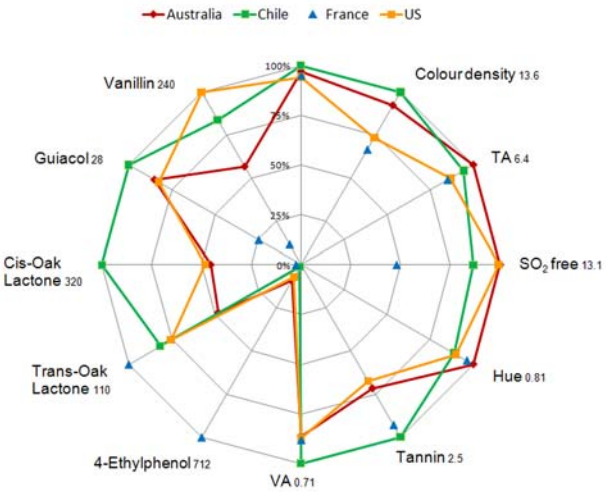
Ehrenberg-Bass Institute for Marketing Science
WINE MARKETING GROUP

GRAPE AND WINE RESEARCH AND DEVELOPMENT CORPORATION

Determining the relative importance to wine consumers of sensory and non-sensory attributes on liking and choice: A cross-cultural study



Final Report to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **USA 06/01**

Principal Investigator: **Prof. Larry Lockshin**

Research Organisation: **University of South Australia**

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Determining the relative importance to wine consumers of sensory and non-sensory attributes on liking and choice:

A cross-cultural study

Larry Lockshin

Simone Mueller

Ehrenberg-Bass Institute for Marketing Science, University of South Australia

Jordan Louviere

Centre for the Study of Choice, University of Technology Sydney

Leigh Francis

Patricia Osidacz

The Australian Wine Research Institute

Adelaide, 1 March 2010

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1. ABSTRACT

The objective of the project was to understand the relative impact of sensory and non-sensory (e.g., packaging, pricing) attributes on consumer wine choice, and to develop methods capable of measuring and predicting consumer reaction to changes in these variables. Four main methods were used in this project: sensory evaluation, chemical analysis, simulated choices of wines, and actual sales based on AC Nielsen data.

The results showed that even after tasting the wines, consumers' future purchases were mainly predicted by their original choices, not by how much they liked the wine. Availability and price were the most important predictors of sales.

2. EXECUTIVE SUMMARY

This project focused on developing, testing, and demonstrating new methods to understand how consumers make wine choices, and the relative impact of sensory and non-sensory factors. The methods developed are science-based and validated against actual sales in the market, rather than on consumer attitudes towards the taste or packaging of wines. The project demonstrates to the wine sector that it can potentially anticipate consumer responses to changes in the product and its marketing and by doing so can design products more likely to succeed in the competitive wine market. These new methods overcome the issue that consumers cannot introspect their own response to packaging and taste, and therefore their responses do not predict their actual behaviour.

The project was conducted in two phases, one in Australia and one in the United States. The **first phase in Australia** focused on Shiraz wines and used three different experiments: an online choice experiment using 21 real wines, an online choice experiment using simulated wine bottles varying a wide range of packaging and prices, and a tasting of the 21 wines (each person tasted 5 of the 21) followed by an evaluation and purchase intention measure. Overall, we found that consumers' choices online of real wine bottles did reflect the actual sales of those wines using AC Nielsen scanner data. Our experiments were good predictors of actual sales. However, after tasting the wines, consumers had higher liking for the more expensive wines, but did not actually choose these wines for repurchase. Their repurchase was linked more strongly to their online wine choices. Consumers could only taste 5 wines, so it is not practical to include actual tastings in future predictive research. We also found that it is impractical to manipulate packaging variables, because there are too many different combinations to test reliably. We found some indication that wine chemistry was useful in predicting consumer purchases. The most important variables predicting choice were (in order): objective ratings of the wines using 1-5 stars, the brand name, the price, medals, price discounts, followed by alcohol level, region, label style, label colour, and finally closure.

The results were used to inform the **next phase of the research in the US**, where we decided not to try and separately test branding and packaging, but to rely on a larger number of actual wine brands, supplemented with extra information, such as point scores, taste descriptions, and medals. Instead of consumer tastings, we purchased a large number of wines (210) in the market and subjected these to chemical analysis to see if we could enhance the predictability of our models. We also manipulated some information in the form of magazine articles about Australian wine regions, Australian innovation, and American wines to see if this affected wine choice.

Our analysis started with the set of 1,169 red wines in two US markets: Chicago and Tampa, Florida. We found that the most important **drivers of the actual prices in the market** were (in order): origin, label style, label colour, label information and grape variety. We did not analyse brands in this part of the research. The most important factors driving units sold were

availability and price; greater availability and lower price resulted in greater unit sales based on the AC Nielsen data.

The second part of the project in the US was a **choice experiment**, where we developed a better mechanism to simulate retail shelves and were able to have 8 wines visible rather than only 5 or 6. The first important outcome showed no differences between consumers in Chicago and Florida. Their differences were due to the wines available in the markets, not differences in the people. This means Australian wineries can focus on the 4 segments we found, rather than on differences between geographic regions. We also found, similar to the Australian experiment, that the online simulated choices were very similar to the actual market shares of the wines in the AC Nielsen data, which means our research is valid. We found as well, that the prices chosen represented the share of prices in the market. This allowed us to link the experimental choices with the actual shares of the wines in the market and build a trial decision support tool.

Overall, the **most important drivers of wine choice** in the two US cities were (in order): the combination of brand, package and origin; price; gold medal; a sensory description on the shelf; rating points from Parker or the Wine Spectator; manager's recommendation on the shelf; alcohol level; price discount; in-store tasting available; closure. The combination of the core product and price accounted for 57% of the choice, and the combination of wards and shelf information accounted for 43%.

We identified four **consumer segments** in the US, tow currently purchasing Australian wine, and two that purchase little Australian wine. One segment accounted for 22% of the sample, was older, and tended to purchase wines under $15. The other accounted for 55% of the sample and purchased wines around $12-$15 and was quite affected by gold medals and taste descriptions on the shelf, and less so by critic's scores. They tended to be average in age and more female than male. One segment that purchased less than the overall average of Australia wines accounted for 12% of the sample, but focused on low priced wines under $10 and is not very interesting for Australian wine sales in the future. The other segment was 11% of the sample and tends to purchase more expensive wines, especially European wines over $20, is younger, more male, and tends to shop specialty stores and restaurants, asking for advice. These are high involvement wine buyers, who do not currently focus on Australian wine, but are potentially a valuable segment.

Another useful finding was that the **magazine articles** we provided to the respondents did affect their simulated purchasing. Each respondent received 1 of 3 different articles, or no article. The articles all had an effect on the wines chosen. The article with biggest effect was about the innovativeness of the Australian wine sector, which had a bigger effect on the choice of Australian wines, than the article on Australian wine regions. This might provide an unique platform for Australian wine positioning in the US market.

The **chemical analysis** of the 210 wines from the US, Australia, France, Italy, and Chile showed some major differences between the countries, however, the chemistry was not very

predictive of wine sales. There was some relationship between increasing levels of tannin, alcohol, VA, and oak and the price of the wine.

The project successful **developed new methods for predicting consumer response to sensory and non-sensory attributes and validated the predictions with real sales data**. We developed two proof of concept decision support tools, which allow wineries to input their own wine characteristics and then see what effects changing the different information provided would have on sales. These are available to Australian wineries in an Excel spreadsheet. This method could be used to develop similar tools for other countries, e.g., China, or other grape varieties. It also allows the prediction of the impact of packaging and shelf information changes.

The **next stage of research** could build on these methods and findings. It would be important to understand how packaging and price influence sensory expectations and subsequent liking and purchase intent. More understanding of how consumers read and interpret wine labels would provide guidance to label designers and brand owners on how to develop better and more noticeable packaging. The same methods could be used to improve consumer response to wine lists, or to predict changes in trends, such as wine styles and new grape varieities.

The outcomes of the research have been published in 9 academic conference proceedings and 3 academic journals. Seven trade articles have been published and three more are in the draft stage. There will be a presentation and a workshop at the Australian Wine Technical Conference in July 2010. Copies of articles can be found at: www.winepreferences.com.

3. METHOD

The project consisted of two separate phases, one in Australia and one in the United States. There were several sub-projects within each phase and these will be encapsulated below.

Phase 1: Australia

The overall objective of the project was to integrate measures from sensory science and marketing into one science-based model, that could be validated with real world wine purchase data. The project integrates theory and methods from:

- Economics/Psychology (random utility theory based choice models)
- Statistics/Marketing (optimal design of choice experiments)
- Sensory Science (basic wine chemistry & sensory judgments by trained tasters)

Preliminary methodological experiments tested:

a) The applicability of choice in sensory experiments

We compared the standard sensory evaluation method of hedonic liking to letting respondents choose the most and least liked wine out of a set of four wines. The best-worst method produced not sufficient information per respondent to allow segmentation and was not able to significantly differentiate the wines to be evaluated. Accordingly we used hedonic liking measurement for the informed sensory consumer test.

b) On how to reliably measure consumers' wine choice with choice experiments

We tested if consumers were able to state the importance of wine attributes in a best-worst task and compared these findings to a choice experiment with graphically simulated wines that differed in wine attribute levels. Only graphical choice experiments were able to capture subliminal effects from wine packaging. We therefore used graphical shelf simulations for all later choice experiments.

Three separate final experiments were carried out for the Australian project phase:

1) An **online choice experiment** with 1200 red wine consumers from the NSW wine market using **simulated bottles**. We varied 10 different features experimentally:

   - functional (region, alcohol, price, price discount, brand)
   - non-functional (bottle shape, label colour, label style, closure, medals)

Table 1 provides a summary of the attributes and levels. Consumers saw simulated shelves of 6 wines, with each of the wines composed on one level from each of the attributes. Figure 1 shows an example of one choice set. A comprehensive statistical design controls the combination of attribute levels into simulated wine bottles; in our case it contained more than 1,000 graphical combinations. This design ensures that each attribute level co-appears which each other the same number of times which allows us to separate the effect of each individual attribute level on wine choice.

Respondents chose the wine they would buy if they were buying for dinner that night with friends or families. The relative influence of each attribute and its levels was then calculated based on how it impacted the probability of choice.

Table 1: Summary of wine attributes used in the experiment

Attribute	**Levels**	
Brand	8	Tier 1 (very well known brand) to Tier 4 (unknown brand)
Price	4	$7.99 - $22.99 (4 levels)
Medals	4	no medal - Gold Trophy (4 levels)
Price discount	2	none vs. 20% discount
Alcohol level	4	11.5% to 16% (4 levels)
Region	4	Padthaway, Hilltops, Yarra Valley, Barossa
Label style	4	chateau, traditional, minimalistic, graphical
Label colour	4	cream, yellow, red, black
Closure	2	screw cap vs. cork

Figure 1: Example of a screen from the online choice experiment with simulated wine bottles

2) An **online choice experiment** with 350 red wine consumers using 21 **real Shiraz wines**

We selected 21 Shiraz wines from the New South Wales AC Nielsen Top 100 sales data with a wide range of sensory properties and to cover both more and less well-known brands. Photographs of these wines were included in a shelf simulation showing five bottles at a time and their real market price (see a screen shot in Figure 2). We also included short taste descriptions for 6 of the wines to test the effect of a description or not on the shelf. Finally half the wines received a star rating of 1-5 stars given by independent retailers. The rating system was explained before the choice experiment. Respondents choose the wine they would buy to have with dinner that night with friends or family. The choices of the wines were compared to the actual sales of the 21 wines using AC Nielsen scanner data for NSW.

Figure 2: Example of a screen from the online choice experiment with real bottles

3) An **informed sensory tasting** by 420 red wine consumers of the same 21 real Shiraz wines was the final part of phase one.

Consumers were recruited to match the demographics of typical bottled red wine consumers in Australia. Each consumer tasted 5 of the 21 red wines in an informed condition – an A4 photograph of the bottle and the price was provided for each wine during the tasting. Respondents rated how well they liked the wine and whether or not they would purchase it at the retail price provided.

Figure 2b: Informed sensory tasting in central location test

Phase 2: United States wine market

The US research was comprised of three sections. The third part of the experiment involved purchasing 210 representative red wines from the US market and bringing them to the AWRI for tasting and chemical analysis.

1) First was an **analysis of the AC Nielsen** data from two geographic wine markets in the US: Chicago, Illinois and Tampa, Florida.

This analysis was not part of the original plan, but since we obtained the AC Nielsen data to test the validity of our experiments, we decided to do a thorough analysis of it. We coded the 1,167 red wines that were the same in both markets for country and region of origin, grape variety, label style, label colour, bottle shape, extra information on the label, alcohol content, price, and closure. We then ran a hedonic price analysis, regressing these independent variables against the price of the wine to measure the impact of each on the retail price. We did the same for the units sold, using the independent variable as predictors for the number of bottles sold during one year.

2) A **large choice experiment** was run in the same two areas: Chicago, Illinois and Florida with 1000 red wine consumers from each area.

We expanded the simulated shelf to include 8 wines (Figure 3). We chose 32 real wines to be representative of the packaging, regions, prices, and closures. We added prices, price discounts, tasting descriptions, rating points by two US experts, manager's recommendations, medals, alcohol levels, and in-store tastings.

A second part of the choice experiment tested consumers' response to different communication messages. Respondents received one of three different communications, as simulated magazine articles. The fourth group (control) received no communications. The three articles concerned: the US as the largest wine consuming country in the world, Australian wine regions, Australia as an innovative wine producing country. We predicted that each of these articles would affect the choice of wines in the experiment afterwards; the US article would increase the choice of US wines, and the Australian articles would increase the choice of Australian wines as compared to the no communication condition.

Figure 3: Screen shot of online shelf experiment in the US

3) The third part of this phase involved purchasing a representative selection of red wines from the Chicago market, and **chemically analysing** them at the AWRI.

4. RESULTS / DISCUSSION

The results are provided in the same sections and order as the methods section above. Detailed results are available at www.winepreferences.com in the articles published in trade and academic press.

Phase 1- Australia

1) Online choice experiment using simulated bottles

While complex statistical analyses are required to evaluate fully the outcomes of choice experiments, they can be easily understood by calculating how often an attribute level was chosen when it appeared on the simulated wine shelves. This **frequency of choice** gives a measure of the preference for each attribute level; those which are chosen more often are more preferred than rarely chosen levels.

Considering the effect of the four **price levels** investigated, Figure 4 shows that a wine was chosen three out of ten times (29.9%) when its price was $12.99. So this price level was more preferred than $22.99 which was only chosen two out of ten times (19.2%). The preference for price levels of $7.99 and $17.99 were in between these most and least preferred prices. Interestingly, these outcomes indicate that lower prices for Australian wine do not automatically sell more but that consumers actually chose wines around $13 most often. Thus, we could not confirm a linear price-sales relationship as is often assumed. Remember the purchase situation was with family and friends, which may have affected the different choices. This exact same relationship was found in the US experiments as well.

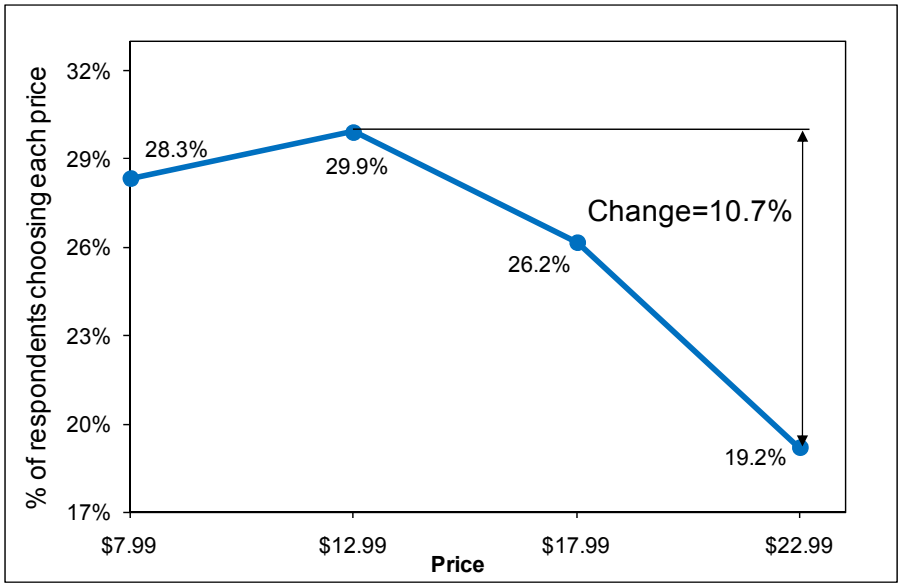


Figure 4: Impact of different price levels on choice

To compare the relative effects of different attributes, like price and label design, one has to look at the **maximum impact on choice of a change of attribute levels**. For price this maximum impact is achieved by switching between the least chosen price of $22.99 (19.2%) and the most often chosen price level $12.99 (29.9%), which represents a relative difference (increase) in choice of 10.7%. To compare the relative importance of attributes for consumer choice this effect can now be compared to the maximum impact of other attributes. From all attributes analysed, price had the second strongest influence after brand (see Table 2).

Comparing the impact of changes in attribute levels **allows wineries to make their own trade-offs** in packaging and labelling, and is the biggest advantage of choice experiments. So a manager of a brand portfolio can calculate if a price discount is necessary to keep the same market share if s/he sources grapes from a less well-known region, and if the region is clearly stated on the label.

It has to be noted that the measured impact depends on the attribute levels chosen by the experimenters; ideally they should cover the maximum range of the relevant market under study. A too narrow range (e.g. only looking at $10-$15 wines) will result in a smaller impact of the attribute while a very wide range (e.g. $8-$35) will increase it.

Drivers of wine choice

Brand was revealed to be the most important for consumers' wine choice, and was just a bit higher than price. We used eight different Australian brands, which represented four different tiers of brand reputation from very well known brands (Tier 1 such as Wolf Blass and Hardy's) to unknown (made-up) brands (Tier 4 such as Basalt Ridge and Duck Hollow). The total effect of 10.8% of difference in choice between these brands is mainly caused by one brand with a very high reputation while we found only small differences between medium known and unknown brands. This shows the strong impact of a very well known and advertised wine brand.

After price **medals** were the third most influential attribute on consumer choice. Not surprisingly a gold medal with a trophy was most often chosen, followed by a single gold medal and a single silver medal (see Figure 5). Compared to having no medal a Gold Medal + Trophy increased the chance of a wine being chosen by 7.3%.

A **price discount** proved to have a high impact on consumer choice. A special price of 20% off the listed price increased choice by 6.4%. Comparing this increase in market share to winning a Gold Medal + Trophy, we find that the medal + trophy outweigh the effect of a price discount.

There has been some recent discussion about Australian wines having too high **alcohol levels** and consumers potentially preferring lower alcohol level wines. We could not confirm this for our sample of regular red wine consumers from NSW. For the four alcohol levels tested we found higher alcohol levels to be preferred. Increasing the alcohol level from 11.5% to 16% increased choice by 4.3%. This might be related to consumers preferring the higher perceived body and viscosity of wines with higher alcohol levels (Gawel et al. 2007). The biggest change happens when raising the alcohol level from 13.0% to 14.5%, after this choice does not increase much further for the highest level.

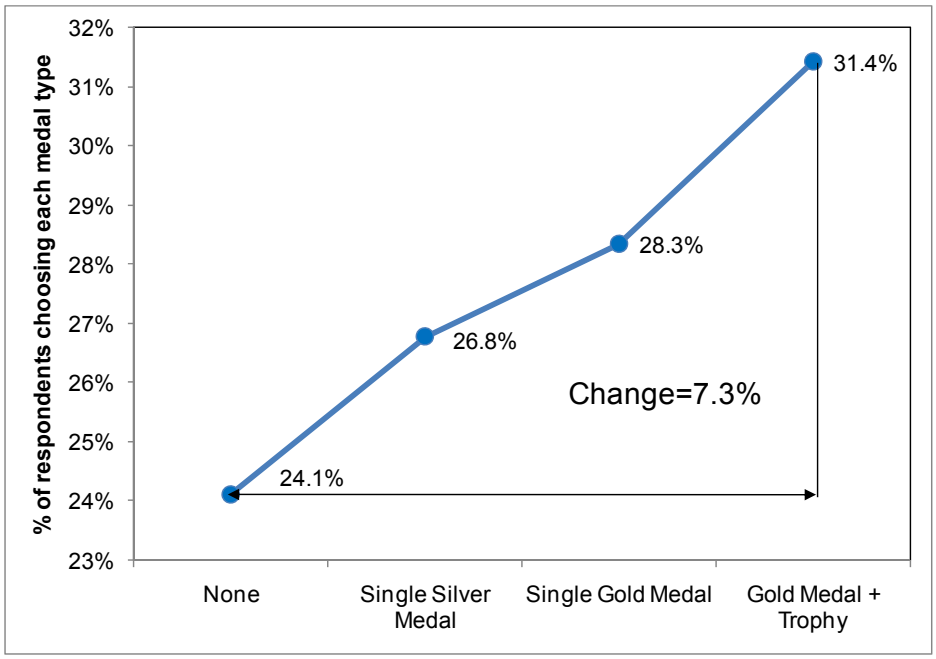


Figure 5: Impact of medal types on relative choice

An emphasis on **regionality** is seen as an important aspect for exports for the Australian industry, but it did not show a very strong effect on wine choice in our experiment with NSW consumers. Changing the region of origin of a wine from less known regions like Padthaway or Hilltops to well known regions like Yarra Valley or Barossa only increased choice by 3.8%. For NSW wine consumers Yarra Valley and Barossa resulted in the same relative choice overall, indicating that they are perceived to be of similar value for Shiraz wine.

Table 2: Summary of relative impact of wine attributes on consumer choice

Attribute	**Levels**		**Maximum difference in % choice**
Brand	8	Tier 1 (very well known brand) to Tier 4 (unknown brand)	10.8%
Price	4	$7.99 - $22.99	10.7%
Medals	4	no medal - Gold Trophy	7.3%
Price discount	2	none vs. 20% discount	6.4%
Alcohol level	4	11.5% to 16%	4.3%
Region	4	Padthaway, Hilltops, Yarra Valley, Barossa	3.8%
Label style	4	chateau, traditional, minimalistic, graphical	3.6%
Label colour	4	cream, yellow, red, black	1.2%
Closure	2	screw cap vs. cork	0.6%

For a first proof of concept we also included four different **label styles** and **label colours** into the experiment. Over all respondents both effects were not very strong, with 3.6% difference in choice between a minimalistic and a traditional type label and 1.2% between yellow and grey/black colours. On the individual level we found packaging to be more important for some consumer segments.

Our results for the effect of closure type provide some confirmation that **screw cap** has gained wide acceptance in Australia. While cork was chosen slightly more often, the difference of 0.6% is extremely small. While this may be partly due to limitations of consumers noticing the closure type on a simulated shelf (see Figure 1), this mimics the situation in a retail outlet.

Consumer segments

While the results discussed above refer to the 'typical' NSW red wine consumer we found **three different consumer segments** driven by different wine attributes and who prefer different characteristics (see Table 3).

The **first segment**, representing almost half of NSW regular red wine consumers, is mainly brand and medal driven in their wine choice. These consumers prefer lower and medium high price points and most often chose chateau-style and grey/black labels. While alcohol level had no influence on their choice they slightly preferred Yarra Valley over Barossa.

Table 3: Differences between consumer segments and the red wine attributes most often chosen.

	Segment 1	**Segment 2**	**Segment 3**
	Brand driven	*Value for money*	*Price sensitive*
Segment size	42%	40%	18%
Most important choice cues	brand and medal	star rating and discount	low price and price discount
Preferred price level	low/medium	medium	low
Preferred label style	chateau	traditional	unimportant
Preferred colour	grey/black	cream	unimportant
Most preferred region	Yarra Valley	Barossa	Barossa and Yarra Valley
Preferred alcohol level	unimportant	medium	highest
Brand influence	High (Wolf Blass and Hardy's)	Medium (Wolf Blass and Wynn's)	low
Medal influence	high	medium	low
Sociodemographics	more female		more male

The wine choice of the **second segment**, containing 40% of respondents, was most influenced by price discounts and wine ratings, which is discussed in the next section on the 21 real wines. These consumers seem to be motivated by value for money, most often choosing medium price level wines with a strong preference for a price discount, signalling that they want to get more than they pay for. Regarding packaging they preferred traditional and cream-coloured labels and most valued the Barossa region and medium alcohol levels.

A **smaller third segment** of about a fifth of all consumers is very price sensitive. Their wine choice is mainly determined by the lowest prices and price discounts. While packaging does not seem to influence their choice at all, they prefer the highest alcohol levels. Well known regions have a relatively small influence on their wine choice.

The segmentation helps us understand that not all consumers will react the same way to changes in wine packaging and pricing. The overall sample indicated that brand and price were about equal in importance and that the most chosen price was $12.99. When we look at segments, we see one segment is more brand driven and one mostly price driven. Not all consumers will respond the same to discounts and lower prices, and these should be used only when aiming at one specific segment.

2) Online experiment using 21 real wines

It was found that the wines that respondents chose in the experiment were strongly related to their actual market shares according to AC Nielsen data. A strong and significant correlation of 0.75 showed that an **online choice experiment is a very good approximation for what consumers purchase in reality**. This allows us to be confident that the following simulated bottle experiment could predict sales changes in the market. For this stage, it was not our aim to explain what causes or influences sales (how well known a wine is or how it is packaged), which was the subject of the simulated wine bottles, but rather to test if the choice method is able to give valid predictions.

The second aspect of the real bottle experiment was to investigate the **impact of shelf information on wine choice**. We report here the results from the 21 real wines (Figure 2) plus the use of medals and star ratings from the simulated wines (Figure 1).

Sensory description

The impact of the presence of a **sensory description** was analysed as described previously by calculating how often a wine was chosen when it had a sensory description compared to when it had none. If a sensory description has a positive influence on choice then wines should be consistently chosen more often with a taste description than with no description. On average over all six wines, the presence of a taste description increased choice by 7.4%. As might be expected, the increase in choice was not the same for all six wines but was found to be always positive and varied between 3.9% and 15.1%. .

Further research is necessary to better understand what caused this **differential impact on choice**. At this stage we cannot yet say what the relative contribution of each of the possible aspects of a description is. It might be related to the content and wording of the sensory description; the wine with its unique combination of brand, region and packaging, or the price of the wine. All these variables will have to be combined independently in a new choice experiment to disentangle their individual influences from each other.

There are indications that the wording of sensory descriptions used in the marketplace can be improved to be **more understandable by consumers**. In a recent study more than a quarter of Australian wine consumers stated that they find it hard to identify flavours indicated on wine back labels when they tasted the wine (Mueller et al., 2009). Nonexpert consumers have previously been found to be best able to match wines to short instead of long sensory descriptions (Hughson and Boakes, 2002). Nonexperts are also better able to match wines to concrete flavour descriptions made by experts than to their own abstract descriptions (Lawless, 1984). But despite the fact consumers might find simpler taste descriptions easier to understand, it seems to be the case that they find elaborate taste descriptions more appealing when choosing a wine. In the study by Mueller et al. (2009) an elaborate taste description on

the back label had on average a more positive influence on choice than a simple taste description. More research is required into the optimal translation between the inherent sensory characteristics of a wine and consumer understanding and appeal.

Wine critics' scores

Wine quality ratings are not widely used in the Australian wine retail market to assist consumer purchase, and there is not such a clear single critic's influence on the Australian scene compared to markets such as the US, where Robert Parker or the Wine Spectator are very influential. Because there are a number of different sources of opinions in Australia, we were not only interested in the effect of **lower or higher critic's scores** but also in the effect of the **degree of agreement** among several critics.

On the 'shelf talker' of the choice experiment we displayed three hypothetical ratings: one indicated to be from Kemenys, one from Vintage Cellars and one from Winestate magazine, with a maximum of 100 points each (see Figure 2). The ratings varied in both their average score (the low average was 85 points and the high one 90 points) and in the degree of agreement between the three scores (low and high agreement), resulting in four conditions in total.

Table 4: Relative impact of wine critic's point ratings with high and low average and different degrees of agreement between the critics (ratings are shown in brackets).

	Increase in choice (%)	
	Low average rating	High average rating
High agreement	1.9% (85, 83, 87)	9.8% (90, 88, 92)
Low agreement	5.9% (85, 75, 95)	7.2% (90, 85, 95)

Table 4 summarises the average impact of the four rating conditions on relative wine choice. For a low wine rating where all three sources highly agreed with each other the impact was as expected low (1.9%). Not surprisingly the condition in which all three rating sources agreed on a high rating had the highest impact, with an average increase in relative choice of 9.8%.

One could expect that disagreement between the three scores would signal to the consumers a higher risk. We would then expect ratings with a high variation to have a lower impact on choice than those with lower variance at the same average level. We found that the effect of

disagreement differs for the low and high average rating conditions. As expected, the strongly deviating rating scores on the high average had a somewhat lower impact on choice (7.2%) than those agreeing on the same high average (9.8%). Interestingly, if wine raters disagreed on the quality rating of the wines at the lower average level then consumers seem to be more influenced by the single high score of 95 and hardly consider the very low score.

At this stage we can conclude that high expert wine ratings indeed have a positive impact on consumer choice. For the highest influence on consumer choice, retailers should consider picking the highest score available from different expert ratings and only show several ratings when they agree on a high value (e.g. above 90 points).

Star ratings

With thousands of wines available in Australia only a relatively small group are rated by external wine experts. However, a **retailer could develop its own quality rating system**. To investigate the effect of such a retailer specific system we integrated a five star quality rating into the shelf choice experiment with simulated wine bottles (see Figure 1). Before the experiment, respondents were informed about the definition of the quality ratings, from no star to a maximum of five stars for an outstanding wine. Half of all wines in the experiment had no star rating (blank) while 12.5% showed either one, two, four or five stars as a quality rating.

As shown in Figure 6 while a wine without any star was chosen 21% of the time, a wine that had a five star rating was chosen 38.6% of the times it appeared. Keeping all other attributes constant, the relative impact on choice from having no rating to a five star rating was thus 17.6%. This equates to about a 3.5% increase in relative choice per incremental star.

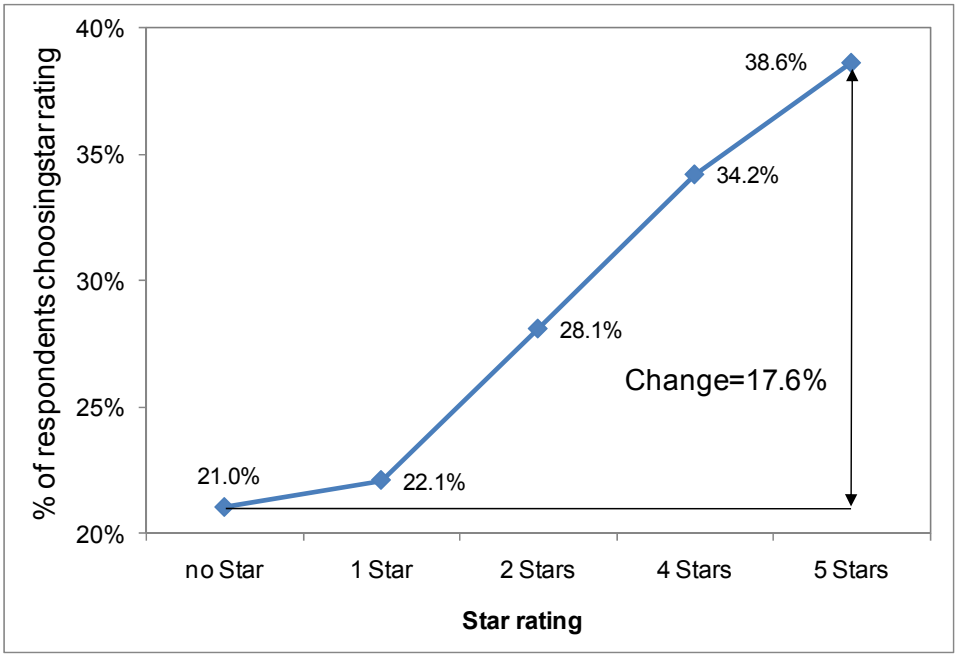


Figure 6: Impact of star ratings on relative choice.

As discussed in more detail in our previous article, choice models allow wine marketers to assess how consumers trade off attributes against each other. An attribute beneficial to consumers such as a quality rating could be compensated by an attribute that is less preferred such as a higher price. While adding a beneficial attribute at a constant price would increase the likelihood of the wine being chosen (i.e. more volume sold) a producer could also consider raising the price by a certain amount. One might also assume that a wine that aims to achieve a five star rating is more expensive in its production than an average commercial wine. Taking into account the relative choice impact of price, where a decrease of choice by 10.7% was found for an increase from $7.99 to $22.99, a producer could potentially raise a wine's price by about $6 if the star rating is increased from four to five stars. Similarly, an additional star from three to four might justify a price increase by about $4.

Phase 2- United States

1) Analysis of AC Nielsen sales data

Results from the analysis of AC Nielsen data from 2 wine markets are based on regression analysis of the sales and prices of 1,167 wines common to our two test markets. The sample showed a wide range of wines, prices and availability (Table 5).

Table 5: Characteristics of the wine sample from Chicago and Tampa

	average	min	max
Price	$ 14.76	$ 3.09	$ 157.43
Availability %	34.8	1.0	96.0
Units sold	16,537	28	303,420
Sales	$ 165,686	$ 407	$ 2,438,080

Wine origin

The **origin of the wines** in our sample gives a good indication of the structure of the US wine market (Table 6). We can see that California in general leads the US market with an overrepresentation of sales for the number of SKUs on the shelf. Australia, on the other hand is overrepresented in lower priced wines from SE Australia, but has a small share (even less than the SKUs on the shelf) of sales from other regions. This situation of small sales from a greater percentage of SKUs is typical also of other importing countries.

Table 6: Origins of wines by SKUs, sales share, and average price in 2 US markets

Origin	% SKU		% SKU	% sales	av. price
Domestic	56%	California general	17%	28%	$ 8.69
		Californian other regions	29%	31%	$ 13.06
		Napa Valley	10%	8%	$ 23.65
Import	44%	Australia SEA	6%	11.1%	$ 6.62
		Australia other	6%	2.8%	$ 12.12
		Argentina	4%	1%	$ 8.69
		Chile	5%	2%	$ 8.38
		France	5%	5%	$ 9.56
		Italy	10%	7%	$ 10.98
		South Africa	2%	1%	$ 7.93
		Spain	5%	3%	$ 11.09
		other import	2%	0.0%	$ 10.26

Grape variety

The structure of the US market in terms of the **red grape varieties** is presented in Table 7. Cabernet and Merlot dominate the market, with Pinot Noir also large. Shiraz is similar in size to Pinot. The rest of the grape varieties are small in the market. Australia will have difficulty competing in the Pinot Noir area, and tends to be low-priced in the other varietal areas.

Table 7: Structure of US market by grape variety from 2 major cities

Grape Variety	% SKU	% sales	av. price
Cabernet Sauvignon	23%	32%	$10.88
Merlot and blends	17%	19%	$8.88
Pinot	13%	13%	$11.64
Shiraz and blends	12%	10%	$7.78
Zinfandel	7%	5%	$10.88
Cabernet blends	3%	2%	$8.43
Malbec	3%	1%	$9.94
Tempranillo	2%	1%	$10.34
other	22%	16%	$10.57

Label styles

We also coded each of the 1,167 wines by the **type of label**. We downloaded all the labels and printed out approximately 500 of these. These were given to 8 different consumers, who were asked to categorise them in any way that made sense to them. From this, we developed a categorisation scheme based on label type (clean unicolour, clean with highlight, chateau basic, chateau with highlight, animal graphic, or graphical), label colour, bottle form, closure, and whether or no the label had extra information.

The results of this analysis showed some **major differences between countries**. Australia and South Africa were dominated by animal labels, and those clean with highlights on the edges (typically brand name label, such as Jacob's Creek). France and Chile were mainly basic chateaux labels and chateau with highlights. France also had many graphical labels (but not with animals). Argentina and Italy were similar to France, but they also had a large share of clean unicolour (non-white) labels. Spain was mainly clean and graphic labels. The US had the most graphic labels (all very different) plus a wide range of clean highlight and unicolour labels.

Table 8 provides the **results of the hedonic price regression** based on a range of packaging attributes and information. We did not test brands, because there are too many different ones to get a useful coefficient. We did find that the origin plays a large role in explaining prices for domestic and imported wine, followed by label colour and bottle form for imported wines, but by label style and grape variety for domestic wines.

Table 8: Relative importance for attributes in explaining prices

	Imported wines	US domestic wines
Origin	40%	34%
Label colour	14%	8%
Bottle form	12%	5%
Label information	11%	9%
Label style	10%	21%
Grape variety	9%	14%
Closure	4%	9%

Drivers units sold

We also considered what the **key drivers were for units sold**, rather than prices.

It is not surprising that **availability** and **price** account for approximately 75% of the variance in units sold. There is a clear positive relationship with availability (Figure 7) and a less clear negative relationship with price (Figure 8). It is obvious that some low priced wines sell a lot of units and some do not; price is not the sole determinant of sales, but there are no high priced wines with lots of sales. We did find some other significant attributes that were related to unit sold. Those that increased the number of units sold were: Pinot Noir, being from south eastern Australia, and having a red or animal label. Negative influences were: Zinfandel, black coloured labels, and unicolour labels.

Figure 7: Relationship of availability and units sold

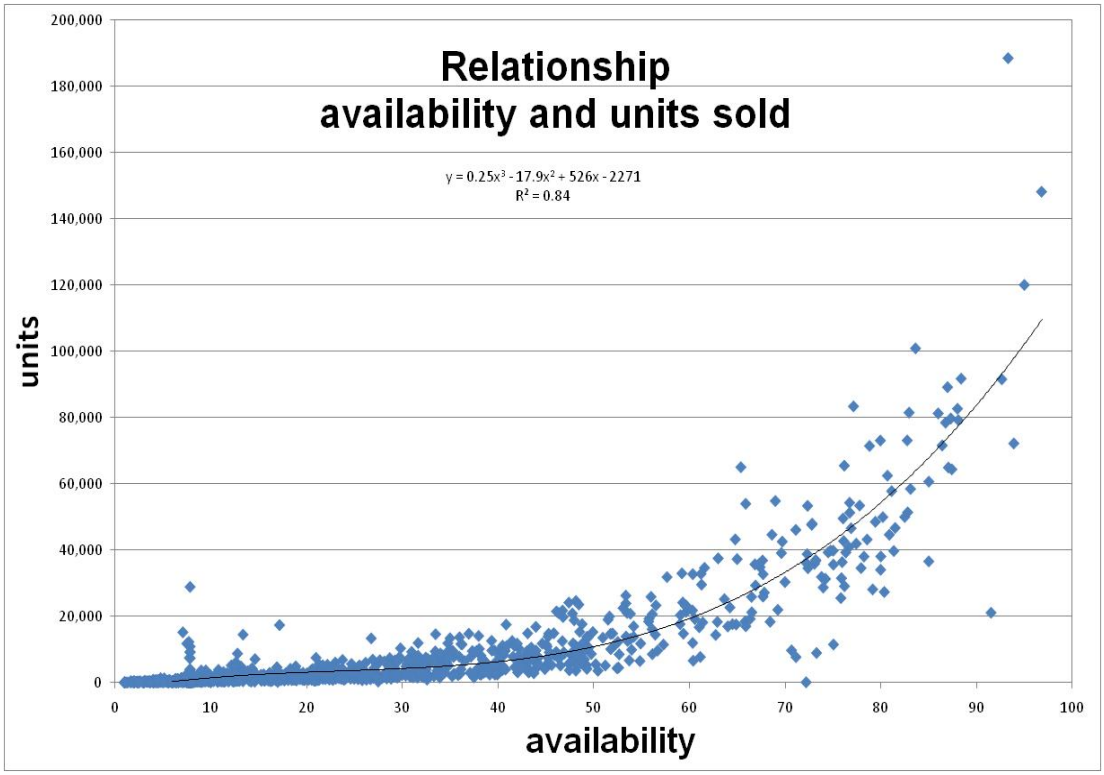
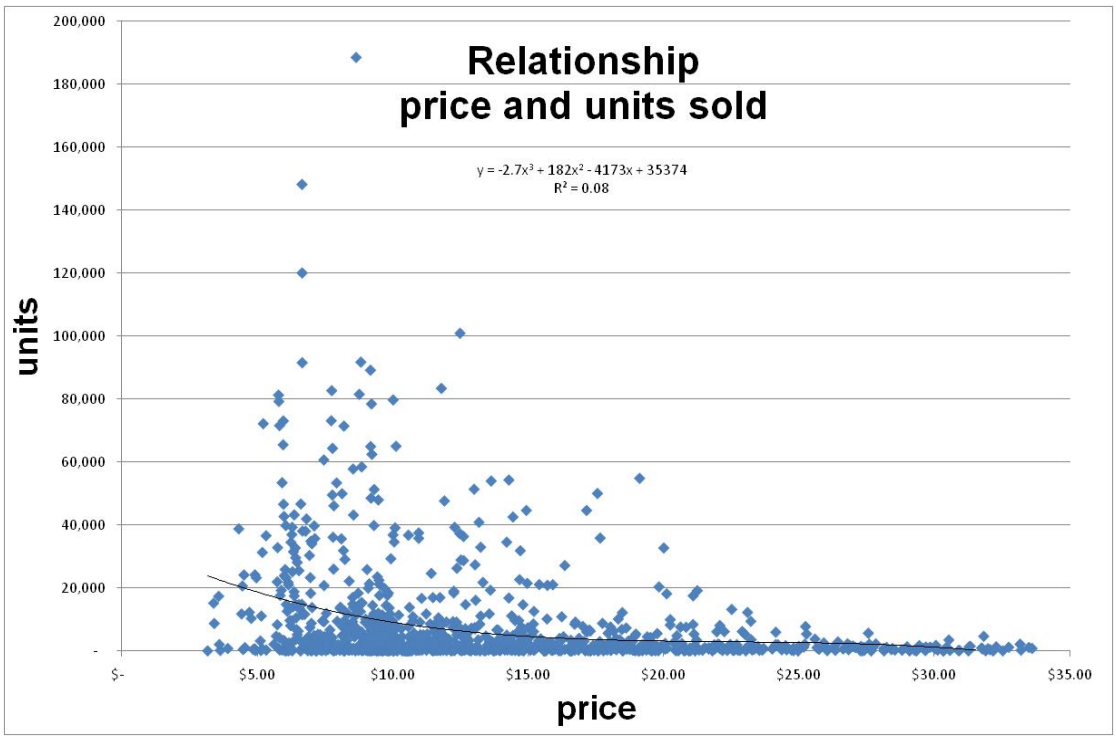


Figure 8: Relationship of price and units sold



2) Results of the discrete choice experiment in the US

The experiment was conducted in Chicago and initially Tampa, Florida. When we could not recruit enough wine drinkers from Tampa, we expanded the range to all of Florida. The first part of the analysis was **to compare the results from Chicago and Florida**, to see if we had two different samples, or whether we could combine the two samples in our analysis. The correlation between the two samples choices was 0.95, so we decided to combine them. This in itself is important; average wine consumers in two different US markets are very similar on their choices for wines. The differences in the markets are more based on what wines are available, rather than differences between the consumers.

Validity of choice experiment

The next stage of analysis looked at how closely the consumer choices of the 32 real wines reflected the actual shares of those wines in the market (from now on we use the term market to stand for the combination of Chicago and Florida). After adjusting the sales for availability, we found that our DCE (discrete choice experiment) **choices explained 65% of the variance in real world sales**. If we removed the single outlier of Hess Select wines, the R^2 was 0.71.

We also compared the choices of the different prices with the actual market sales at those prices. Our data closely reflect the actual number of units sold at the different **price points**. We see the highest choices at approximately $10 as compared to between $7-$10 in the sales data, but both sets of data show fewer sales below $4, rising in sales to about $10, and then declining after. Both of these validity checks show clearly that DCEs are a good approximation of the real market and allow us to model the effect of different attribute combinations on real consumer purchasing.

Relative importance of wine choice drivers

Table 9 provides a summary of the importance of different factors in wine choice based on our DCE. We can see that the **combination of brand, packaging, and the origin** accounts for over a third of the choice decision. We decided we could not clearly and easily separate the effects of brand and package, since they are linked by consumers' recognition of all of these at the same time. We measured the level of importance of origin in the hedonic regression and showed it was very important on its own. Here it is part of the brand, since the vast majority of brands come from a single country and often a single region.

Price is also very important but only marginally more than medals and a description of the taste of the wine. These are interesting findings, since medals are not very common in the US market, yet are more important than rating points in our experiment. This may be because **medals** are simpler to understand than rating points for the average consumer, or that many consumers do not agree with the rating scales used by wine writers or wine magazines. Sensory descriptions are a simple, yet powerful means to provide information to typically risk

adverse wine buyers. These could be provided by the winery either on the bottle, or to the retailer as shelf talkers. Much less important were manager's recommendations, alcohol level, price discounts, in-store tastings, and closures. The **low importance of price discounts** and closures indicates that many Australian wine brand managers do not clearly understand consumer choice behaviour in the US market. The overall effect of core product and pricing is just over 50% of the overall impact, while awards and shelf communication provide just over 40% of the choice importance. This indicates there is a slot of scope for wineries to manipulate information for consumers beyond the already chosen brand and price point.

Table 9: Relative importance of choice drivers in the US market

Attribute	Levels	Importance
Brand, packaging, origin	32	36.1%
Price	8	16.0%
Medal	4	15.0%
Wine sensory description	2	12.4%
Rating points	2	8.4%
Managers recommendation	2	5.6%
Alcohol level	4	2.5%
Price discount	4	2.3%
In store tasting available	2	1.3%
Closure	2	0.4%

Core product and pricing	57%
Awards and shelf communication	43%

Individual wine ranking

Table 10 provides a **complete list of the 32 wines used in the experiment**. The two columns provide the ranking (out of 32) of the consumers' best and least liked wines. We have colour coded the results to show wines that are polarised (both highly liked and highly disliked), wines that are overall liked, and wines which are overall disliked. The Australian wines are also identified. We can see of the top 5 wines, three are polarising and 2 are overall well-liked. They are not all the lowest priced wines either. More of the less-liked wines were also ones of low market share and near the bottom in overall liking.

The most chosen Australian wines are well known and widely distributed, mainly from south eastern Australia, under $15, with colourful labels, made from Cabernet, Merlot, and Pinot. The Australian brands chosen less often were smaller market share brands often made from Shiraz and Cabernet. These results represent what we found form analysing actual sales with the AC Nielsen data.

Table 10: List of wines by most and least liked

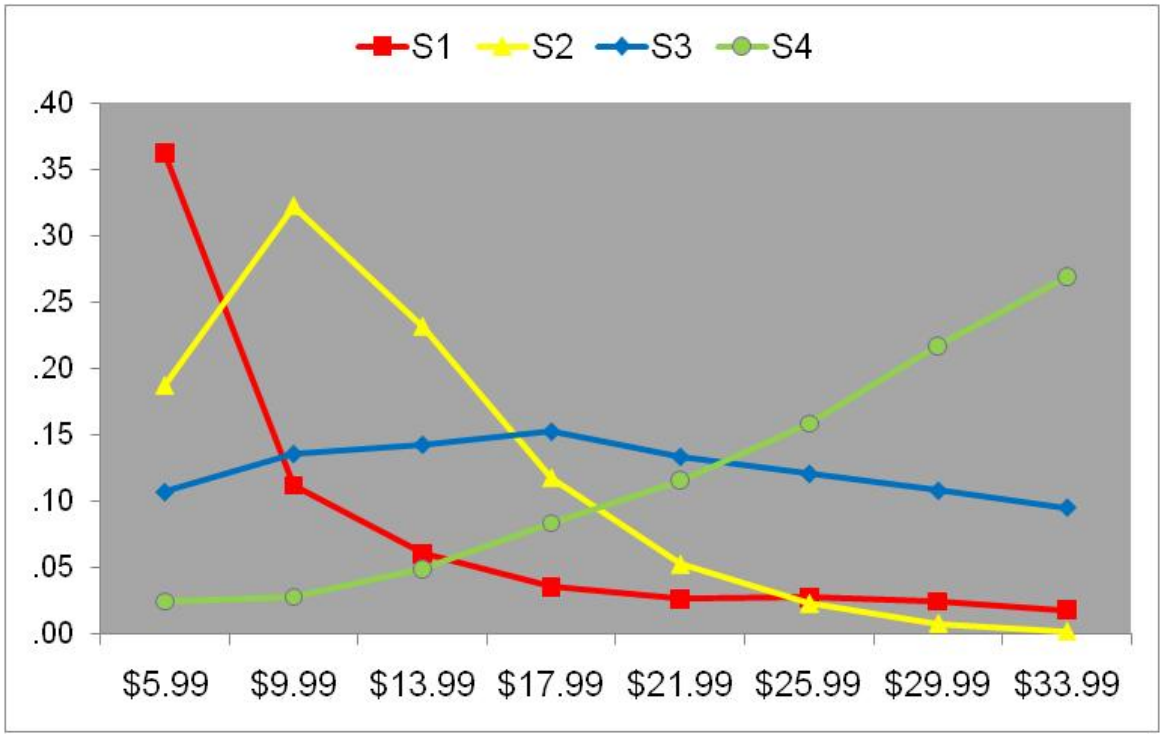
	rank most liked	rank least liked
Yellow Tail Pinot	1	1
Louis Jadot Pinot	2	12
Ruffino Chianti	3	6
Francis Coppola Merlot	4	3
Rosemount Estate Cab Merlot	5	23
Meridian CabSauv	6	17
Bella Sera Pinot	7	11
Ridge Geyserville Zinfandel	8	2
Woop Woop Shiraz	9	5
Bivio Tuscan Red	10	26
Peter Lehmann CabSauv	11	16
Bodega Norton Malbec	12	14
Weinstock Cellar Select Zinf.	13	9
Hess Select CabSauv	14	19
St Hugo CabSauv	15	32
Murphy-Goode CabSauv	16	30
Marques de Caceres Rioja	17	14
Pepperwood Grove Pinot	18	3
Yalumba Shiraz Viognier	19	27
True Earth Cab blend	20	20
Secco-Bertani Valpolicella	21	28
Penfolds Bin 128 Shiraz	22	25
Red Diamond Shiraz	23	7
Dona Paula Malbec	24	13
Thorn-Clarke Terra Barossa Shiraz	25	31
Allegrini Valpolicella	26	29
Lyeth Meritage	27	22
Hob Nob Shiraz	28	8
D'Arenberg The Footbolt Shiraz	29	23
Tir Na N'OG Grenache	30	10
Turner Road Shiraz	31	18
Penascal Tempranillo	32	21

Australian wines
Polarising wines (liked and disliked)
Agreement wines (mainly liked)
Not liked wines

Segmentation

The results presented above represent the overall market. We also segmented the respondents based on their choices among the 32 wines. After the segmentation we analysed the members of each segment to better understand their demographics and preferences. We found **four segments**, two of which already buy Australian wines and are therefore less interesting for the future; one segment that buys very low-priced and wines and is also not that interesting for Australian producers; and a fourth segments that buys more expensive wines, especially European and Californian wines, but buys less Australian wines. This **segment holds promise for Australian wine producers**.

Figure 9: Mapping of four consumer segments based on prices chosen



We can see that segment 3 has a similar probability across all **prices**. It is the biggest segment at 53% of the sample. Segment 1 is very much a low price buying segment and represents 12% of the sample. Segment 2 is 22% of the sample and bys wines typically at prices below $15 a bottle. Segment 4 is 11% of the sample, but is much more likely to buy wines at prices.

Tables 11 and 12 show the **makeup and preferences of the four segments**. Table 11 shows those already purchasing Australian wines, of which segment 3 is the most important due to its size. This segment is impacted by medals, critic's scores, and sensory descriptions much more than segment 2.

Table 11: Description of segments already buying Australian wines in the US

	Segment 2	Segment 3
Size	**22%**	**55%**
Preferred origins	US 70%, Aus 10%	US 60%, Aus 11%, Italy 12%
Preferred grape variety	> Merlot, Shiraz, blends < Cabernet	average
Preferred price	lower (<$15)	medium
Effect price discount (none to -20%)	+3%	+1%
Effect medal (none to Gold)	+2.8%	+8.2%
Effect of critic's scores (none to any)	+2.3%	+3.7%
Effect sensory description	+0.6%	+7.5%
Age	older	average
Gender		> female
location	> Chicago	
Australian image	> regions	
Purchase location	> Grocery store	
Purchase behaviour	more impulsive, less planned	
Wine involvement	low	medium

Segment 2, though 22% of the sample does not respond strongly to many of the promotions or communications. Segment 1 is only 12% of the sample and is focused on low prices and not influenced much by promotion and communication. Segment 4, 11% of the sample is a group Australia is not currently doing well in targeting. These people buy the most expensive wines, are younger, male, and buy through specialty stores, rather than supermarkets. A close look at the analysis shows they are most influenced by other's opinions: medals, critic's scores, and salespeople in the shops. Australia needs to target these specialty stores and their employees as well as gaining critic's scores to impact this segment. Also, wine lists are a good mechanism to get exposure to these wine buyers. Because they are young, this segment holds promise for long term purchasing of Australian wine.

Table 12: Description of segments with less current buying of Australian wine

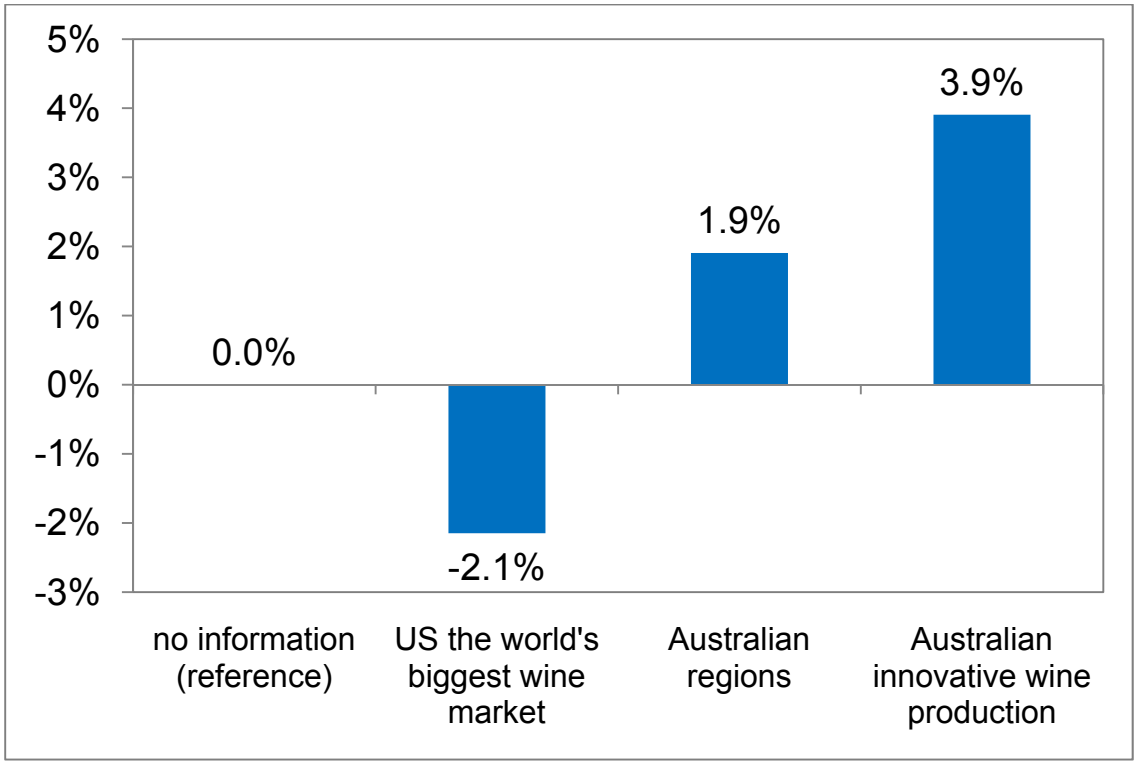
	Segment 1	Segment 4
Size	**12%**	**11%**
Preferred origins	US 65%, Aus 8%, >Spain, Chile	US 55%, Aus 7%, Italy 17%, France 12%
Preferred grape variety	> Merlot, Zinfandel < Cabernet	> Cabernet, Pinot, Shiraz < Merlot, Zinfandel
Preferred price	lowest (<$10)	Highest >$20
Effect medal (none to Gold)	+1.2%	+4.2%
Effect of critic's scores (none to any)	+1.7%	+3.4%
Effect sensory description	+1.9%	+1.9%
Age & gender		younger, > male
Income & education	lowest	highest
Location	> Tampa	Florida
Australian image		>> innovation
Purchase location		Liquor store
Purchase behaviour		> planned, ask for help
Wine involvement	lowest	highest
Dining out – hosting guest	least frequent	most frequent

Testing the effect of communication

We also conducted an experiment within the DCE, where different respondents were exposed to different **magazine articles** regarding the US as the largest wine consuming country, Australian wine regions, or Australia as an innovative wine producing country, or no communication (control).

Figure 10 provides the results of this part of the experiment. It shows clearly that communication (simulated magazine articles) effects future purchase behaviour. The US manipulation caused people to choose more US wine, and less Australian wine. Both Australian articles increased the probability of consumers choosing Australian wine, but the **most effective was the article on innovation in Australia**, not regionality. This clearly demonstrates that among average US wine consumers messages about innovation are more effective than regionality. Regions are important to a small proportion of high-end consumers, but a more modern approach could be used to increase consumption of Australian wine.

Figure 10: Relative change in choice by different communication strategies



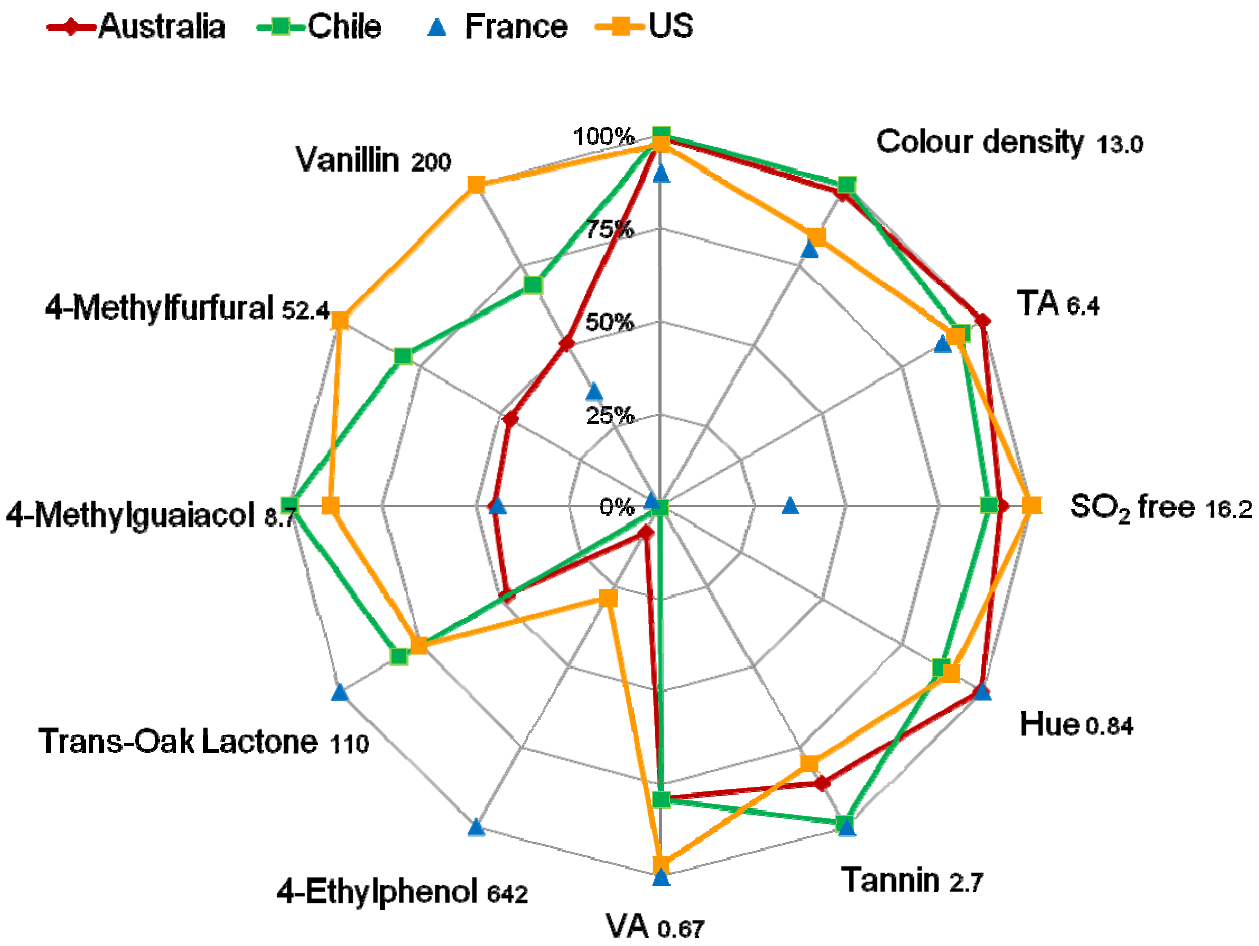
3) Chemical analysis of wines sold in the US

210 wines were sourced from Chicago and shipped to Australia. The wines consisted of roughly equal numbers of Cabernet Sauvignon predominant wines (n=74), Merlot (n=69) and Shiraz (n=67), randomly selected from wines available in the market from $12 -$40. The wines were selected on the basis of variation in sales, distribution, label styles and countries of origin, with a stratified sampling method used to ensure reasonable numbers of wines from the major producer countries were represented.

Country specific chemical and sensory profiles

The wines were analysed for **basic chemical composition**, including alcohol, sugar, acidity, as well as more complex analyses such as oak and *Brettanomyces* flavour components and colour and tannin measures. The wines were also informally assessed by a group of highly experienced AWRI wine judges.

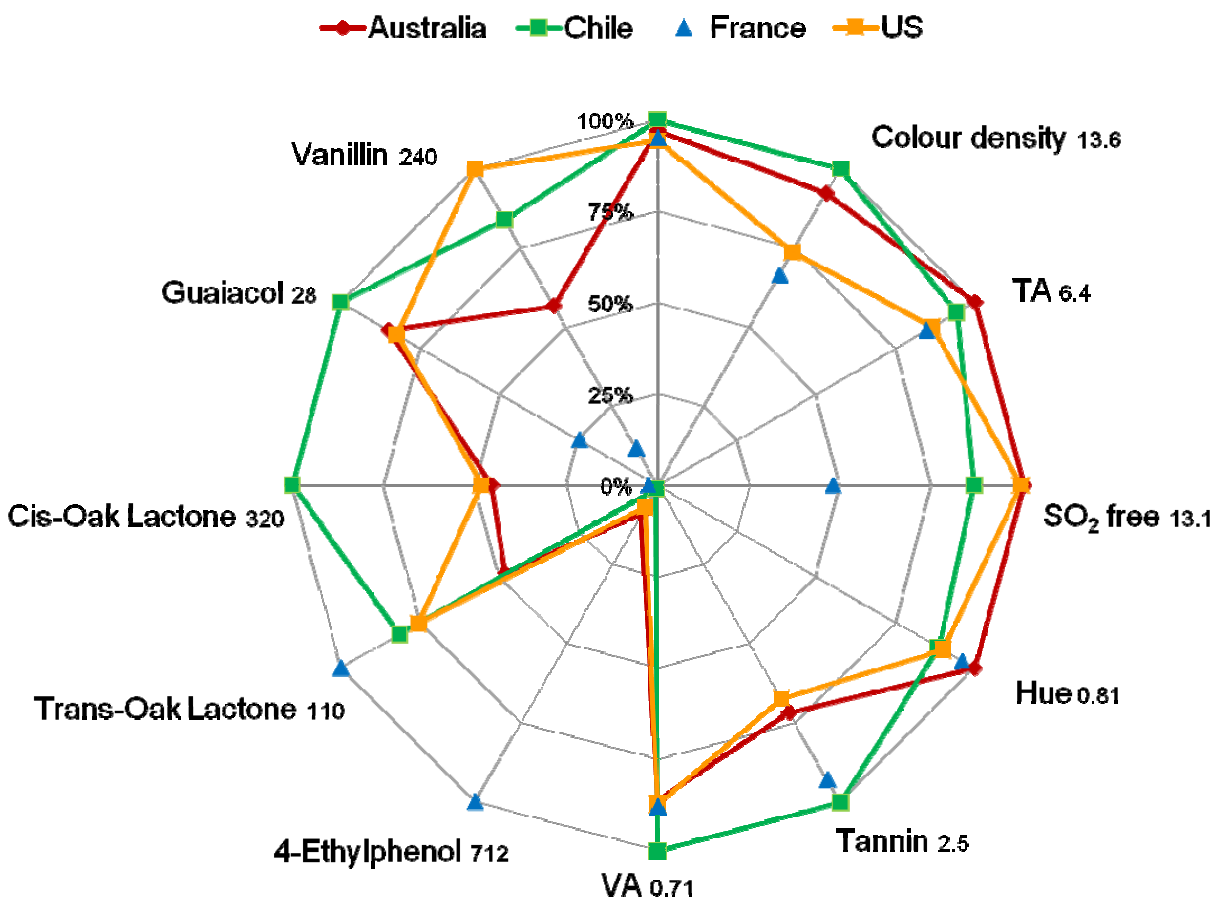
Figure 11: Country specific profiles of Cabernet Sauvignon wines



One of the outcomes of the chemical results is that they provide a **valuable set of survey data regarding wines in the US market**. The results showed that for most wines sourced from France there were substantially lower levels of alcohol, acidity and colour compared to Australian wines and much higher levels of tannin and *Brettanomyces* flavour (Figures 11 and 12). The US wines had similar high levels of alcohol as the Australian samples, but lower colour, and higher levels of the oak component vanillin. While Chilean wines were a smaller proportion of the total sample, they were generally similar in composition to Australian wines but with higher tannin concentration and levels of oak flavour components.

In the sensory assessment of the wines most Chilean samples were noted as having a strong degree of reductive off-flavour. It was noteworthy that the Australian wines were overall higher in titratable acidity compared to wine from other countries, which might be an issue that Australian producers should take note of with regard to consumer taste preferences.

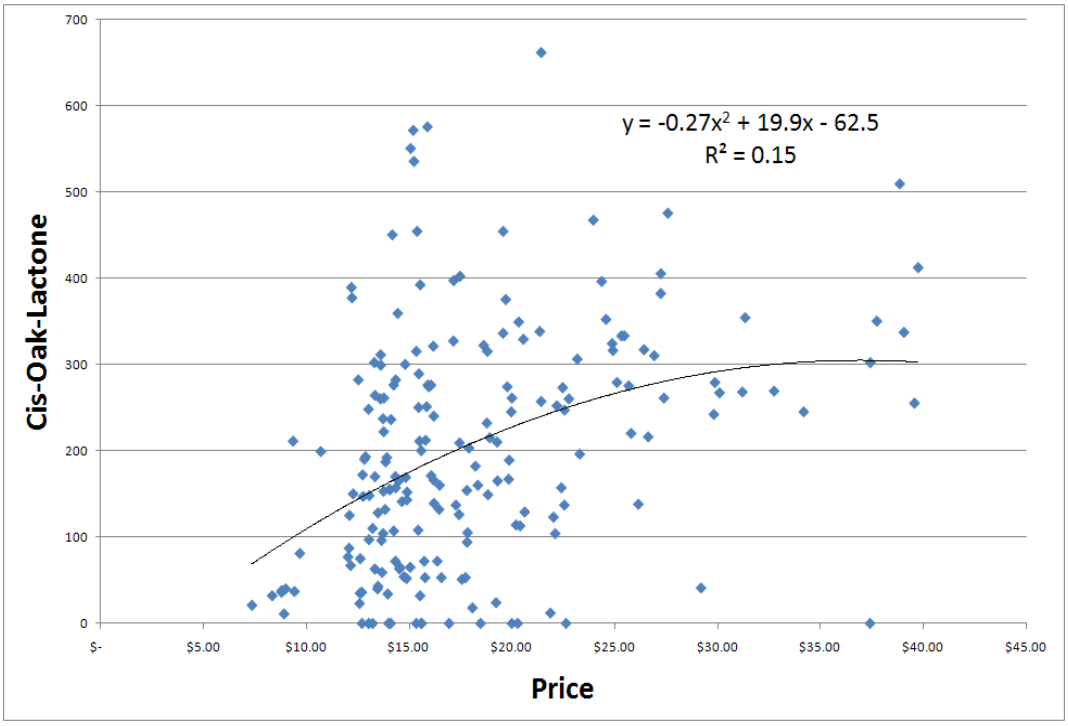
Figure 12: Country specific profiles of Shiraz wines



Relationship of chemical components and price

In including chemical composition in regression models there was a **relationship with price with some components**, but not with sales (Figure 13). Alcohol, colour, tannin and oak flavour related positively to price. The highest priced Cabernet Sauvignon based wines were either from Bordeaux and high in tannin and moderate to high in colour, or else American and moderate in tannin and high in colour. In contrast, the highest priced Shiraz wines were Australian and moderate to high in tannin and highest in colour density.

Figure 13: Relationship of alcohol, tannin, VA, and oak with price



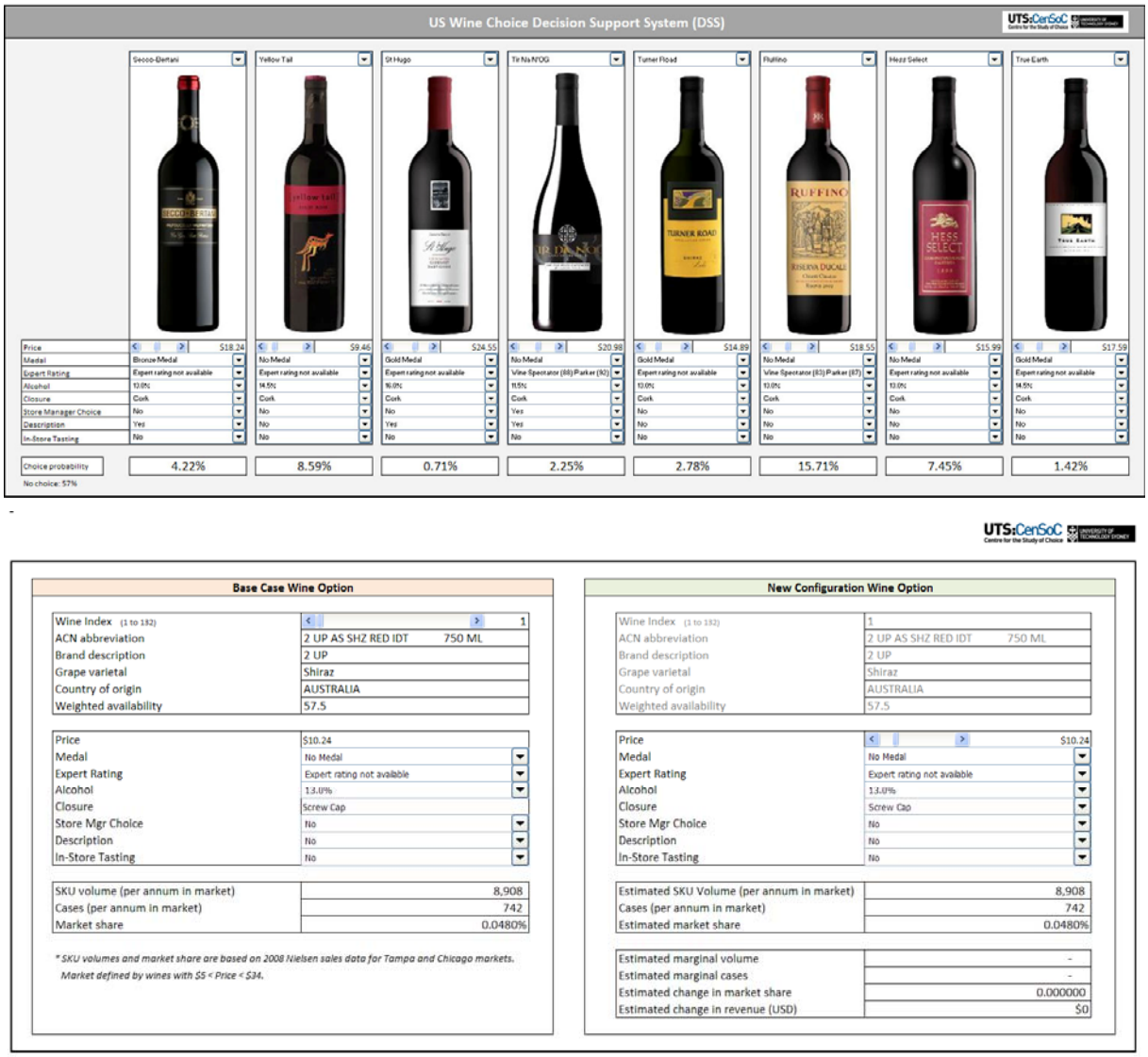
Relationship of wine critic ratings and price

We conducted some other analyses that were not part of the original project. We retrieved Robert Parker and Wine Spectator scores for as many of the 210 wines as possible. These wines were also rated informally by 7 AWRI tasters as noted above. We found the Parker and Wine Spectator scores to be closely related and significantly correlated with the price of the wines, Parker 0.53, Wine Spectator 0.32. These wines were tasted in an informed condition. The AWRI tasters did not know the identity of the wines and their scores were not correlated with price. More sophisticated analysis showed that the wine critics and the AWRI tasters were tapping different dimensions of quality. This is an area for further investigation. Do wine critics from different countries use different measures of quality?

4) Decision Support Tools

We provided two proof of concept decision support tools using Excel. These tools are available directly from UniSA to all wineries and grape growers in Australia. They allow users to select specific wines in the US market and change various attributes, such as price, medals, and critic's scores, and then to see what each of these (or in combination) changes in sales and market share. These tools demonstrate the usefulness of the choice experiment technique, not only in showing the importance of each attribute, but also allowing these market simulations to be used by individual companies depending on their own positioning and needs.

Figure 14: Screenshot of proof of concept decision support tools



5. PROJECT OUTPUTS AND PERFORMANCE

Project performance against planned output

The following tables list performance targets as outlined in the project contract and later contract amendments.

Outputs and Performance Targets 2006-07

Outputs	Performance Targets	Performance
Stage 1		
1. Measurement of the capacity of respondents to undertake BW choices, number wines per flight and number of flights.	Have completed pre-tests using a range of wines per flight and numbers of fights in a Latin Square design to measure the time taken and the variance associated with increasing samples.	**Achieved** Result: maximum is two sets of four wines
2. Measurement of the error (variability) and viability (number of samples per person, etc.) of the Best – Worst method as compared to conventional hedonic ratings, and information regarding the optimal experimental design for Best-Worst wine studies. Decision on design of Stage 2 (2007-8 research overseas).	Have completed an experimentally designed study comparing best-worst and hedonic scoring using a minimum of 64 Australian consumers, with a set of red wines varying in three or four sensory attribute factors (high and low). Repeating the above study with at least one different sensory factor to measure each technique's variability under replication.	**Achieved** Result: decision to use hedonic rating for future experiments
3. Ability to determine non-sensory drivers of purchase intent of Australian wine consumers using web-based label design experiments.	Have tested and compared a broad selection of the drivers of wine choice, as recommended by the advisory panel, to choose the most important for the web experiment. Have completed and tested website using non-sensory factors. Have completed the web-based label optimisation experiments. Have completed development of the information acceleration website.	**Achieved** One experiment with verbal descriptions and one separate experiment with visual shelf simulation Result: visual presentation required

Outputs and Performance Targets 2007-08

Outputs	Performance Targets	Performance
Stage 2	Have submitted a manuscript to an appropriate journal regarding the comparative methods study.	**Achieved** Paper published in AJGWR
1. Information regarding the relative importance of sensory and non-sensory attributes in red wines for Australian consumers and degree of segmentation. Information regarding the repeat purchase rate for sensory and non-sensory attributes in red wine for Australian consumers. Information regarding the usefulness of information acceleration for predicting the purchase of wines in Australia. Decision on design of Stage 3	Have carried out a study assessing red wine consumer preference with idealised combinations of sensory and non-sensory attributes for red wines, using a minimum of 150 Australian consumers. Have carried out a study measuring choice rates for idealised combinations of sensory and non-sensory attributes for red wine. Have carried out a study using information acceleration on Australian wine consumers.	**Achieved** Combined experiment with n=420 consumers **Achieved** Simulated graphical shelf choice experiment with n>1,200 consumers **Achieved** Information acceleration experiment (wine shelf information) with n>300 consumers
Stage 3		
2. Information regarding the applicability of the methods designed and tested in Australia to a selected export market. Decision on design of Stage 4.	Have carried out a detailed market analysis of two markets of the US based on wines sold (e.g. AC Nielsen data).	**Achieved** Market analysis of Chicago and Tampa wine market

Outputs and Performance Targets 2008-09

Outputs	Performance Targets	Performance
	Have submitted a manuscript to an appropriate journal (and an Australian wine trade journal) regarding the sensory and non-sensory choice in Australia study. Have submitted a manuscript to an appropriate journal (and an Australian wine trade journal) comparing the information acceleration results with the sensory and non-sensory results.	**Achieved** Submitted to Food Quality and Preference **Achieved** 2 articles published in Wine Industry Journal 2008
Stage 4		
1. Knowledge regarding the degree of importance of label information, packaging and market communications for red wines in two markets of the US.	Have completed a study in two US markets quantifying, using Choice Experiment methods and display information, the relative effect of at least four non-sensory influences with a minimum of 512 consumers tested.	**Achieved** Online choice experiment with n>2,000
2. Information regarding the relative importance of chemical and non-sensory attributes in red wines in two US markets based on prior market transactions (AC Nielsen data).	Exploring the contribution of chemical characteristics as proxies for sensory wine attributes for explaining wine market share with a minimum of 50 wines from the market analysed.	**Achieved** Chemical composition of 210 wines analysed
3. Information regarding the contribution of chemical and non-sensory attributes to the prices and market share of Australian red wine for two markets in the US. 4. A Proof of Concept Framework for Decision-Making incorporating these findings in a simple to use interface.	Have completed an exploratory analysis of market transactions (price, market share) combining chemical and non-sensory attributes for Australian red wine in two US markets.	**Achieved** Analysed chemical and non-sensory drivers of price and unit sales for n=210 wines
	Late 2009 to mid 2010: publication and presentation of the results of the overseas studies in Australian trade journal, academic journals and in seminars directly to the wine sector.	**Achieved** Workshop and presentation AWITC 2010 For detailed communications see Appendix 1

Assessment of practical implications

Development of a new method to validly predict consumer choice

The project has developed a method to elicit consumers' wine choices in simulated visual wine shelves. The method of online choice experiments proofed to have a high external validity. That is its predictions reflect what consumers are choosing on the real market and allow companies an accurate forecast.

The scientifically grounded and evidence based method can be used to anticipate consumer response to changes in product and marketing activities. It is able to overcome prior measuring and predicting issues by capturing choice drivers that consumers cannot introspect and that may affect them subliminally.

The developed method can now be applied fast and cost-effective to a large number of marketing questions (as outlined in recommendations) from individual wineries or national wine bodies.

Relative importance of sensory and non-sensory characteristics

We found extrinsic packaging characteristics to stronger effect consumer choice and liking than sensory characteristics. We identified sensory characteristics that were able to cut through the strong impact of packaging and labelling characteristics: faults such as Brettanomyces, aged aromas and reductive sulfid aromas had a negative impact and should be reduced to increase the likelihood of a repurchase. Fresh fruit aromas and sweetness were positive driver for purchase intent.

Practical insights for Australian wine market

Our project allows producers to optimise their wine offerings for the Australian market and their communication with domestic retailers by providing insights into:

- The relative importance of wine characteristics for wine choice
- The existence of different segments with specific requirements
- The valuation of wine information in form of sensory descriptions, rating points and medals on the retail shelf

Practical insights for US wine market

Our project allows producers to optimise their wine offerings for the US market and their communication with distributers and retailers by providing insights into:

- Price premiums and discounts for packaging and regions of origin on two US red wine markets (Chicago and Florida)
- The existence of different segments with specific requirements and targeting options
- The valuation of wine information in form of sensory descriptions, rating points and medals on the retail shelf

Benefits from the Project

The project supported a number of wine industry's strategic initiatives.

1) **Anticipating the market**

   Our new method is able to give the industry insights into consumers' perception of Australian wine. It can quantify differences amongst consumers and how they respond to different wine characteristics. It allows the industry to better understand consumer preferences and to deliver products that better match consumer taste.

2) **Targeting the Consumer**

   By providing insights into what consumers want, where and how they purchase the insights derived with our method is a valid basis for positioning and targeting.

   The choice method can predict the impact of communication tools on consumers' wine choice and can be used to test the effectiveness of national and international communication strategies before media investments.

3) **Sustainability**

   Our method can be used to test newly developed products, new brands and wine styles that allow Australia to predict its success and optimise them before entering a new market or introducing new products into existing markets.

6. RECOMMENDATIONS

Investment in Marketing Research

The key focus of this project was to develop new techniques to be able to predict consumer response to sensory and non-sensory attributes of wine. Investing in research techniques for marketing is just like investing in research techniques for any other research. It has long term benefits and multiple uses. The **multi-media shelf simulations** we developed allow the testing of shelf information, pricing and even advertising and communication strategies with more flexibility and lower cost than doing these directly in the market. Our simulations were validated with real market data and show the ability of this approach to predict changes in sales and dollars.

Simulation of packaging changes

We found it difficult to simulate changes to specific packaging attributes, such as brand names, logos, colours, and label styles. There are so many variations to these that no experimental design can account for enough of them to make a wide range of wineries happy. On the other hand, these techniques would work well for a single winery, or for a few brands contemplating changes to packaging and wanting to see the effects before investing in wholesale changes.

Dominance of extrinsic wine attributes

We found that changes to overall packaging, distribution, and price predict sales better and have a greater effect than changes to wine sensory attributes. Consumers are not good judges of wine taste and respond more to the price paid (in terms of liking) than wine style. Wine style does have an effect on preference and choice, but it is smaller than the packaging and pricing effects. Wine chemistry is complex and it is difficult to establish a relationship between individual measures and sales, though there are some useful relationships between certain chemicals and the price charged.

It may not be big news, but **distribution intensity** has the highest correlation with sales. Wineries striving to increase sales should focus on increasing availability before anything else. Even price effects are less powerful than distribution effects. Wine closures, often a point of disagreement in the US market, have little effect on sales, either using AC Nielsen data or our simulated choices. Wineries should use the packaging they prefer and approach the market with confidence. More surprising is the small role of discounts as compared to distribution, pricing overall, branding, and origin. Wineries should set their pricing structure to include the necessary discounts depending on the channels they choose (grocery stores, wine shops, on-premise); they should avoid large discounts and unplanned price reductions, because these will not result in concomitant increases in sales.

Importance of shelf information

A major finding is that shelf information can **have a large effect on sales**. Individual wineries or even regions can work to get short taste descriptions, critic's scores, medals, or even in-store recommendations placed with their wines. This effort will be well-rewarded by increasing sales, especially if other wineries do not try this at the same time. Another finding is that promoting innovation as a tenet of the Australian wine sector has a larger effect on preference than promoting wine regions. Regionality is strong part of every wine country's promotion. It is important to wine writers and to a small proportion of important wine consumers, who buy expensive wines. Innovation, on the other hand, is a different position, one that is not in conflict with other wine producing countries. It may be a very useful way of differentiating the Australian offer, especially to lower involvement consumers. Any message, however, will increase sales compared to no publicity.

Similarity of preferences between US markets

We also found that consumers in two different geographic markets (Chicago and Florida) have similar buying preferences and responses to various stimuli. From a consumer perspective there is no reason to develop different strategies for different geographic markets, but there could be need to react to different distribution systems. There clear **segments** in the markets, which can be targeted with different strategies depending on the price point and positioning of the brand. We identified a 'sweet spot' for Australian wine between $11 and $20, both through our experiments and through the AC Nielsen data. Many Australian wines seem underpriced, and this is creating a low end positioning across the board.

Decisions support tools

The proof of concept decision support tools demonstrate the strength of our approach. These tools could be built to monitor the US market for changes overall, to look at changes in price sensitivity, or even to compare the coastal US markets with the heartland. The **same method could be applied to other markets**, such as China to better understand the drivers of choice and how manipulating various attributes affects those choice. It could be applied to market sectors, like Sauvignon Blanc in Australia to test how different varieties might compete with it. It can be used by individual companies to look at packaging comparisons before launching into the market.

Further research

This research, as all research, provides some guidelines for further investigation. We found that **branding, packaging and pricing influence sensory liking**. This area needs further investigation so that Australian wineries can use the right combination of packaging and pricing to set sensory expectations for their target markets.

Packaging in general is a new an important area that could help Australia sell more wine. **Packaging fluency**, how consumers read a package (before even picking up the bottle) and what information they get from it as the look over the shelf is an important determinant of choice, yet we understand very little about how packaging cues are processed while someone looks at a shelf. Our research focused so far on the processing of cues, once the bottle is picked up, but not on what happens prior to that time, when thousands of potential choices are quickly narrowed to a few.

The same techniques we used on retail buying could be applied to wine lists. We could measure the impact of various cues on **wine lists** and help Australian wineries work with their agents to develop more effective listings. We could also develop an instrument to predict trends in **grape varieties** and wine styles using the same techniques. This would be used annually or biennially in any market to act as an indicator of changes in preferences.

One final area to conduct future research is **how wine critics from different countries evaluate wines**. It is possible that Australian wines are being made for a different palate (among critics) and are not garnering the attention they should. Initial measures of wine chemistry showed Australian wines to have greater levels of acidity than our major competitors. We don't know if this has an effect on critics' scores or if this affects consumer preference. No research has **linked wine chemistry, critics' scores and consumer preferences**, which could lead to important changes in some wine styles resulting in greater scores and higher preferences.

7. LIST OF ALL COMMUNICATIONS

The following table lists all project related communications ordered by time. From the beginning it was our focus to share our findings with the Australian wine industry. This reflects in a total of *7* industry presentations and *12* industry or trade journal publications.

We presented and discussed the methodological insights from the projects with international academic peers. So far *10* conference presentations and/or refereed conference papers resulted from the project. From the early academic insights we have so far *3* academic journal papers published and *1* paper is currently under review at an international leading food research journal. We are currently starting to transform some conference papers into journal papers and expect number of academic papers to follow after the completion of the project.

The following table specifies the type, topic, venue, audience and date of our communications and indicates to which project part (extrinsic cues, sensory cues or combination of both) they covered. The first column indicates which of the communications are enclosed in Appendix 1 of this report.

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
	Presentation	AWBC and WFA Directions to 2025 research capacity meeting	Australian Wine Industry	17/11/06	Yes	-	-
X	Presentation	Project Update - GWRDC	GWRDC, AWBC, Advisory Board	24/07/2007	Yes	Yes	Yes
	Presentation	Consumer Wine Marketing Research – Australian Institute of Food Science and Technology (AIFST) Convention in Melbourne	Australian Food and Wine Industry	26/07/2007	Yes	partial	partial
	Presentation + Poster	Consumer Preferences for Brett – Australian Technical Wine Conference	Australian Wine Industry	28/07-02/08/07	-	-	partial
	Article	Project Portray – GWRDC R&D AT WORK, August 2007, p. 4-6.	Australian Wine Industry	04/08/07	Yes	-	-
X	Article	Project Results – What's important in choosing wine, Wine Business Monthly, August 2007, p. 32-33.	Australian Wine Industry	August/2007	Yes	Yes	-
X	Article	Project Results – Packaging is important, Wine Business Monthly, October 2007, p. 36-37.	Australian Wine Industry	October/2007	Yes	Yes	-

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
	Presentation	BW vs HR for wine preferences, 7th Pangborn Sensory Science Symposium, Minneapolis (later published as academic journal article)	International Sensory Science Researchers	13/08/07	-	-	Yes
X	Presentation/ Article	'Do respondents use extra information provided in online Best-Worst choice experiments?' Australian and New Zealand Marketing Academy Conference (ANZMAC), 3-5 December 2007, Dunedin, New Zealand	Australian and NZ marketing researchers	04/12/07	-	Yes	-
X	Presentation	Project Update - GWRDC	GWRDC, AWBC, Advisory Board	30/05/08	Yes	Yes	Yes
X	Presentation/ Article	The relationship between wine liking, subjective and objective wine knowledge: Does it matter who is in your 'consumer' sample?	Proceedings of 4th International Conference of the Academy of Wine Business Research, Siena,	17/07/08	-	-	Yes

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
X	Presentation/ Article	How important is wine packaging for consumes? On the reliability of measuring attribute importance with direct verbal versus indirect visual methods *Received Runner-up Best paper award*	Proceedings of 4th International Conference of the Academy of Wine Business Research, Siena, 17-19 July, 2008.	17/07/08	-	Yes	-
X	Presentation	2nd Annual Meeting of the American Association of Wine Economics in Oregon: Modelling consumer sensory preference heterogeneity – A case study on how the choice of clustering method impacts implications for optimal product design	International wine economics researchers	15/08/08	-	-	Yes
X	Presentation	Project Update – GWRDC, deliverables phase 2	GWRDC, AWBC, Advisory Board	19/09/08	Yes	Yes	Yes
	Presentation	Project Update – results Australian experiments	Vivian Boghossian, Chair Sensory and Consumer Science Group, Fosters	25/09/08	Yes	Yes	Yes

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
	DVD	Recording of presentation Project Update from 19/09/08	GWRDC, Advisory Group	26/09/08	Yes	Yes	Yes
X	Article	How consumers choose wine, Wine Business Monthly, October 2008, p. 32-33.	Australian Wine Industry	October/08	Yes	Yes	-
	Article	Daily Wine News: Australian wine researchers a step closer to predicting consumer choice	Australian Wine Industry	15/10/08	Yes	Yes	Yes
	Written Report	Understanding consumer preferences for Australian Shiraz wines with informed tasting Detailed results of Australian experiments Copy provided to GWRDC in December 2008	GWRDC, Advisory Group, 11 Wineries providing wine	13/12/08	Yes	Yes	Yes

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
	Presentation	Mueller, S., Szolnoki, G. (2009): Does packaging influence the price of wine?: A hedonic price analysis of US scanner data, invited presentation at the Australian Agricultural and Resource Economics Society, SA branch Later written up as conference paper for Auckland	Australian Agricultural Economists	17/03/2009	-	Yes	-
X	Article	Lockshin, L., Mueller, S., Louviere, J., Francis, L., Osidacz, P. (2009), Development of a new method to measure how consumers choose wine, The Australian and New Zealand Wine Industry Journal, Vol. 24 (2), 35-40.	Australian Wine Industry	04/05/2009	Yes	Yes	-
X	Article	Mueller, S., Lockshin, L., Louviere, J., Francis, L., Osidacz, P. (2009), How does shelf information influence consumers' wine choice?, The Australian and New Zealand Wine Industry Journal, Vol. 24 (3), p.50-58.	Australian Wine Industry	30/06/2009	Yes	Yes	-

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
	Presentation	Mueller, S., Osidacz, P., Francis, L., Lockshin, L. (2009), The relative importance of sensory and non-sensory product characteristics: Combining discrete choice and informed sensory testing, 8th Pangborn Sensory Science Symposium, Florence, 26-30 July 2009. Later written up as academic journal article for FQP.	International Sensory Science Researchers	28/07/2009	Yes	Yes	Yes
X	Article	Journal paper Mueller, S., Francis, L., Lockshin, L. (2009), Comparison of Best-Worst and Hedonic Scaling for the Measurement of Consumer Wine Preferences, Australian Journal of Grape and Wine Research, Vol. 15 (3), 205-215.	International wine researchers	Oct 2009	-	-	Yes
X	Article	Lockshin, L., Don't Ask Consumers, Wine Business Monthly,October 2009	Australian Wine Industry	October 2009	-	Yes	-

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
X	Article	Article accepted for publication Mueller, S., Lockshin, L., Louviere, L. (2010): What you see may not be what you get: Asking consumers what matters may not reflect what they choose. Marketing Letters. Available Online First.	International Marketing researchers	Oct 2009	-	Yes	-
	Article	Submitted to Journal Food Quality and Preference Combining discrete choice and informed sensory testing of extrinsic and intrinsic wine attributes: can it predict real world market share?	International food consumer preference researchers	30/10/2009	Yes	Yes	Yes
X	Presentation	Project Update – GWRDC, US market results	GWRDC, AWBC, Advisory Board	24/11/2009	Yes	Yes	Yes

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
X	Article	Mueller, S., Lockshin, L., Saltman, Y., Blanford, J. (2010), Message on a bottle: The relative influence of wine back label information on wine choice, Food Quality and Preference, Vol. 21(1), 22-32.	International food consumer preference researchers	Jan 2010	-	Yes	-
X	Article and conference presentation	Lockshin, L., Mueller, S., Louviere, J. (2010), The influence of shelf information on consumers' wine choice, 5th International Academy of Wine Business Research Conference 8-10 February 2010, Auckland (NZ).	International wine marketing researchers	Feb 2010	-	Yes.	-
X	Article and conference presentation	Mueller, S., Osidacz, P., Francis I.L., Lockshin, L. (2010), Combining discrete choice and informed sensory testing to measure extrinsic and intrinsic wine attributes, 5th International Academy of Wine Business Research Conference 8-10 February 2010, Auckland (NZ).	International wine marketing researchers	Feb 2010	Yes	Yes	Yes

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
X	Article and conference presentation	Mueller, S., Szolnoki, G. (2010), Wine packaging and labelling - do they impact market price? A hedonic price analysis of US scanner data, 5th International Academy of Wine Business Research Conference 8-10 February 2010, Auckland (NZ).	International wine marketing researchers	Feb 2010	-	Yes	-
X	Article	Mueller, S., Kweh, H., Lockshin, L. (2010), Can bottle weight be taken lightly for premium wine?, The Australian and New Zealand Wine Industry Journal, Vol. 25 (1), 28-30.	Australian Wine Industry	Feb 2010	-	Yes	-
X	Article	Mueller, S., Lockshin, L. (2010), Message on a bottle: The relative influence of wine back label information on wine choice, The Australian and New Zealand Wine Industry Journal, Vol. 25 (1), 32-35.	Australian Wine Industry	Feb 2010	-	Yes	-

enclosed App. 1	Type	Topic & Venue	Audience	Date	Project Sections - primarily related to		
					Overall	Extrinsic	Sensory
	Workshop	Lockshin, L., Mueller, S., Francis, L., Osidacz, P. What most influences consumer wine choices? The wine, the package or external information? Workshop at Australian Wine Technical Conference	Australian wine industry	July 2010	Yes	Yes	Yes
	Presentation	Mueller, S. Filling the gap – how do sensory and marketing attributes interact in consumer choices? Invited for presentation at Australian Wine Technical Conference	Australian wine industry	July 2010	Yes	Yes	Yes