International Food and Agribusiness Management Review
Volume 9, Issue 1, 2006

Does Product Diversity Signal Bargains in Australian Wine?[1]

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Abstract

The residuals from a set of linear regression equations built to explain the quality of a bottle of Australian wine via eight quality signals are examined to determine whether there is any relationship between their signs for individual producers and the diversity of their offerings. Product diversity is found to be a fault-ridden signal of a quality-bargain, which we define as a bottle of wine whose quality rating exceeds its regression-based expectation. Indeed, to the extent that the signal does impart useful information, the message would be that consumers are less likely to get their money's worth the greater is the diversity of the producer's offerings.

Keywords: wine marketing, product diversity, wine quality, predicted quality, quality-bargain

[1] The authors would like to thank Professor Kym Anderson and Gunter Schamel of the Centre for International Economic Studies at the University of Adelaide for providing the majority of data that were used in the previous research that forms the basis for the present study. Subject to the traditional disclaimer, the comments of an anonymous referee are also gratefully acknowledged.
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Introduction

Economists have long been aware that "the consumer is no longer an expert shopper. More and more, therefore, the consumer of today has to judge quality by some indices of quality. Hence the importance producers attach to goodwill and trademarks. Another important index of quality is price" (Scitovsky, 1944-5, p. 100). That is, at the time of purchase consumers observe intrinsic and extrinsic quality signals rather than experiencing the actual quality attributes (Steenkamp, 1990). This is especially true for services and some products, such as wine, which cannot be judged until actual consumption occurs.

Akerlof (1970) deduced some of the consequences of formally injecting into economic thought the notion that consumers often make purchasing decisions under uncertainty as to product quality. Subsequently, the implied ideas that "prices convey information other than that about scarcity" and that economically relevant information is conveyed in a variety of ways were also formalized (Stiglitz, 2000, p. 1449). Even in Scitovsky's time, however, the basic ideas were not novel. Rather, they had fallen between cracks that remained unfilled in microeconomic models built on a shaky foundation of a world populated by economic agents that had perfect information (Stiglitz, 2002). The burgeoning field of information economics allows that foundation to crumble, replacing it with one that incorporates ubiquitous and imperfect, but economically relevant, information that influences behavior.

Akerlof drew attention to the information asymmetries about product quality that might exist between buyers and sellers and suggested that "[N]umerous institutions would arise to counteract the effects of quality uncertainty" (Akerlof, 1970, p. 499). He cited guarantees and various types of branding as cases in point. Spence paid heed. After initially being intrigued by the potential implications of asymmetric information for job markets, he turned his attention to the implications of what he called information-conveying signals for market structure in general (Spence, 2002, p. 434). The signals might extend beyond those over which sellers have control and intentionally send to buyers (i.e., advertisements) or that buyers may infer from seller behavior (i.e., money-back guarantees), and include such things as buyer experience and third-party sources (Spence, 1977, p. 571).

The information conveyed through signals may impact the behavior of a market's agents, and their individual actions, and in turn may provide additional information to the other participants (Stiglitz, 2000. p. 1469). It therefore becomes incumbent upon sellers to know how buyers will interpret the signals they are being sent. For their part, buyers seek to separate the wheat from the chaff so as to take full advantage of those same signals in their own decision-making processes.

Although various quality signals, cues, or indicators have attracted considerable theoretical attention, the empirical evidence as to their quality is scarce and mixed (Kirmani and Rao, 2000). Gerstner (1985), for example, found higher prices to be poor signals of quality, and Hjorth-Anderson (1991) gave low marks to both price and seller reputation as quality indicators. By contrast, examining warranties for appliances and motor vehicles Wiener (1985) found them to be accurate quality (reliability) indicators. Kirmani and Rao (2000) conclude that from the perspective of a seller attempting to influence buyer behavior, sending a combination of complementary quality signals would be the most apt signaling strategy.

Horowitz and Lockshin (2002) sought to contribute to the latter literature. There, a quality measure for eight varieties of Australian wine serves as the dependent variable in linear regressions whose independent variables are many of the signals that others have used to explain wine quality. We now extend this earlier work to address two additional quality-related issues: (1) Will a producer who gives more or less bang for the Australian buck in a bottle of any one varietal on a retailer's shelf tend to do likewise in its other offerings? (2) Does the number of varietals that a producer offers signal anything about the bang for the buck provided by any one of them? Thus, whereas Oczkowski (2001) considers a bargain wine to be one that sells for a lower-than-expected price, given its quality, we look at the flip side of the coin and consider a bargain wine to be one that provides greater-than-expected quality for the price at which it sells. We call this a quality-bargain. This is a relevant issue for many product categories, including the wine sector. Quality improvements occur constantly in consumer products, while the price points remain constant. This has occurred in automobiles in regard to safety, reliability, and fuel consumption as well as in the wine industry. With wine, however, the quality-bargain issue is especially salient. Even knowledgeable consumers shopping for wine will often seek the counsel of a shop's wine expert. After eliciting some information as to the customer's preferences and/or what occasions the purchase, the expert will typically ask a question along the following lines: "What price range did you have in mind?" The expert's recommendations will then reflect his or her judgment as to the highest-quality wines – the quality-bargains – within that price range. We then ask (1) whether producers are prone to providing either quality-bargains or rip-offs across the entire range of their offerings, and (2) whether product diversity is a useful signal of a producer's tendency to do either. The answer to the first question is a soft-spoken "Yes" with respect to a few varieties, such as riesling when paired with shiraz, and a much louder "No" with respect to most other pairings, such as chardonnay and sauvignon blanc. The answer to the second question is a firm "Yes," with the tendency being to give less bang for the buck when more than two varieties of wine are on offer.

The Diversity Issue

Approximately 2000 wineries comprise the Australian wine industry. Some grow their own grapes and make, bottle and sell their own branded wine; others sell wine that is made elsewhere or wine produced from purchased grapes (Kyte-Powell and Hooke, 2000, p. 5). The three largest producers, Foster's Wine Estates (comprising Beringer-Blass and Southcorp Wines), Hardy Wines (part of Constellation Brands), and Orlando-Wyndham are groups that account for more than seventy-five percent of the industry's wine-grape crush. That crush has grown by almost fifty percent over the past five years and now exceeds 1.8 million tons. Over 50 percent of the wine produced from that crush, in excess of 500 million liters valued at over 2.2 billion Australian dollars ($) is exported. Almost half of those exports, and one-third of the production of the Big Three, go to the United Kingdom; another quarter goes to the United States (AWBC, 2003). The year 2000 was a hallmark year for the industry, one in which for the first, but surely not the last time Australia was the largest exporter of New World wine (Nicholson, 2001, p. 40).

One of the reasons the wine sector in Australia provides a useful test arena is due to the diversity of the product offer available. The standard supermarket category has between 3-10 brands and around 50-70 product variants. The wine category itself has a minimum of 300 brands and product variants, which stretches to over 1500 different wines in some more specialized outlets. All groups bottle wine under labels that are designed to appeal to all tastes and budgets. Foster's Wine Estates, for example, sells in the neighborhood of ten million cases of its Lindemans' Bin 95 Sauvignon Blanc, Bin 65 Chardonnay, Bin 99 Pinot Noir, Bin 50 Shiraz, and Bin 45 Cabernet Sauvignon, all of which retail for at most $10 a bottle; Foster's Wine Estates sells somewhat less of its Penfolds' Grange, the Australian pride and joy, a shiraz that retails for about $300 (Halliday, 2001, pp. 216-17, 287). By contrast, the Scarp Valley Vineyard produced only 24 cases of its sole label, Scarp Valley Darling Range Hermitage, a shiraz and cabernet sauvignon blend that retails for about $17, while Jollymont, perhaps Australia's smallest winery, produced 20 cases in total of a pinot noir and a chardonnay that retail in the $20-$25 range (Halliday, 2001, pp. 185, 341).

Looking down from the heavens, Adam Smith who believed that the division of labour "must always be limited by…the extent of the market" (Smith, 1776, pp. 1-21) might well be surprised at the variety of products offered by the multi-product firm that characterizes the Australian wine industry. Two centuries later and long after the multi-product firm became a global phenomenon, economies of scope was formalized into a commonly accepted concept in the economics literature, one that provides the multi-product firm with a raison d'être (Panzar and Willig, 1981, p. 168). Thus, like Rosen's suppliers, Australian wineries "either specialize their production in distinct varieties or produce several of them in a product line. Costs and production conditions, indivisibilities, the nature of competition, and

competitors' costs factor into these outcomes" (Rosen, 2002, p. 4), and firm size does not necessarily dictate the course of action taken by any one of them. Nonetheless, a small winery is more likely to concentrate its efforts on a few wines, whereas a larger winery or group is more likely to diversify its offerings. This raises two issues, the first being whether size signals quality. Is the mystique of the boutique winery justified? Has a large group gained market share at the expense of quality? We touched on these interesting questions in our earlier paper. A second issue is whether the diversity of a seller's product line reveals anything about whether those products are or are not quality-bargains. Do you get your money's worth when you buy one of the two varietals that are sold by a boutique winery? Quality considerations aside, do any economies of scope enjoyed by a large group translate into better wine for the money? In this paper, then, we explore whether product diversity signals quality-bargains in Australian wine.

Estimating Deviations from Quality Expectations for an Australian Wine

Horowitz and Lockshin (2002) hypothesized that an Australian winery's reputation and the price of any one bottle are effective, if imperfect, quality signals. Like brand advertising, price is an extrinsic attribute that consumers often use to assess product quality when the intrinsic attributes cannot be assessed (Ralston, 2003). The bottle's label typically contains additional potentially cogent information, with the location of the winery as a signal of its collective reputation (Landon and Smith, 1998, p. 632), and the vintage, being particular cases in point. Indeed, it is a poorly-kept secret that, in general, region of origin has the potential to influence consumer perceptions of a product and consequently the price consumers are willing to pay for it (Quagrainie et al., 2003), and wine is often offered as a classic case in point (e..g, van Ittersum et al., 2003, p. 215).

Consumer expectations may also be influenced by expert judgments, even though the latter are necessarily subjective and are also imperfect predictors of quality because, for example, "experts do not take into account all the information that they have…Ratings of wine experts do not predict in an efficient way the prices of mature Bordeaux wines for the same reasons' (Ginsburgh, 2003, p. 110). Still, wine producers hope their better efforts will be rewarded at wine exhibitions, say, in that they can subsequently mention of any notable awards a wine may have received as an addendum to the bottle's label (Orth and Krška, 2001).

From that jumping-off point, and with a wine-quality measure as the dependent variable and eight potential quality signals as the independent variables, Horowitz and Lockshin (2002) estimated individual linear regressions for eight varietals of wine, four whites and four reds: chardonnay, riesling, sauvignon blanc, and semillon are the whites, and cabernet sauvignon, merlot, pinot noir, and shiraz are the reds. Blends such as Fox Creek's JSM (shiraz 70%, cabernet franc 20%, and cabernet sauvignon 10%) were not included in the study because of comparability

problems. The more familiar sort of analysis uses similar cues and a quality measure to explain price in a hedonic price equation as in Combris et al. (1997, 2000), Landis and Smith (1997, 1998), and Ocskowski (1994, 2001). Unwin (1999) provides an excellent review of hedonic wine-price models. Insofar as price and quality are variables that are jointly determined by management and the market, explaining the two-way price-quantity relationship would require a simultaneous-equation model, such as the one used by Ling and Lockshin (2003). Our more modest aspirations were to focus solely on how individual consumers might use the available extrinsic cues on the price tag and label affixed to the bottle, in an attempt to glean some insights into a wine's intrinsic quality. In a sense, we are estimating what might be termed a hedonic quality regression, the flip side of the hedonic-price-regression coin (Rosen, 1974), wherein buyers shop around and compare the qualities of brands with different bundles of characteristics, including price. If, to modestly paraphrase Rosen (1974, p. 37), two brands offer the same bundle, but promise different qualities, consumers only consider the higher-quality one, and the identity of the sellers is irrelevant to their purchase decision. This is not a bargaining process in which the consumer and the producer negotiate themselves into a price-quality equilibrium. Rather, the consumer looks at the bottle and the price in a take-it-or leave-it situation and decides, based on his or her expectations as to the quality of the bottle's contents, whether the wine is going to be worth its cost.

The quality measure is the well-known and highly respected Halliday (1999) wine ratings, denoted H1. Halliday's ratings generally run from the mid 70s to the high 90s, and are always expressed as integers; the lowest-quality wines are not rated. Although this means that many of the very lowest-priced wines are not included in our database, the database does include a large number of low-priced wines and does indeed cover the full price range. Unfortunately it also means that any higher-priced wines that did not meet Halliday's minimum standards are also excluded.

Assuredly, any quality measure is open to dispute and prone to measurement error (Landon and Smith, 1997; Schamel and Anderson, 2001; Oczkowski, 2001). Oczkowski (2001, pp. 315-317), in particular, observes, that quality-measurement error can result in biased ordinary-least-squares (OLS) parameter estimates, which is the case when the measure is an independent variable in a hedonic price equation. When, however, when the quality measure is the dependent variable, even with measurement error OLS will give unbiased parameter estimates. The penalty paid for measurement error is less precision, in the sense of overestimated standard errors and an underestimated coefficient of determination (R2) (Hausman, 2001, pp. 59-60). But James Halliday's authoritative book on Australian wines has been published annually for more than a decade, and he has contributed to the wine literature on a regular basis for more than two decades. When Halliday speaks, albeit with a not completely infallible voice, the Australian wine industry and its customers listen. We do too.

The Halliday rating system has a particular virtue for the use to which it is put here: namely, it provides metric ratings that can serve as the dependent variable in an ordinary-least-squares regression, as opposed to count data, qualitative data, rankings, or categorizations, all of which would imply the need to use some discrete-choice estimation approach, such as multivariate logit (Greene, 2003, pp. 663-664). That is, unlike a system that might award stars to wines, for example, where the implied quality difference between a one-star wine and a two-star wine is not necessarily the same as that between a four-star wine and a five-star wine. A Halliday two-point difference between wines has the same implication whether the wines are modest bottles in the 70s or higher-quality wines in the high 80s.

Eight basic types of independent variables serve as our quality signals. Each winery's individual reputation, as opposed to a group's collective reputation, is measured here through Halliday's winery rating, denoted H2. The ratings run from 3 to 5 in half-point increments. Wineries not rated by Halliday were arbitrarily assigned a rating of 2.5. A winery's reputation depends on its past output. The collective reputation of a group will depend upon some average of the reputations of its individual wineries (Tirole, 1996). Landis and Smith (1998) include three different collective reputation measures along with individual firm reputation in their hedonic price equation. Many if not most of our wineries are not members of a group and their collective and individual reputations would be one and the same. Insofar as high-quality wines command price premiums, the latter can be viewed as in part reflecting returns to the individual winery's reputation (Shapiro, 1983).

Price as a quality signal enters in three different ways. First, the natural logarithm of the retail price, denoted P_{NL}, is included in every equation. Second a vector of dummy variables, denoted P_i, is introduced to reflect the so-called *pricing points* into which a particular bottle falls. The specific pricing points depend upon the varietal. Semillon and sauvignon blanc, for example, tend to sell for less than comparably-rated chardonnays. Thus, the pricing points considered for the former two wines are $P \leq 10$, $10.01 \leq P \leq 15$, $15.01 \leq P \leq 20$, and $P \geq 20.01$ and the vector P_i contains three dummy variables, one for each of the first three pricing categories. For chardonnay, however, two different pricing categories define dummy variables to replace the $P \geq 20.01$ category: namely, $20.01 \leq P \leq 30$ and $P \geq 30.01$. Finally, we capture any *interaction effects* of price within each price category through a vector of variables denoted $P_{NL} \times P_i$.

The winery's *experience* and potential exposure to the public eye is captured in the dummy variable $Y = 1$ for a winery established after 1990 and $Y = 0$, otherwise. This variable, too, may reflect an individual winery's reputation.

A vector of dummy variables, denoted V_j, distinguishes *vintage*. Depending upon the varietal, dummy variables were defined for either pre-1996 or pre-1997 vintages, as well as for each of the subsequent years.

Winery or group *size*, which again may be at least a partial determinant of reputation, is another quality signal that was explored through a vector of dummy variables, denoted Q, defined in accordance with the total tons of grapes processed, or Q. Four size categories were delineated: namely, $Q \leq 99$, $100 \leq Q \leq 999$, $1{,}000 \leq Q \leq 9{,}999$, and $Q \geq 10{,}000$.

Finally, the vector of dummy variables R_k indicates the wine-producing *region* in which the winery is located. The vector's components depend upon the varietal, because some regions, such as the Barossa Valley and Coonawarra, are notable for their cabernet sauvignons and shirazes, whereas the Clare Valley, say, is more noted for its aromatic white wines. The zero-one regional delineations serve as *collective reputation* indicators.

Let ε denote a random-error term with the usual normality properties and let β_m denote a population parameter; $\boldsymbol{\beta_m}$ denotes a vector of parameters. Suppressing subscripts that delineate specific wines, parameter estimates b_m and $\boldsymbol{b_m}$ were obtained for eight specifications of the following regression equation, corresponding to each of the eight varietals:

$$H_1 = \beta_0 + \beta_1 H_2 + \beta_3 P_{NL} + \boldsymbol{\beta_4 P_i} + \boldsymbol{\beta_5 P_{NL} P_i} + \beta_6 Y + \boldsymbol{\beta_7 V_j} + \boldsymbol{\beta_8 Q} + \boldsymbol{\beta_9 R_k} + \varepsilon. \quad (1)$$

After eliminating the variables whose coefficients were not statistically significant ($\alpha \leq 0.106$), the adjusted R^2s for the final estimated equations ranged from a low of 0.188 for merlot and a sample size of $N = 94$ (with four statistically significant [$\alpha \leq 0.026$] slope-parameter estimates) to a high of 0.472 for semillon and $N = 213$ (with nine statistically significant [$\alpha \leq 0.028$] slope-parameter estimates). The individual reputation signal was an important positive ($0.974 \leq b_1 \leq 2.602$) and statistically significant ($\alpha \leq 0.005$) factor in all eight estimated equations. In one form or another price also was an important positive ($b_3 > 0$ and/or $b_4 \geq 0$ and/or $b_5 \geq 0$) and statistically significant ($\alpha \leq 0.008$) factor in all eight estimated equations. The positive relationship, however, is not necessarily linear so that increases in price need not explain equal increases in quality. In only one case (merlot) was $b_6 = 2.949$ statistically significant ($\alpha = 0.015$). At least one vintage dummy entered into each final equation, implying that some vintages signal lower-quality or higher-quality wines.

The winery size dummies only entered into the final estimated equations for riesling, semillon, cabernet sauvignon, and pinot noir. Insofar as one can generalize this result, it would be to the effect that the largest wineries or groups tended to produce wines of these four varieties that are more highly rated than did the

wineries or groups in one or more of the other size categories. Finally, one or more of the regional dummies, or collective reputation signals, entered into the final estimated equation for every varietal, in some cases with a positive impact and in others with a negative impact on the quality rating.

In sum, then, as one might expect, price and winery rating are uniformly important and reliable quality signals across all varietals. Vintage, size of winery, and region can also provide cues as to the quality of an individual bottle for a particular varietal, but not necessarily for all varietals. The differences are in the details, which are available to the interested reader in Tables 2 and 3 of Horowitz and Lockshin (2002, pp. 14-15).

We use the residual,

$$e = H_1 - b_0 + b_1 H_2 + b_3 P_{NL} + \boldsymbol{b_4 P_i} + \boldsymbol{b_5 P_{NL} P_i} + b_6 Y + \boldsymbol{b_7 V_j} + \boldsymbol{b_8 Q} + \boldsymbol{b_9 R_k}, \quad (2)$$

as our *ceteris paribus* measure of the difference between the actual and the expected quality of a particular bottle of wine. To repeat, the question addressed here is not whether a particular winery or group offers consistently higher quality or lesser-quality wines. Rather, our concern is with whether the seller consistently offers higher quality or lesser-quality wines than the informed wine buyer has reason to *expect*, quality-bargains or rip-offs, given the seller's various characteristics, including its reputation, and those of the particular bottle, including its price, and whether product diversity signals such. Assuredly, consumers willing to bear the costs of search can always pick up a copy of Halliday's latest wine guide to inform themselves as to the quality of a particular bottle. Halliday, however, does not indicate whether the bottle is worth the price. Other guides or wine columnists, such as Kyte-Powell and Hooke (2000), indicate value for money, but their coverage is not as extensive as Halliday's.

Berrys Bridge ($H_2 = 4.50$), for example, which is located in Pyrenees ($R_{19} = 1$), was established in 1990 ($Y = 0$). The winery was not included in our study, but it produced 1,500 cases of the only two wines that it sells during the study period: the 1999 ($V_3 = 1$) Berrys Bridge Shiraz ($H_1 = 89$) and the 1999 Berrys Bridge Cabernet Sauvignon ($H_1 = 92$). The 1,500 cases translate into $Q < 35$ ($Q_1 = 1$). Both wines retail for $P = \$28$, so that $P_{NL} = 3.3322$, $P_7 = 1$, and $P_{NL}P_7 = 3.3322$, and "[N]ot surprisingly, the limited quantity sells out with great speed" (Halliday, 2001, p. 33). That is, the winery produces a reasonably high-quality product. Halliday's comment implies that both he and the public believe the wines to be more than reasonably priced, given their quality. In that sense they are quality-bargains. Focusing on the 1999 Berrys Bridge Shiraz and substituting the above data into the estimated equation for shiraz, all the dummy variables for the statistically significant parameters are set equal to zero. The *expected* quality rating for this wine is:

$E[H_1] = 69.154 + 1.938 \times 4.5 = 77.875.$

Thus the residual is: $e = 89 - 77.875 = 11.125$. As regards the 1999 Berrys Bridge Cabernet Sauvignon, here too all the dummy variables for the statistically significant parameter estimates are equal to zero and the expected quality rating is:

$E[H_1] = 62.741 + 1.951 \times 4.5 = 71.521.$

The residual is: $e = 92 - 71.521 = 20.479$. Thus, as informed consumers we too are not surprised that Berrys Bridge wines sell out with alacrity. Berrys Bridge 1999 vintage comprises two high-quality bottles that provide much *more* quality than its customers have reason to expect at that price. Both bottles are veritable bargains in this sense, too.

The Overall Results

Is Berrys Bridge unique among wineries specializing in cabernet sauvignon and shiraz in offering quality-bargains? Does Berrys Bridge do so as a matter of policy? There were 517 wineries or groups in our sample. Of those 517, disregarding any blends, 27 offered only shiraz and cabernet sauvignon. In some cases, however, more than one label of the varietal was on offer by the winery or group. The additional labels derive from, for example, different vintages of the same wine (e.g., 1998 and 1999), different wines of the same vintage from the same winery (e.g., a 1998 Shiraz and a 1998 Reserve Shiraz), and wines from different wineries in a group (e.g., a Coonawarra Shiraz and a Padthaway Shiraz). Averaging the residuals for each varietal, ten sellers other than Berrys Bridge exceeded the regression-based quality expectations for both wines and six fell short for both. If deviations from the estimated regression line were strictly a matter of chance, in about half the cases we would find $e \leq 0$, so that the likelihood of being either below or above the estimated regression line would be $p = ½$. Hence, the probability that a seller offering two varietals will have either $e \leq 0$ or $e \geq 0$ for both varietals, will be ¼. Therefore, an expected ¼×27 = 6.75 out of the 27 sellers would fall into each of the latter two categories. An expected 13.5 sellers, as opposed to 11 sellers, would be above the line for one varietal and below it for the other. Computing chi-square with two degrees of freedom yields $\chi^2 = 2.1111$, and we fail to reject the independence and matter-of-chance hypothesis. Thus, the Berrys Bridge data might very well reflect the winery's price and production policy and a management that considers itself to be in the wine-quality-bargain business. But nothing in the sample data suggests a quality-bargain or rip-off strategy in general for these 27 sellers, although the results for any one might reflect its quality vis-á-vis price and production policies.

The average of the residuals is our ceteris paribus measure of the difference between the actual and the expected quality of a particular varietal offered by a winery or a group. The number of varietals is our measure of product diversity,

although it captures only one dimension of product diversity. Other dimensions, such as the side-by-side appearance of the same varietal from different vineyards, or of different vintages, or by status (i.e., vintner's reserve), are subsumed in the averaging process.

To explore whether in general there is any relationship between the average residuals for one varietal and that for another, we first compute their 28 product-moment correlation coefficients. If there is no tendency for a seller that bottles higher-than-might-be-expected quality of one varietal to bottle either higher-than-might-be-expected or lower-than-might-be-expected quality of another, then each of these 28 coefficients should be equal to zero.

The correlation coefficients are the above-the-diagonal elements of Table 1. The number of paired observations for the particular varietals is given below the diagonal. Thus, 66 sellers produced at least one label of both riesling and chardonnay. The correlation between the averages of the residuals of the labels for those 66 is 0.3162. Only 12 sellers produced at least one label of both pinot noir and merlot, and the correlation between the averages of the residuals of the labels for those 12 is –0.5240. The former correlation is statistically significant ($\alpha = 0.05$), whereas the latter is not.

Table 1: Number of Paired Varietals\Correlation Coefficients Between Residuals

	Chard.	Riesling	Sau. Bl.	Semillon	Merlot	Pin Noir	Cab. Sau.	Shiraz
Chard	-	0.3162*	0.0335	-0.1014	0.2493	0.1142	0.2612*	-0.0090
Ries.	66	-	0.0831	-0.0540	-0.0199	0.1201	0.3372*	0.5474*
Sau. Bl.	51	28	-	0.4463	-0.3750	0.0956	0.3095	0.1617
Semillon	49	24	19	-	-0.0590	-0.2410	-0.0872	0.0440
Merlot	35	19	18	17	-	-0.5240	0.0310	0.0631
Pin. Noir	84	40	32	14	12	-	-0.2330	0.1039
Cab. Sau.	90	51	36	44	28	30	-	0.2444*
Shiraz	121	70	37	53	27	33	101	-

* Statistically significant at $\alpha = 0.05$.

Six of the coefficients, all of which are positive, ranging between 0.2444 and 0.5474, are statistically significant. Cabernet sauvignon, paired with chardonnay, riesling, and shiraz, is one of the varietals in half of the statistically-significant relationships. In effect, there is the weak hint of a possible positive carry-over effect from one varietal to another, at least with regard to certain specific pairings of varietals.

A more illuminating result is obtained from our second set of computations and a chi-square analysis. Consider the 175 sellers that contributed only a single varietal to the sample set. Bellingham, for example, only produced riesling and Beresford only produced chardonnay. Of these 175 observations, 93 of the residual averages were positive and 82 were negative. Suppose specialization in a single varietal does not necessarily signal quality-bargain status. Instead, whether the specialist's product is of higher or lesser quality than might be expected is likely a matter of chance. Then, half of the averages would be positive and half would be negative. Computing chi-square with one degree of freedom yields $\chi^2 = 0.6914$, which does not reject the matter-of-chance hypothesis. Whether as a matter of policy some Australian wineries that specialize in a particular varietal provide higher or lesser quality than might be expected from its price and its label, is a separate issue. It would, however, be erroneous for the consumer to infer anything either positive or negative about whether a bottle of wine is a quality-bargain from the signal that it contains the only varietal that the winery offers.

Table 2 extends this analysis to producers that contributed between two and four varietals to the sample set. With two varietals, $\chi^2 = 1.9938$, which again does not reject the matter-of-chance hypothesis. With three varietals and three degrees of freedom, however, we get a statistically significant ($\alpha = 0.05$) $\chi^2 = 6.0582$. Four varietals and four degrees of freedom also yield in a statistically significant $\chi^2 = 13.4493$. The latter two tests reject the matter-of-chance hypothesis in favor of the suggestion that when sellers offer more than two varietals the bang for a buck offered in one of these will tend to be related to the bang for the buck offered in another. Closer inspection of the elements contributing to the chi-square suggests what that relationship might be.

Table 2: Data For The Chi-Square Tests For One to Four Varietals

No. Positive (+) and Negative (-)		Actual	Expected	χ^2
	+	93	87.5	0.3457
One Varietal	-	82	87.5	0.3457
	Total	175	175	0.6914
	++	48	40.25	1.4927
Two Varietals	+-	75	80.5	0.3758
	--	38	40.25	0.1258
	Total	161	161	1.9938
	+++	13	13.625	0.0287
Three Varietals	++-	43	40.875	0.1105
	+--	32	40.875	1.9270
	---	21	13.625	3.9920
	Total	109	109	6.0582*
	++++	6	2.875	3.3967
	+++-	7	11.5	1.7609
Four Varietals	++--	10	17.25	3.0471
	+---	18	11.5	3.6739
	----	5	2.875	1.5707
	Total	46	46	13.4493*

* Statistically significant at $\alpha = 0.05$.

With three varietals, two-thirds of the $\chi^2 = 6.0582$ is attributable to 21 sellers with negative average residuals for all three of their varietals, as opposed to an expected 13.625 observations under the independence hypothesis. With four varietals we only have an expected 2.872 observations in the two extreme cells. When those cells are combined with their immediate predecessors to form categories of at least three positive (negative) residuals, we again obtain a statistically significant $\chi^2 = 7.7536$. Sixty percent of the latter value is contributed by the at-least-three-negatives category. In tandem, the three-varietal and four-varietal cases suggest that while there may be several sellers offering several varietals that as a matter of business policy and practice seek to offer their customers quality-bargains, many more of their counterparts do just the reverse.

Too few sellers offered more than four varietals to permit similar tests, but an analogous grouping of their results provides some interesting insights. In five of the fourteen cases of a seller offering five varietals, there were three positive and two negative residual averages; the reverse holds in six of the cases. In the remaining three cases, four of the residual averages were negative. Once again, when more than two varietals are on offer, lower-than-expected quality tends to be the result. Nine sellers offered six varietals. Of those, two had three positive and three negative residual averages, two had two positive and four negative residual averages, four had five negative averages and one positive average, and one contrived to produce six negatives. Five wineries or groups offered seven varietals. One of these had five positives and two negatives, one had four positives and three negatives, two had two positives and five negatives, and one had one positive and six negatives. These results are also supportive of the general notion that when more than two varietals are on offer, lower-than-expected quality tends to be the result. The lone departure from the suggestion comes from the three sellers that offered all eight varietals. One of these producers had six positive and two negative residual averages, one had five positive and three negative residual averages, and the third had four and four.

It would be erroneous to infer from the latter results a tendency for the larger sellers to bottle wine that will disappoint, given its price and other characteristics. First, any such inference relies on the erroneous presumption that only a large seller offers a broad array of products. Only one of the three sellers offering all eight varietals is in the Big Three and by contrast with the Hardy Wine Company and Foster's Wine Estates, with wine-grape crushes of over 200,000 tons during our sample year, one of the three had a crush of less than 500 tons. Second, the larger sellers are unlikely to have achieved their large market shares by focusing solely on high-quality, higher-priced, single-grape wines that merit Halliday's attention. And it would be equally erroneous to infer anything about the relationship of seller size and product quality from our results.

Doubtless many Australian producers can be relied on to offer higher-quality wines across the board than consumers have reason to expect, ceteris paribus, and doubtless others can be relied on to do just the reverse. The general implication of our results, however, is that product diversity is an especially fault-ridden signal as to the category, if either, into which any one producer falls. Several varietals from the same seller on a vintner's shelf might want to give the potential buyer modest pause, as this diversity hints at giving buyers less than their money's worth in any one bottle. In the overwhelming majority of instances, however, those in which a seller offers only one or two varietals, the lack of diversity provides not a shred of evidence as to where the bottle falls on the quality-bargain scale.

Conclusions

Economists have an unflappable belief in the disciplining force of the market. Yet, "you get what you pay for" remains a cliché that is regularly honored in the breech. Even as we write, some consumers are being pleasantly surprised by a bottle of wine because they think it's a quality-bargain. Others, however, are suffering the less pleasant experience of feeling that the bottle isn't worth the money. Even the repeat buyer is not immune. How often does one hear "This is not as good as I remembered it" or "This is better than I recalled"? A bottle of Australian wine could serve as an exemplar.

Experience aside, consumers take their cues as to what to expect from a product of uncertain quality from its price, from the producer's reputation, and from any number of other imperfect signals of product quality. A bottle of Australian wine could serve as an exemplar of such a product and one for which the practice is not entirely unjustified. Price and quality are indeed associated, and generally strongly so for Australian wine, but consumers will not necessarily get what they pay for. Sometimes they'll get more and sometimes they'll get less. The winery's reputation also is a strong signal as to what to expect from the bottle, because that is how the winery got its reputation in the first place. Nevertheless, given its price, the winery's reputation, and other specifics of the wine, the bottle might well exceed or fall short of the consumer's expectations for it.

Because sellers' actions and the signals that they send can affect buyer behavior, sellers must consider how those acts and signals will be interpreted and the reactions they will engender. A decision to offer an array of wines, a merlot as well as a shiraz, whites as well as reds, sends a signal. How that signal will or should be interpreted are two different things. We have shown that one should not consider specialization to be a virtue when anticipating whether an Australian wine will surpass or fall short of price-and-label-based expectations. Indeed, the signal that a seller offers only one or two varietals provides no new information as to whether or not a quality-bargain is at hand. By the same token, while the diversity signaled by more than two varietals should not necessarily be considered a vice in the

anticipation process, the evidence points that way. We refrain from speculating whether Australian wine also qualifies as an exemplar in this regard.

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