, they show that the price effect of quality assessments increases with the number of reviews a winery has received before the price was set. However, the authors do not examine price dispersion.

Grover et al. (2006) analyze price dispersion in e-markets for 161 homogenous electronic products and find detrimental effects of abundant and equivocal information. In particular, they show that "information overload," measured as the number of stores with a "good" or higher rating selling the same product significantly contributes to price dispersion. In addition, they report a positive relationship between price dispersion and "information equivocality," measured as the variance of product review ratings.

Our analysis is closely related to the one by Roberts and Reagans (2007) in that we examine the impact of past critical exposure and also draw on a large sample of wines. However, in contrast to Roberts and Reagans, our analysis is aimed at examining the relationship between critical coverage and price-quality dispersion.

Like Grover et al. (2006) we find that expert opinion exerts a negative impact on price dispersion. However, and this is much stronger than found by Grover et al.

(2006), the detrimental effect of information is not confined to overload or equivocality, but is caused by its spillover on un-reviewed products by the same producer in the next time period.

III. Data

Our analysis is based on almost all U.S. produced wines reviewed from 1984 to 2008 by *Wine Spectator*, the wine magazine with the by far largest circulation in the United States.[3] Our data sample comprises wines from all major growing regions.[4] *Wine Spectator* reviews wines in blind tastings and provides its quality assessment for each reviewed wine on a scale from zero to 100 points. However, the zero to 50-point range is not used. *Wine Spectator* points correspond to the following quality segments: *Not Recommended* (50-74 points), *Mediocre* (75-79 points), *Good* (80-84 points), *Very Good* (85-89 points), *Outstanding* (90-94 points) and *Classic* (95-100 points). After removing wines without a vintage, non-standard bottles, and wines without any price information we have a workable sample of 44,808 observations.

Table 1 reports the descriptive price, point and review statistics by wine growing region. Clearly, the variation in the number of wine reviews per region is enormous. While Napa and Sonoma together account for more than half of all observations, regions such as Texas or Virginia, account for less than one percent each.

Quality-wise, our sample is dominated by Walla Walla wines with an average of 89.12 points (Table 1, panel (a)); Napa wines are, with an average of 86.46 points, a distanced second rank. In comparison, Texan wines, averaging 78.9 points, are at the lower end of the quality scale. As reported in panel (b) of Table 1, quality is more or less well mirrored by prices. While Napa and Walla Walla wines command

[3] For circulation data of wine magazines see also Storchmann (2012).
[4] This includes Napa, Sonoma, Mendocino, Sierra Foothills, Carneros, Central Coast/Bay Area, South Coast (Santa Rita Hills, Paso Robles, Edna Valley, Santa Barbara County, Santa Maria Valley, Santa Ynez Valley, Arroyo Grande Valley, San Luis Obispo County), Oregon, Yakima (WA), Walla Walla, Texas, Virginia, Finger Lakes (NY) and North Fork (NY).

the highest average prices per bottle ($38.56 and $37.47, respectively), Texan wines are the least expensive of the sample (average price of $15.72 per bottle).

Panel (c) of Table 1 reports the wineries' level of critical exposure in each region. Since each winery posts its wine prices before the *Wine Spectator* assessment is known, only previous reviews may influence prices. The figures in panel (c) of Table 1 reflect the (undepreciated) sum of reviews over the last four years prior to the posted observation and show that the level of critical exposure varies widely by winery. There are formerly unreviewed wineries in each region, and heavily reviewed wineries that draw on as many as 158 accumulated reviews. However, there are also large differences between regions. While wines from the South Coast, Central Coast, Carneros or Sonoma regions exhibit an average review count of above 20, the average winery in Virginia experienced just 5.7 reviews over four years.

Table 2 reports the descriptive statistics for points, prices and reviews by level of critical exposure. We partitioned the sample into five quintiles according to the amount of critical coverage a wine producer received over the last four years. The first quintile (Q1) comprises all wines of a producer who had not been reviewed prior to the observation and is somewhat smaller than the others ($\sum R=0$). Quintile 2 (Q2) refers to wines of producers who had been reviewed only sparsely, $0<\sum R\leq 7$. Similarly, Q3 ranges from $7\leq\sum R<15$, Q4 from $15\leq\sum R\leq 29$ and Q5 covers all wines of producers who were reviewed at least 29 times over the last four years. The review statistics and the quintile cut-offs are reported in panel (c) of Table 2.

The two upper panels of Table 2 show a positive correlation between past reviews on the one hand and average critical point level and average price on the other hand. At the same time, the point and price standard deviation within each quintile steadily decreases with the amount of critical exposure. Hence, wineries that have been subject to extensive critical reviews produce better wine (without any causal determination) and exhibit slightly smaller price dispersion. This may be an indication for the price-converging effect of critical reviews. However, it may also be caused by producer- or varietal-specific effects.

IV. Econometric Analysis

A. Stratified Models

To examine how past critical exposure affects wine prices, we estimate the equation

(1) $\ln(P)_{i,j,t} = \beta_0 + \beta_1 Q_{i,j,t} + \beta_2 A_{i,j,t} + \beta_3 T_{i,j,t} + \phi_i + \theta_j + \varepsilon_{i,j,t}$

where *i* indicates the wine, *j* the producer and *t* the time of review. *P* denotes the price of the wine, *Q* denotes its quality measured by *Wine Spectator* points, *A* denotes the wine's age at the time of review and *T* is a trend variable, which accounts for time effects. ϕ stands for grape varietal fixed effects, θ stands for firm fixed effects and ε is the idiosyncratic term.

There is a price and a quality assessment, i.e., *Wine Spectator* points, for each observation. Note, however, that the price of a wine is already set when the winery submits it to *Wine Spectator* for review. This has two important implications. First, since not every wine submitted to *Wine Spectator* is reviewed, the present level of exposure is unknown to the winery when it sets the price. Thus not present critical exposure but only past critical coverage can influence the price. We, therefore, lag the review variable.

Second, our analysis is based on the assumption that producers have a good idea about the quality of their products when setting their list prices. We furthermore assume that producers' quality assessments correspond to the critics' assessments; ideally, both are good proxies for "true quality." Therefore, if producers learn from past critical reviews, the correlation between the critical and winery quality assessments should be a positive function of the level of past critical coverage.

Ceteris paribus, this effect may lead to a decrease in price-quality dispersion with increasing critical exposure.

Column (1) of Table 3 reports the result of a regression over the entire sample, independent of the level of critical reviews. The regression contains a full set of fixed effects for grape varietal[5] and producer that control for time-invariant factors such as grape prices and quality potential, natural and technological endowment or market access. Both points given by *Wine Spectator* and the trend variable have a significant positive effect on wine prices. Note, however, that the marginal effect of points, about 19.8% per point, is not independent of quality. In fact, several studies suggest that expert assessments mostly repeat publically available information (e.g., the weather of the vintage) and that the quality-independent effect of critical points is minimal (Ashenfelter and Jones, 2012; Haeger and Storchmann, 2006; Hadj Ali et al., 2008). Therefore, the marginal effects of critical points reported in Table 3 mostly reflect the impact of (wine review-independent) quality on price.

The negative effect of age on wine price squares with the findings of prior analyses and suggests that producers are willing to offer a discount for older wines to free-up storage space (e.g., Haeger and Storchmann, 2006).

However, the quality variable may have different marginal effects on the price depending on the degree of critical exposure for each winery. In fact, in an analysis of New World wines, Roberts and Reagans (2007) found that critical points exert stronger effects on wine prices for wineries that previously have been assessed extensively by *Wine Spectator*.

[5] We consider the following grape varietals: Barbera, Cabernet Franc, Cabernet Sauvignon, Grenache, Malbec, Merlot, Petite Syrah, Pinot Noir, Syrah, Sangiovese, Zinfandel, Chardonnay, Chenin Blanc, Gewürztraminer, Marsanne, Müller-Thurgau, Muscat, Pinot Blanc, Pinot Gris, Riesling, Roussanne, Sauvignon Blanc, and Viognier.

We, therefore, divide our sample into five quintiles depending on the amount of critical coverage the producer has experienced over the last four years (see also Section 2). Using a dummy variable for each quintile we create interaction terms *points x quintile level of critical reviews* and add them to the equation as shown in column (2). While the coefficients for the age and trend variables remain virtually unchanged, we find that the impact of *Wine Spectator* points on the price increases with critical exposure. This squares with the results of Roberts and Reagans (2007) who find that "… while a wine's price is a positive function of its own quality rating, the strength of the price-quality relationship increases with critical exposure" (Roberts and Reagans, 2007, p. 84).

In contrast to Roberts and Reagans, we are interested in the dispersion from the predicted price and its relation to the amount of critical reviews a producer has experienced. Since a Wald test rejects the null hypothesis that the interaction terms are identical and equal to zero, we now stratify our analysis and run five different regressions, one for each quintile; the results are shown in column (3) to (7) of Table 3. As expected, the coefficient of the point variable increases with critical coverage. However, due to the fact that each model draws on a different sample, the marginal effects of age and trend variables now vary considerably. It is remarkable that the impact of the trend variable grows with the review quintiles. That is, wines of extensively reviewed producers have experienced higher annual price increases than those of less or un-reviewed firms – independently of quality.

At the bottom of each column we report the coefficient of variation, CV(RMSE) as a measure of price dispersion.[6] The CV is our measure of price-quality dispersion. While the quality-adjusted CV for the entire sample equals approximately 10.3%, there is a wide variation in the stratified CVs. In fact, price dispersion steadily grows with critical exposure and ranges from 9.1% from hitherto un-reviewed producers to 11.5% for wines from producers with 29 or more reviews over the last four years.

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[6] The CV(RMSE) is calculated as the root-mean squared error normalized to the mean of the dependent variable.

Given that a winery's ability to build expectations about critics' assessments and to price accordingly improves with learning through past evaluations, our results are even more astounding. .

B. Depreciation of Critical Reviews

So far we have assumed that critical evaluations do not depreciate over time, i.e., the number of reviews written four years ago have the same impact on prices as more recent reviews. In order to test how robust our results are to review-depreciation we now evaluate the impact of various constant deprecation rates on the CV. In particular, we compute aggregate critical reviews as

$$(2) \quad \sum R = r_{t-1} + (1-\delta)r_{t-2} + (1-\delta)^2 r_{t-3} + (1-\delta)^3 r_{t-4}$$

where r is the producer-specific number of reviews per year and δ denotes a constant depreciation rate.

We now run numerous regressions like the one described in equation (1) for each review quintile and for various depreciation rates δ. Table 4 reports the resulting CV measures.[7] First, as shown in the very right column, among all depreciation rates, $\delta = 0$ and $\delta = 0.3$ exhibit the lowest weighted CV for all quintiles combined. However, for Q5 δ=0 results in a relatively high CV of 11.648 suggesting that a significant "wear-out effect" of expert opinion on the price setting process only occurs for extensively reviewed firms. In contrast, for firms whose wines have been seldomly reviewed, a four year old review has almost the same weight as a one year old review. Note that the case of δ=0 corresponds to our analysis shown in Table 3.

[7] Note that the thresholds between the quintiles will not remain constant, i.e., with increasing δ the cut-offs move closer together. For instance, while the thresholds for , $\delta = 0$ are 7, 15 and 29 reviews over four years, for $\delta = 0.5$ this is 3.25, 7.25 and 13.5.

Second, and more importantly, all CVs exhibit the same pattern, i.e., price variations grow with increasing critical exposure, regardless of what depreciation rate is chosen. This enforces our confidence in our main findings, i.e., the detrimental effect of expert reviews on price dispersion.

Since our following analysis is insensitive to the choice of depreciation rate we will from now on refer to $\delta = 0$ and simply add up the number of reviews a winery experienced over the four years before each observation.

C. External Effects of Reviews on Low-Quality Products

It may appear puzzling that critical exposure increases rather than decreases price variation among wines of the same quality. Apparently, the number of past reviews increases the incentive to either extract rents from the market or signal quality with price. In both cases, increasing price dispersion can only be caused by asymmetrical price changes over the quality spectrum.

In general, high critical exposure can cause price-quality dispersion by either raising the price of low-quality wines above their full-information level, or by lowering the prices of high-quality wines. From a producer's standpoint, only the former alternative is a feasible option. A high degree of past critical exposure may boost the prestige of the entire product line, allowing the firm to disproportionately increase the price for low-quality products. In this sense, and from a firm's perspective, past reviews exert positive externalities on current low-quality products.

We, therefore, examine whether the distortionary effect of past reviews takes hold mainly within the low-quality segment. Table 5 reports CV measures, segmented by review quintile as well as by quality bracket. Again, each CV figure is based on a separate regression. The wine quality brackets correspond to the following *Wine Spectator* definitions: *Not Recommended* and *Mediocre* (50-79 points), *Good* and *Very*

Good (80-89 points), and *Outstanding* and *Classic* (90-100 points). All CVs are based on un-depreciated review data, i.e., we assume $\delta = 0$.

First, within each quality category, the CVs increase from the left to the right, again confirming the negative impact of expert reviews on price dispersion. Second, and more importantly, for any given level of critical exposure we find that price dispersion decreases with increasing quality. Combining these two observations, we find the lowest CV in the lower left corner of Table 5, i.e., high-quality wines of producers that had not been reviewed in the past. In contrast, we find the highest CV in the upper right corner, i.e., for low-quality wines of producers that have been reviewed extensively. Also note that, with CVs between 5.2% and 11.6%, the range in variation is substantial.

This suggests that a high level of past reviews allows a wine maker to increase prices of all of his wines. Apparently, these price increases occur above-proportionally in the low-quality segment, causing substantial deviations from the full-information price.

However, the relationship between price-quality variation, level of critical exposure, and quality may not be as straightforward as here suggested. Especially the fact that the sample is partially self-selected may introduce a confounding element. Apparently, only wineries that expect to obtain good evaluations submit their wines for review to *Wine Spectator*. Therefore, the number of reviews a firm receives may be influenced by the quality of prior assessments. Figure 1 depicts scatterplots and nonparametric regression lines[8] for the number of annual reviews and the average and maximum points obtained in the preceding year.[9]

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[8] The Figure displays the local polynomial smooth within a 95% confidence interval.
[9] Here, the term "average points" refers to the average score of all wines of a firm in a given year; "maximum points" denotes the score of only the highest rated wine in that year.

Both graphs suggest that having received high marks last year leads to a higher number of reviews this year; this appears to be particularly pronounced when referring to maximum points. However, once the wine is submitted, it is at *Wine Spectator's* discretion whether it will be reviewed at all and what points it will receive. First, *Wine Spectator* does not review every wine that is submitted. In addition, Reuter (2009) reports that *Wine Spectator* assessments exhibit a modest bias towards wineries that advertise in it. As suggested by Figure 1, this may, in turn, lead to a higher level of critical exposure further confounding the impact of review level and quality assessments on wine prices.

Therefore, to further disentangle the relation between the level of critical exposure and product quality we examine the residuals of each quintile regression reported in Table 3 (see equations 3a-3c). This analysis can be seen as a heterogeneity test within each review quintile. More specifically, we regress the absolute errors of each equation on the winery's performance one year prior to the review submission and refer to maximum points (*MAXP*), average points (*AVGP*) and the difference between maximum and average points measured in standard deviations (*SDMAXP*).[10] The latter may capture the effect of quality outliers on the price-quality relationship. The dummy variables *L* and *H* denote low quality wines (50-79 *Wine Spectator* points) and high quality (90+ points), respectively. The subscript *i* denotes the kind of wine, *j* stands for producer and *t* for the respective year.

(3a) $$\sqrt{\hat{\varepsilon}_{i,j,t}^2} = \alpha_0 + \beta_1 MAXP_{j,t-1} + \alpha_2 L_{i,j,t} * MAXP_{j,t-1} + \alpha_3 H_{i,j,t} * MAXP_{j,t-1} + u_{i,j,t}$$

(3b) $$\sqrt{\hat{\varepsilon}_{i,j,t}^2} = \beta_0 + \beta_1 AVGP_{j,t-1} + \beta_2 L_{i,j,t} * AVGP_{j,t-1} + \beta_3 H_{i,j,t} * AVGP_{j,t-1} + v_{i,j,t}$$

(3c) $$\sqrt{\hat{\varepsilon}_{i,j,t}^2} = \gamma_0 + \gamma_1 SDMAXP_{j,t-1} + \gamma_2 L_{i,j,t} * SDMAXP_{j,t-1} +$$

[10] In addition, but not reported here, we examined the influence of various other variables (e.g., minumim points, maximum and average score changes). While firm-specific minimum points yield similar resulats as average or maximum points, point changes (t-2) to (t-1)yield only insignificant results.

$$\gamma_3 H_{i,j,t} * SDMAXP_{j,t-1} + z_{i,j,t}$$

The interacted terms capture the marginal effects of past points on the price-quality dispersion at the low-end and the high-end of the quality scale, respectively. Note that *L* and *H* are for time *t*, while MAXP, AVGP and SDMAXP are measured in *t-1*.

Following the suggestions derived from Table 5, we hypothesize that

- higher past winery quality ratings can exert a positive effect on the absolute error when low-quality wines experience an above-proportional price effect from higher past points.
- Due to their spillover effect, we assume the marginal effect of past quality scores on low-quality wines to be higher than on high-quality wines. We expect this to be true within each given review quintile. Holding everything else equal, this should increase the price-quality variation.
- We assume both effects described above to increase with increasing critical exposure, i.e., from quintile 2 to quintile 5.

Since review quintile one (Q1) is exclusively comprised of formerly un-reviewed wineries (without any prior points), we omit this category. Table 6 reports the corresponding results for the remaining four review quintiles.

In general, as shown in panel (a) of Table 6, past maximum points exert a significant and positive effect on the price-quality dispersion in all review quintiles. In fact, the marginal effects increase substantially with the level of critical exposure. The average point equations display the same patterns, however, at a lower significance level (Table 6, panel (b)). As expected, the marginal effects of past points on the price-quality dispersion are the largest for low-quality wines. Again, the maximum-point specifications show consistently higher significance levels than the average-point specifications.

Given that past maximum and average points are closely correlated (r=0.882)[11] similar effects on price dispersion are hardly surprising. In light of the greater relevance of maximum points with respect to price-quality dispersion, we are interested in whether the difference between both variables inserts additional noise into the price-quality relationship. Panel (c) of Table 6 reports the results of four regressions using the difference between maximum and average points, measured in standard deviations, as an independent variable. As expected, over all quality brackets and the three most reviewed quintiles, a large maximum-average point differential significantly increases the price-quality dispersion. Apparently, the detrimental effect intensifies with the level of critical exposure and is particularly pronounced for low-quality products of highly reviewed companies. In contrast, the coefficients suggest that top quality wines do not experience any higher price dispersion than average wines in the 80-89 point bracket.

The increase in price-quality dispersion in response to higher quality scores in the preceding year is due to the price setting behavior of the winery. Rising maximum scores, especially compared to the firm's average performance, may be followed by increasing prices. However, as reported by Table 6, prices do not increase proportionally along the entire product line of a firm. Our results suggest that low-quality wines may experience the strongest spillover effect, resulting in disproportionately large price increases.

In order to examine the price effects caused by the firm's performance in the preceding year, we analyze the (unsquared) residuals of the equations provided in Table 3 and regress them again on maximum points, average points and their difference. We, therefore, test whether our regressions in Table 3 exhibit a systematic bias. Note that a positive residual reflects overpricing compared to the

[11] In fact, for many wineries both variables are identical.

predicted price and *vice versa*. Table 7 reports the respective results. Since the original dependent variable is ln(P) (also see equation (1)), the coefficients in Table 7 reflect the percentage above or below the predicted price.

Panels (a) and (b) show that low-quality as well as high-quality wine prices respond positively to past performance.[12] First, in each review quintile, the marginal effect of past performance is substantially higher on low-quality than on high-quality wines. [13] Second, we find that, particularly within the low-quality bracket, the degree of overpricing rises with critical exposure. Similar to our analysis in Table 6, we also test whether the difference between maximum and average points affects the pricing behavior (Table 7, panel (c)). Again, we find that maximum points exert higher spillovers than do average points.

Wine prices are positively related to the number of standard deviations maximum points are above the average. While this effect increases with critical exposure for low-quality wines, the opposite is true for high-quality wines. The results given in Table 7 suggest that a high maximum score for an otherwise well-reviewed but mediocre winery, leads to subsequent price increases in their low-quality segment that are almost threefold of those in the high-quality segment.

V. Summary

In this paper we analyze the effect of expert opinion on price-quality dispersion for experience goods by referring to a large sample of U.S. wines reviewed by *Wine Spectator* between 1984 and 2008. By stratifying our sample into five quintiles according to the level of past critical reviews, we find that expert opinion inserts more dispersion into the price-quality relationship. Given that the review level and the quality scores attained are closely correlated, we further disentangle our data.

[12] Interestingly we find little significant evidence for past point-induced price changes in the 80-89 point quality range.

[13] Since this is beyond the scope of this analysis, we did not analyze whether past performance exerts non-linear effects on prices.

When controlling for past quality scores attained, our analysis suggests that, in addition to past review level, price dispersion is driven by the score a winery received for its best wine in the year prior to its review submission. Overall, the following results emerge from our analysis:
(1) Price-quality dispersion grows with the level of past critical exposure.
(2) Price-quality dispersion grows with the level of past maximum scores obtained, in particular if the difference between maximum and average points is high.
(3) Both effects mentioned above exert their largest spillover in the low-quality bracket resulting in significant overpricing.

Given these conclusions, one might therefore expect to observe the largest price distortion for low-quality wines of a mediocre but extensively reviewed winery that last year produced a high-quality outlier wine.

Our findings regarding the spillover effects of high-quality goods square with findings in the literature on brand equity, brand alliances and advertising spillovers across brands (e.g., Simonin and Ruth, 1998; Vardanyan and Temblay, 2006, Hakenes and Peitz, 2007; Heith et al., 2011). For instance, Heith et al. (2011) find that higher-quality extensions improve brand equity more than lower-quality extensions damage it. This is mainly due to the fact that high-quality products signal capability and experience. In a similar vain, our findings are also related to the "basking in reflected glory" (*BIRG*) effect (Cialdini et al., 1976) which describes spillover effects due to associations with successful others. As a wine industry-relevant example, Roberts et al. (2011) show that hiring a well-known winemaker from a competitor allows the winery to raise prices for all wines, including those produced by the previous winemaker.

There is ample anecdotal evidence that wineries emphasize the BIRG effect and advertise gold medals and critical praise, but do not mention low critical points or lost competitions.

In this study, we only refer to wines for which we have price and quality information, i.e., which were reviewed by *Wine Spectator*. We disregard wines that have not been reviewed. Assuming that winemakers strive to attain high maximum scores, as suggested by our analysis and by Figure 1, the wines submitted to *Wine Spectator* will by definition be a biased sample. We, therefore, expect that our sample of reviewed wines may have yielded biased results. However, the direction of this bias is a priori unknown.

Future analyses may examine the impact of past reviews on unreviewed wines by referring to the complete firm-specific price lists. Since quality data for these wines are not available one might calculate an imputed quality index by referring to objective data such as weather or vineyard quality (e.g., Ashenfelter et al., 1995; Ashenfelter, 2008).

References

Ashenfelter, O. (2008). Predicting the quality and prices of Bordeaux wine. *The Economic Journal*, 118, F174-184.

Ashenfelter, O., Ashmore, D. and Lalonde, R. (1995). Bordeaux wine vintage quality and the weather. *Chance*, 8, 7-14.

Ashenfelter, O. and Jones, G.V. (2012). The demand for expert opinion: Bordeaux wine. *Journal of Wine Economics*, 7(2), forthcoming.

Bagwell, K. and Riordan, M.H. (1991), High and declining prices signal product quality. *American Economic Review*, 81, 224-239.

Bakos, Y. (1997). Reducing buyer search costs: implications for electronic marketplaces. *Management Science,* 43(12), 1676-1692.

Basuroy, S., Chatterjee, S. and Ravid, S.A. (2003). How critical are critical reviews? The box office effects of film critics, star power, and budgets. *Journal of Marketing*, 67(4), 103-117.

Baylis, K. and Perloff, J.M. (2002). Price dispersion on the internet: good firms and bad firms. *Review of Industrial Organization*, 21(3), 305-324.

Burdett, K. and Judd, K. (1983). Equilibrium price dispersion. *Econometrica*, 51(4), 955-969.

Carlson, J. and McAfee, P. (1983). Discrete equilibrium price dispersion. *Journal of Political Economy*, 91, 480-493.

Caves, R.E. and Greene, D.P. (1996). Brands' quality levels, prices, and advertising outlays: empirical evidence on signals and information cost. *International Journal of Industrial Organization*, 14, 29-52.

Cialdini, R.B., Borden, R.J., Thorne, A. Walker, M.R., Freeman, S., Sloan, L.R. (1976). Basking in reflected glory: three (football) field studies. *Journal of Personality and Social Psychology*, 34(3), 366-375.

Clemons, E., Hann, I.-H. and Hitt, L.M. (2002). Price dispersion and differentiation in online travel: an empirical investigation. *Management Science*, 48(4), 534-549.

Curry, D.J. and Riesz, P.C. (1988). Prices and price/quality relationships: a longitudinal analysis. *Journal of Marketing*, 52, 36-51.

Daughety, A. and Reinganum, J. (2007a). Imperfect competition and quality signaling. *RAND Journal of Economics*, 39,163-183.

Daughety, A. and Reinganum, J. (2007b). Competition and confidentiality: signaling quality in a duopoly when there is universal private information. *Games and Economic Behavior*, 58, 94-120.

Diamond, P.A. (1971). A model of price adjustment. *Journal of Economic Theory*, 3(2), 156-168.

Dubois, P. and Nauges, C. (2010). Identifying the effect of unobserved quality and experts' reviews in the pricing of experience goods: empirical application on Bordeaux wine. *International Journal of Industrial Organization*, 28(3), 205-212.

Geistfeld, L.V. (1982). The price-quality relationship – revisited. *Journal of Consumer Affairs*, 16, 334-346.

Gerstner, E. (1985). Do higher prices signal higher quality? *Journal of Marketing Research*, 22, 209-215.

Grover, V., Lim, J. and Ayyagari, R. (2006). The dark side of information and market efficiency in e-markets. *Decision Science*, 37(3), 297-324.

Grossman, S. and Stiglitz, J. (1980). On the impossibility of informationally efficient markets. *American Economic Review*, 70, 393–408.

Hadj Ali, H., Lecocq, S. and Visser, M. (2008). The impact of gurus: Parker grades and *en primeur* wine prices. *Economic Journal*, 118(529), F158-173.

Haeger, J.W. and Storchmann, K. (2006). Prices of American Pinot Noir wines: climate, craftsmanship, critics. *Agricultural Economics*, 35(1), 67-78.

Hakenes, H. and Peitz, M. (2007). Umbrella branding and the provision of quality. *International Journal of Industrial Organization*, 26, 546–556

Heath, T.B., DelVecchio, D. and McCarthy, M.S. (2011). The asymmetric effects of extending brands to lower and higher quality. *Journal of Marketing*, 75, 3-20.

Hjorth-Andersen, C. (1984). The concept of quality and the efficiency of markets for consumer products. *Journal of Consumer Research*, 11, 708-718.

Jaeger, D.A. and Storchmann, K. (2011). Wine retail price dispersion in the United States: searching for expensive wines? *American Economic Review, Papers & Proceedings*, 101(3), 136-141.

Pan, X., P., Ratchford, B.T. and Shankar, V. (2002). Can price dispersion in online markets be explained by differences in e-tailer service quality? *Journal of the Academy of Marketing Science*, 30(4), 433-455.

Ratchford B.T. (1980). The value of information for selected appliances. *Journal of Marketing Research*, 17(1), 14-25.

Reinganum, J.F. (1979). A simple model of equilibrium price dispersion. *Journal of Political Economy*, 87(4), 851-858.

Reinstein, D.A. and Snyder, C.M. (2005). The influence of expert reviews on consumer demand for experience goods: a case study of movie critics. *Journal of Industrial Economics*, 53(1), 27-51.

Reuter, J. (2009). Does Advertising Bias Product Reviews? An Analysis of Wine Ratings. *Journal of Wine Economics*, 4(2), 125-151.

Riesz, P.C. (1978). Price versus quality in the market place. *Journal of Retailing*, 58, 15-28.

Roberts P.W., Khaire, M. and Rider, C.I. (2011). Isolating the symbolic implications of employee mobility: price increases after hiring winemakers from prominent wineries. *American Economic Review, Papers and Proceedings*, 101(3), 147-151.

Roberts P.W. and Reagans, R. (2007). Critical exposure and price-quality relationships for New World wines in the U.S. market. *Journal of Wine Economics*, 2(1), 84-97.

Salop, S. (1976). Information and monopolistic competition. *American Economic Review, Papers and Proceedings*, 66(2), 240-245.

Salop, S. and Stiglitz, J.E. (1977). Bargains and ripoffs: a model of monopolistically competitive price dispersion. *Review of Economic Studies*, 44(3), 493-451.

Salop, S. and Stiglitz, J.E. (1982). The theory of sales: a simple model of equilibrium price dispersion with identical agents. *American Economic Review*, 72(5), 1121-1130.

Schnabel, H. and Storchmann, K. (2010). Prices as quality signals: evidence from the wine market. *Journal of Agricultural & Food Industrial Organization*, 8, Article No. 2.

Simonin, B.L. and Ruth. J.A. (1998). Is a company known by the company it keeps? Assessing the spillover effects of brand alliances on consumer brand attitudes. *Journal of Marketing Research*, 35(1), 30-42.

Sorensen, A.T. and Rasmussen, S.J. (2004). Is any publicity good publicity? A note on the impact of book reviews. Unpublished Working Paper, Stanford University.

Stahl, D.O. II. (1989). Oligopolistic pricing with sequential consumer search. *American Economic Review*, 79(4), 700-712.

Stigler, G.J. (1961). The economics of information. *Journal of Political Economy*, 69(3), 213-225.

Storchmann, K. (2012). Wine economics. *Journal of Wine Economics*, 7(1), 1-33.

Tellis, G.J. and Wernerfelt, B. (1987). Competitive price and quality under asymmetric information. *Marketing Science*, 6, 240-253.

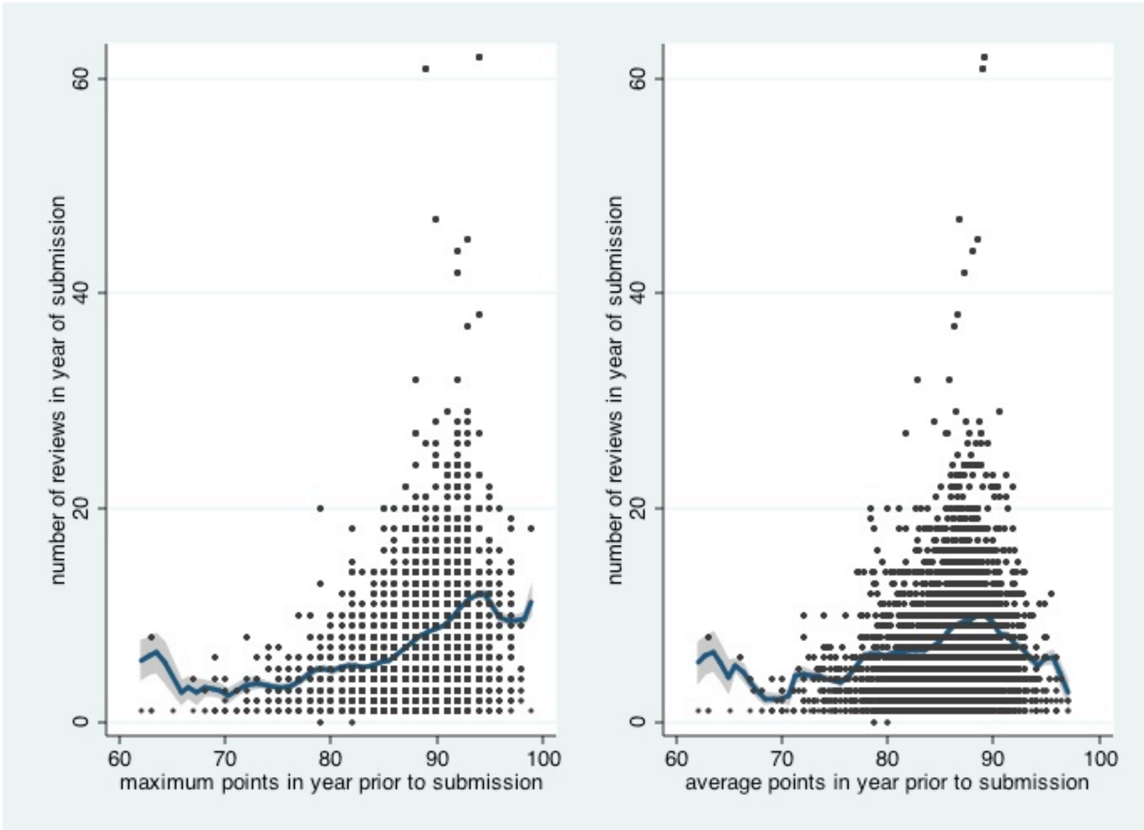
Tirole, J. (1988). *The Theory of Industrial Organization*. Cambridge, Mass.: MIT Press.

Van Zandt, T. (2004). Information overload in a network of targeted communication, *RAND Journal of Economics*, 35(3), 542-560.

Vardanyan, M. and Temblay, V.J. (2006). The measurement of marketing efficiency in the presence of spillovers: theory and evidence. *Managerial and Decision Economics*, 27(5), 319-331.

Varian, H.R. (1980). A model of sales. *American Economic Review*, 70(4), 651-659.

Figure 1
Number of Reviews and Prior Critical Points
1984-2008



Local polynomial smooth within a 95% confidence interval.

Table 1

Descriptive Statistics by Region

	Obs	Mean	Std Dev	Min	Max
			(a) Points		
All	44,808	85.67	4.657	50	99
Napa, CA	12,817	86.46	4.51	55	99
Sonoma, CA	11,083	85.93	4.32	55	98
Mendocino, CA	2,043	84.76	4.05	61	94
Sierra Foothills, CA	969	83.09	4.35	64	93
Carneros, CA	2,191	86.18	4.00	57	97
Central Coast/Bay Area, CA	2,883	84.86	4.60	55	97
South Coast, CA	4,959	85.47	4.41	55	98
Oregon	4,255	85.95	4.57	58	95
Yakima, WA	749	85.96	4.22	68	95
Walla Walla, WA	522	89.12	3.20	70	96
Texas	237	78.87	4.01	64	90
Virginia	408	80.92	4.93	50	91
Finger Lakes, NY	962	81.78	4.93	50	91
North Fork, NY	730	82.62	4.38	53	92
			(b) Price		
All	44,808	29.07	23.33	3	750
Napa, CA	12,817	38.56	34.09	4	750
Sonoma, CA	11,083	26.71	16.68	3	180
Mendocino, CA	2,043	19.95	12.26	4	90
Sierra Foothills, CA	969	16.35	9.39	5	80
Carneros, CA	2,191	27.19	14.80	6	150
Central Coast/Bay Area, CA	2,883	25.45	17.32	5	165
South Coast, CA	4,959	26.13	14.27	6	166
Oregon	4,255	27.05	16.75	5	150
Yakima, WA	749	23.48	15.26	5	120
Walla Walla, WA	522	37.47	14.87	8	125
Texas	237	15.72	8.18	5	40
Virginia	408	18.66	6.74	7	58
Finger Lakes, NY	962	16.41	8.68	5	100
North Fork, NY	730	19.09	8.69	6	100
			(c) Number of Reviews in last 4 Years		
All	44,808	17.51	18.87	0	158
Napa, CA	12,817	15.62	10.89	0	158
Sonoma, CA	11,083	20.27	20.55	0	158
Mendocino, CA	2,043	16.06	19.87	0	148
Sierra Foothills, CA	969	12.16	12.62	0	148
Carneros, CA	2,191	22.59	18.41	0	108
Central Coast/Bay Area, CA	2,883	21.26	23.01	0	158
South Coast, CA	4,959	23.63	21.73	0	148
Oregon	4,255	13.19	12.41	0	89
Yakima, WA	749	10.04	9.42	0	34
Walla Walla, WA	522	8.01	8.32	0	37
Texas	237	8.93	10.88	0	39
Virginia	408	5.67	7.22	0	32
Finger Lakes, NY	962	9.63	8.70	0	30
North Fork, NY	730	7.81	6.78	0	27

Source: Wine Spectator (2012).

Table 2

Descriptive Statistics by Level of Critical Exposure

	Obs	Mean	Std Dev	Min	Max
			(a) Points		
All	44,808	85.67	4.57	50	99
Reviewed Q1	5,071	84.24	5.34	50	97
Reviewed Q2	10,354	85.05	4.97	55	99
Reviewed Q3	9,599	85.54	4.47	55	99
Reviewed Q4	10,480	86.14	4.16	55	98
Reviewed Q5	9,304	86.77	3.83	55	99
			(b) Price		
All	44,808	29.07	23.33	3	750
Reviewed Q1	5,071	26.22	21.31	4	350
Reviewed Q2	10,354	27.63	24.94	4	750
Reviewed Q3	9,599	27.73	23.78	3	450
Reviewed Q4	10,480	29.48	22.55	4	275
Reviewed Q5	9,304	33.16	22.37	5	225
			(c) Number of Reviews in Last 4 Years		
All	44,808	17.51	18.87	0	158
Reviewed Q1	5,071	0	0	0	0
Reviewed Q2	10,354	3.31	1.69	1	6
Reviewed Q3	9,599	10.34	2.30	7	14
Reviewed Q4	10,480	20.99	4.09	15	28
Reviewed Q5	9,304	46.35	19.93	29	158

Source: Wine Spectator (2012).

Table 3

Determinants of Wine Prices

Stratified by Level of Critical Exposure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	All	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Points	2.197***	2.227***					
	(9.29)	(9.49)					
Points x Quintile1		-0.046	1.303***				
		(-1.74)	(4.38)				
Points x Quintile2		-0.068***		1.362***			
		(-3.06)		(13.51)			
Points x Quintile3		-0.053***			1.985***		
		(-3.11)			(7.09)		
Points x Quintile4		-0.026*				2.904***	
		(-2.23)				(6.18)	
Points x Quintile5							3.417***
							(6.17)
Age	2.023	2.036	6.797***	1.285	2.674	1.997	1.463
	(1.35)	(1.35)	(3.33)	(0.61)	(1.43)	(1.09)	(1.40)
Trend	4.826***	4.676***	4.461***	4.434***	4.982***	5.099***	4.844***
	(12.64)	(10.76)	(12.84)	(11.58)	(13.19)	(11.17)	(6.38)
Constant	39.583	42.775	100.050***	118.990***	51.767*	-26.371	-61.564
	(1.88)	(1.94)	(3.64)	(11.34)	(2.30)	(-0.62)	(-1.08)
Obs.	44,808	44,808	5,071	10,354	9,599	10,480	9,304
Adj R2 (%)	67.99	68.03	81.44	76.55	70.48	63.89	54.23
Wald test[a]		3.80 (p=0.029)					
RMSE	0.3535	0.3533	0.2776	0.3144	0.3385	0.3659	0.3821
mean ln(p)	3.159	3.159	3.042	3.085	3.105	3.183	3.332
CV(RMSE) in %	11.190	11.184	9.126	10.191	10.902	11.495	11.468

Dependent variable is log price. Estimated via OLS. Absolute values of heteroskedasticity-consistent t-statistics are in parentheses; all t-statistics are based on region-clustered standard errors. All coefficients are multiplied by 100. Significance levels 5% (*), 2% (**) and 1% (***). [a]Wald Test F(4,13) for Points*Q1=Points*Q2=Points*Q3=Points*Q4=0. All equations include full sets of grape varietal and producer fixed effects.

Table 4

Coefficients of Variation for Various Review-Depreciation Rates δ

Depreciation rate	Level of Critical Coverage Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	all*
δ=0	9.123	10.191	10.902	11.495	11.468	10.793
	(5071)	(10354)	(9599)	(10480)	(9304)	(44808)
δ=0.1	9.123	10.300	10.858	11.532	11.425	10.800
	(5071)	(9917)	(9919)	(9931)	(9970)	(44808)
δ=0.2	9.123	10.300	10.882	11.566	11.379	10.817
	(5071)	(9890)	(9944)	(9943)	(9960)	(44808)
δ=0.3	9.123	10.138	10.980	11.514	11.382	10.791
	(5071)	(9941)	(9891)	(9946)	(9959)	(44808)
δ=0.4	9.123	10.364	10.977	11.544	11.373	10.858
	(5071)	(9879)	(9969)	(9961)	(9928)	(44808)
δ=0.5	9.123	10.413	11.029	11.546	11.319	10.861
	(5071)	(9767)	(9794)	(10109)	(10067)	(44808)
δ=0.6	9.123	10.464	11.026	11.594	11.287	10.870
	(5071)	(9912)	(9918)	(9954)	(9953)	(44808)
δ=0.7	9.123	10.513	11.155	11.561	11.229	10.890
	(5071)	(9919)	(9910)	(9953)	(9955)	(44808)
δ=0.8	9.123	10.650	11.120	11.503	11.255	10.905
	(5071)	(9908)	(9922)	(9929)	(9978)	(44808)
δ=0.9	9.123	10.799	11.019	11.507	11.251	10.916
	(5071)	(9919)	(9913)	(9952)	(9953)	(44808)

Number of observations per quintile in parenthesis. * weighed by number of observations in each quintile.

Table 5
Coefficients of Variation for Various Wine Quality Brackets
Assuming no Review Depreciation $\delta=0$

Wine Spectator Points	Level of Critical Coverage				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Not Recommended and *Mediocre* (50-79 points)	7.666 (1023)	9.586 (1504)	10.232 (1055	11.394 (890)	**11.552** (492)
Good and *Very Good* (80-89 points)	7.754 (4184)	9.779 (8199)	10.599 (8043)	11.246 (9009)	11.103 (8923)
Outstanding and *Classic* (90-100 points)	**5.199** (777)	7.847 (1856)	8.166 (1757)	8.885 (1757)	9.314 (3580)

CV in %. Number of observations in parenthesis

Table 6

Price-Quality Dispersion by Review Quintiles

dependent variables: absolute errors from equations in Table 3

	Quintile 2	Quintile 3	Quintile 4	Quintile 5
(a) Last Year's Maximum Points				
Max Points in *t-1*	0.984*	1.470*	2.430***	5.856***
	(1.79)	(2.12)	(3.12)	(5.23)
Max Points in *t-1* * Dummy Low Quality in *t*	-0.010	0.090	0.347***	0.924***
	(-0.13)	(0.96)	(2.76)	(5.11)
Max Points in *t-1* * Dummy for High Quality in *t*	0.051	-0.001	-0.047	-0.272***
	(0.70)	(-0.12)	(-0.70)	(-3.72)
N	7127	8642	10093	9223
R2 (%)	0.08	0.07	0.17	0.81
(b) Last Year's Average Points				
Avg Points in *t-1*	0.719	1.852***	-0.134	-1.200
	(1.28)	(2.75)	(-0.16)	(-1.08)
Avg Points in *t-1* * Dummy Low Quality in *t*	-0.015	0.108	0.311**	0.861***
	(-0.18)	(1.12)	(2.34)	(4.47)
Avg Points in *t-1* * Dummy for High Quality in *t*	0.070	-0.024	0.018	-0.145+
	(0.82)	(-0.31)	(0.25)	(-1.88)
N	7127	8642	10093	9223
R2 (%)	0.05	0.10	0.08	0.47
(c) Last Year's Difference Maximum – Average Points in Standard Deviations				
StdDev Max from Avg Points in *t-1*	-10.935	18.161*	18.592***	25.347***
	(-0.37)	(2.27)	(3.39)	(5.37)
StdDev Max from Avg Points in *t-1* * Dummy for Points <80 in *t*	-46.681*	19.416+	10.703	47.713***
	(-2.31)	(1.94)	(1.20)	(4.50)
StdDev Max from Avg Points in *t-1* * Dummy for Points >89 in *t*	16.969	12.339	0.357	-7.070
	(0.78)	(1.59)	(0.07)	(-1.65)
N	987	5853	9238	9031
R2 (%)	0.46	0.23	0.17	0.78

Robust t-statistics in parentheses. Significance levels 1% (***), 2% (**), 5% (*), 10% (+). [a] critical points of winery's highest rated wine in year prior to submission. [b] average points of winery's wine in year prior to submission. [c] difference between maximum and average score in year prior to submission measured in standard deviations.

Table 7

Overpricing by Review Quintiles

dependent variable: residuals from equations in Table 3

	Quintile 2	Quintile 3	Quintile 4	Quintile 5
(a) Last Year's Maximum Points[a]				
Max Points in *t-1*	0.181*	-0.061	0.131	0.184
	(2.27)	(-0.59)	(1.08)	(1.09)
Max Points in *t-1* * Dummy Low Quality in *t*	0.077***	0.089***	0.169***	0.254***
	(6.49)	(6.27)	(9.25)	(9.72)
Max Points in *t-1* * Dummy for High Quality in *t*	0.070***	0.080***	0.112***	0.094***
	(6.75)	(7.30)	(10.71)	(8.69)
N	7127	8642	10093	9223
R2 (%)	1.26	1.00	2.07	2.08
(b) Last Year's Average Points				
Avg Points in *t-1*	0.185*	0.007	0.082	0.148
	(2.28)	(0.07)	(0.64)	(0.88)
Avg Points in *t-1* * Dummy Low Quality in *t*	0.079***	0.094***	0.174***	0.267***
	(6.54)	(6.38)	(9.09)	(9.69)
Avg Points in *t-1* * Dummy for High Quality in *t*	0.070***	0.080***	0.116***	0.098***
	(6.69)	(7.08)	(10.65)	(8.60)
N	7127	8642	10093	9223
R2 (%)	1.25	1.00	2.05	2.06
(c) Last Year's Difference Maximum–Average Points in Standard Deviations				
Std Dev Max from Avg Points in *t-1*	-0.819	0.088	-2.982***	-1.071
	(-0.19)	(0.07)	(-3.48)	(-1.47)
Std Dev Max from Avg Points in *t-1* * Dummy Low Quality in *t*	3.233	8.203***	8.516***	14.434***
	(1.03)	(5.33)	(6.42)	(9.84)
Std Dev Max from Avg Points in *t-1* * Dummy Low Quality in *t*	12.779***	8.286***	7.773***	5.444***
	(4.32)	(7.36)	(10.26)	(8.61)
N	987	5853	9238	9031
R2 (%)	2.13	1.40	1.55	2.03

Robust t-statistics in parentheses. Significance levels 1% (***), 2% (**), 5% (*), 10% ($^{+}$). [a] critical points of winery's highest rated wine in year prior to submission. [b] average points of winery's wine in year prior to submission. [c] difference between maximum and average score in year prior to submission measured in standard deviations.