

Wine packaging and labelling - do they impact market price?

A hedonic price analysis of US scanner data

Simone Mueller^a, Gergely Szolnoki^b

^a Ehrenberg-Bass Institute for Marketing Science, University of South Australia, Adelaide,
simone.mueller@unisa.edu.au

^b Geisenheim Research Center, Section of Economics and Market Research, Germany,
szolnoki@fa-gm.de

Abstract

Despite previous research has confirmed that wine packaging and labelling influence sensory wine evaluation, product associations and consumer choice, it is still unknown if they have an impact on the market price of wine. We report results from a hedonic price analysis of red wine scanner data from two US markets. While region of origin has the strongest impact on market price we also find significant price premiums and discounts for different label styles, label colours, bottle forms, closures and the presence or absence of front label information. Our findings give marketers valuable strategic insights on how to package and label wines to match consumer expectations for different price tiers.

Keywords: hedonic price analysis, scanner data, wine packaging, labelling information

Introduction and Literature Review

Many wine characteristics, such as region of origin, grape variety and brand reputation can only be changed in the very long term by most wine producers to react to consumer demand and market conditions. On the contrary, attributes such as the packaging and labelling of a wine are in the short term control of a winery and have attracted growing research interest over the last years.

Packaging design of food products in general and wine specifically was shown to influence consumers' sensory expectation and taste evaluation (Deliza and MacFie, 1996; Lange et al., 2002; Szolnoki, 2007). Orth and Malkewitz (2008) report five distinct holistic packaging design styles for which consumers have different product associations. Consumers' liking of a wine was found to be influenced by the label design and labelling information (Szolnoki, 2007). Also when actually choosing wine, consumers were found to react to label style, label colour and labelling information (Lockshin *et al.*, 2009; Mueller et al., 2009; Mueller *et al.*, 2010).

Prior research analysing individual responses found that different consumers like different packaging and label information (Mueller *et al.*, 2010; Lockshin *et al.*, 2009; Szolnoki, 2007; Szolnoki and Mueller, 2009). Whereas such preference heterogeneity can be observed on the individual level, it is possible that these differences cancel each other out over the total market. For instance, if one segment prefers a traditional label style this effect on demand and price could be offset by another segment preferring chateau-style labels (Lockshin *et al.*, 2009), resulting in a similar demand for both label styles on the aggregate level. Accordingly, it is uncertain if the previously observed impact of wine packaging and labelling on individual consumer preferences indeed translates into different market prices.

A range of economic hedonic pricing studies have shown price premiums or discounts relative to the average market price for different wine characteristics. Most of them have concentrated on extrinsic attributes such as region and country of origin (Nerlove, 1995; Oczkowski, 1994), grape variety (Steiner, 2004; Schamel and Anderson, 2003), wine type (Ling and Lockshin, 2003), vintage (Schamel and Anderson, 2003; Oczkowski, 1994) and producer characteristics (Nerlove, 1995; Oczkowski, 1994; Ling and Lockshin, 2003). Some have also studied how price is impacted by wine critic scores (Oczkowski, 2001; Combris *et al.*, 1997, Landon and Smith 1997, Bentzen and Smith, 2008) or expert sensory evaluations (Nerlove, 1995, Combris et al. 1997, Combris et al. 2000). Only Costanigro *et al.* (2007) analysed if the availability of label information was related to wine prices listed in a wine magazine. No prior study explored the relationship between wine packaging and market price.

Our study aims to answer two research questions:

- 1) Do different wine packaging or labelling characteristics achieve a price premium on the market?
- 2) What is the relative importance of wine packaging and labelling in explaining price relative to other extrinsic characteristics such as origin and grape variety?

Data

Most of the previous hedonic price studies used recommended prices in wine guides or magazines that only partially reflect the true market price. Also, many studies completely disregarded the commercially relevant lower price tier. No study has previously analysed real market prices from transactions over a longer time period that also account for promotional prices.

For our analysis we used scanner data from AC Nielsen, comprising market transactions between August 2007 and July 2008 from two major metropolitan US markets, Chicago (IL) and Tampa (FL). The data set contains units of four weeks of sales for n=1,166 stock keeping units (SKU) of red wine (750ml bottles) sold in both markets in grocery, liquor and drug stores. We calculated a unit weighted average price from promotional and non-promotional prices over the total one year time period that represents our dependent variable. Descriptive statistics in Table 1 show that our data set covers a wide range of the market spectrum, including wines that differ in their price, store availability and sales frequency.

Table 1: Descriptive statistics for n=1,166 red wine SKU (August 2007 - July 2008)

	mean	median	stdev	min	max
Price	\$15.42	\$11.76	\$11.89	\$3.40	\$166.85
Availability [0% ;100%]	25.9	18.3	22	1	96.8
Units sold	7,586	1,744	15,891	5	188,669
Sales volume	\$77,833	\$26,459	\$145,923	\$36	\$1,602,893

Based on each SKU's identification, provided by ACN, with country of origin, grape variety, brand and wine name, photographs for each wine showing the total bottle and the front label were accessed from the internet. Label style categories were developed based on existing packaging style categories (Orth and Malkewitz, 2008) and from our own qualitative work. We asked eight regular wine consumers, who differed in their gender, age and wine involvement, to sort 500 wine labels into categories they perceived to be distinct. From this all packaging and information variables were specified for each SKU by two independent coders using objective coding books.

The Model and Estimation

Following conventional hedonic models, the price of a good is a linear function of its utility-generating characteristics for which implicit prices are predicted. Any qualitative and quantitative variable that affects consumer utility can be included in the model.

$$(1) \quad price = f(availability, origin, grape\ variety, packaging, front\ label\ information)$$

We formulate a model (equation 1) assuming that consumers' utility is affected by its availability (linear and quadratic term), its origin (27 nested coded dummy variables for country and region), its grape variety (9 categories), its packaging, and front label information. Each wine's packaging is defined by its label style (8 cat.), label colour (5 cat.), bottle form (3 cat.) and closure (2 cat.). Six binary variables are used to quantify the presence or absence of front label information: brand name, country of origin, region of origin, grape variety, additional wine specific information and other general information. All categorical variables are effects coded which also allows us to calculate an implicit price for the reference category that is not confounded with the constant, representing the average price (grand mean).

Wine expert ratings are not available for the majority of commercial wines and vary with vintage, which is not specified in our data set because older vintages get continuously replaced on the shelves with younger ones. Unlike many other hedonic wine price studies we could not include a quality rating variable in our model. While this potentially might decrease the explained variance of our model, it is very likely to reflect the real market conditions. Most food and drug stores in the US only rarely display wine critic's scores and are more frequently found only in specialty liquor stores.

While the theoretical model described in formula (1) limits the type of explanatory variables, it does not restrict the functional form to be estimated. A large variety of different functional forms have been reported in the empirical hedonic wine pricing literature. The results from applying a RESET-test to ten different empirical model specifications¹ led us to prefer the reciprocal square root model specification $p^{-0.5}$ (Ramsey $F_{3,1107}=0.97$, $p=0.41$). While residuals are not completely normally distributed (Shapiro-Wilk $z=4.61$, $p<0.01$) we cannot reject the hypothesis that the residuals have a homogeneous variance (Breusch-Pagan test $\chi^2=3.03$, $p=0.082$). The reciprocal square root model has also previously been chosen to be the optimal specification by Costanigro *et al.* (2007) and Landon and Smith (1997).

When interpreting the following results, it should be considered that because the dependent variable price was transformed to $p^{-0.5}$, price premiums have a negative coefficient while price discounts have a positive sign.

Results

We estimated a base model without packaging and front label information variables and a full model including all variables specified in (1). According to Table 2 packaging and front label information significantly improve the model and contribute 7% to the explained variance (Adj. R^2). Significantly different average prices between domestic and imported wines led us to also separately estimate a US and an import model, including only US and imported wines (Schamel and Anderson, 2003). These separate models considerably improve the model fit for the US model and more strongly discriminate price differentials for origin and grape variety, but we do not have space to report these here. For both the US and import model, packaging and front label information improve the explained price variance by 8% and 12% respectively.

Table 2: Explained variance of models with and without packaging and information variables

Adj. R^2	Total model	US model	Import model
	n=1,166	n=630	n=536
no packaging variables	49%	53%	35%
including packaging & information	56%	61%	47%
contribution of packaging & information	7%	8%	12%

Table 3 presents the estimated coefficients and implicit prices (in US\$) for packaging and information characteristics for the total model. Results from the separated domestic and import models are very similar in and deviate only slightly.

Because all categorical packaging variables were effects coded, coefficients and price estimates are interpreted relative to the constant, which reflects the average price over all wines (grand mean). Accordingly we find that red wine in Burgundy bottles is sold at \$1.41 above average while Bordeaux bottles attract a discount of \$1.31. Other bottle types such as the amphora style do not have a significant impact on price. The estimates for closure result in a \$0.97 discount for screw cap and \$1.07 premium for cork, confirming that wine consumers in the US do not yet accept screw cap closures (Caputo, 2008). The estimates for all six label colour categories are significant at $p=0.05$. Black and crème/grey labels realise a positive price premium of \$2.03 and \$0.96, while other colours and multi colour labels are more represented in the lower price tiers and accordingly attract a price discount of \$1.56 and

¹ We tested the ladder of power, including p^2 , $p^{1.5}$, linear, log linear, $p^{0.5}$, Box-Cox, $p^{-0.5}$, p^{-1} , $p^{-1.5}$ and p^{-2} .

\$1.05. White labels, which are the most frequent in the sample, are not priced significantly different from the average.

Table 3: Results for packaging and front label information variables for total model (n=1,166)

	Coef. (x 10 ²)	t	P> t	price estimate (\$)	confidence interval	
					low (\$)	high (\$)
Bottle_bordeaux	1.17	4.56	0.00	-1.31	-0.89	-1.59
Bottle_burgundy	-1.10	-2.79	0.01	1.41	2.94	0.35
Bottle_other *	-0.07			0.08		
Closure_screw cap	0.85	3.00	0.00	-0.97	-0.40	-1.35
Closure_cork *	-0.85			1.07		
Colour_creme/grey	-0.76	-2.11	0.04	0.96	2.26	0.05
Colour_black	-1.53	-3.05	0.00	2.03	4.15	0.59
Colour_monochrome	1.40	4.20	0.00	-1.56	-1.00	-1.92
Colour_multi colour	0.92	2.32	0.02	-1.05	-0.20	-1.61
Colour_white *	-0.03			-0.38		
Label_clean uni colour	-1.13	-2.12	0.03	1.46	3.51	0.09
Label_clean highlight	1.32	3.79	0.00	-1.47	-0.85	-1.87
Label_chateau basic	-0.26	-0.57	0.57	0.31	1.72	-0.64
Label_chateau highlight	1.38	3.27	0.00	-1.54	-0.75	-2.05
Label_delicate elegant	-0.47	-0.85	0.40	0.58	2.39	-0.62
Label_animal graphic	1.19	2.66	0.01	-1.34	-0.43	-1.93
Label_artwork graphic	0.46	1.24	0.22	-0.54	0.38	-1.17
Label_nondescript *	-2.49			3.50		
Info_country	-0.40	-1.69	0.09	0.50	1.29	-0.07
Info_region	-0.51	-2.38	0.02	0.63	1.38	0.09
Info_grape	0.81	2.75	0.01	-0.93	-0.32	-1.34
Info_other	-1.26	-5.30	0.00	1.64	2.70	0.87
Info_additional	-2.32	-4.77	0.00	3.22	5.70	1.54
constant	25.52	40.42	0.00	15.35	16.96	13.96

* reference category of effects coded categorical variables (t-statistics and confidence interval unavailable)

Five of eight label styles have implicit prices that are different from zero. Nondescript and clean uni-colour labels are overrepresented in higher price tiers and achieve a price premium of \$3.50 and \$1.46 respectively. An interesting effect can be observed for both pairs of chateau and clean labels, where each version with a coloured or golden highlight attracts a price discount relative to its un-highlighted counterpart. This is an interesting result as gold and coloured accents are often thought to achieve a price premium in the market. Possibly, this effect might have been over-used and lost its credibility. Not surprisingly, graphical animal labels, also called critter labels, attract a price discount, confirming that they are mainly positioned in the lower price tiers (Port, 2008). Wine prices for delicate elegant and artwork graphic label styles were not found to differ from the average. Some of the label styles and label colours for which we found a price premium also concur with findings from a choice experiment with Australian wine consumers (Lockshin *et al.*, 2009).

Estimates for all front label information variables represent the implicit price for the presence of information. The results seem to follow a general rule – the more the better (or the more information the higher the price), with the exception of grape variety which has a negative

implicit price. When estimating separate domestic and import models this negative effect can only be observed for US wines but not for imported wines. This suggests that generic European wines such as Bordeaux and Chianti, not stating a grape variety, do not suffer a price discount. Why is this different for US wines? One would expect that US ‘red blends’ that do not state a specific grape variety would attract a price discount. While we can indeed observe a small price discount for red blends in the lower price tiers, this effect is more than compensated by a number of icon wines such as ‘Opus One’ that are positioned in the maximum price tier >\$50.

The observed price premium for wines indicating a country and region of origin on the front label is congruent with expectations. The substantive price premiums gained by other information is surprising. Story or history information on the front label resulted in a price premium of \$1.64 while additional wine specific information, such as estate grown, single vineyard, reserve or old vine attracted a premium of \$3.22.

From the maximum price difference for each attribute relative to the sum of the price differences over all attributes (not presented here) we calculated the attribute importance for all three models (Table 4). While we cannot discuss detailed differences between the US and import model, it becomes clear that origin has the largest impact on wine prices. This is not surprising as regional reputation is very inelastic, it takes time to evolve and change (Schamel and Anderson, 2003). Packaging characteristics follow as second most important for all models, with label style for the total and US model and label colour for imported wines. While grape variety is third most important in the US it is only next to last for imported wines, largely caused by European origins that do not state grape varieties on the front label. Label information is the fourth most important attribute in our study, contributing between 8% and 11% of explained price differences.

Table 4: Attribute importance (measured as relative share of price differences)

	Total model	rank	US model	rank	Import model	rank
Origin	59%	1	34%	1	40%	1
Label style	10%	2	21%	2	10%	5
Label information	8%	3	9%	4	11%	4
Grape variety	8%	4	14%	3	9%	6
Label colour	7%	5	8%	6	14%	2
Bottle form	5%	6	5%	7	12%	3
Closure	4%	7	9%	5	4%	7

Conclusion

Analysing scanner data of red wine sales in two metropolitan US markets we found a significant impact of packaging and front label information on wine prices. For the first research question it can be concluded that a large number of packaging and label information could be identified that achieve a significant price premium and discount on the market for red wines in the US.

While region of origin attracts the highest differences in implicit prices (34% to 59%), packaging can be related to between 26% (total model) and 42% (US model) of predicted price differences, while label information is linked to between 8% and 11% of total price differentials. Accordingly, for the second research question it can be concluded that wine

packaging is related to price differences that are almost as high as for origin, while labelling information has the smallest impact.

These findings were derived from real market transactions covering all market price tiers and reflect reliable and valid results. Our findings of price premiums and discounts for certain packaging and labelling attributes have a high relevance for strategic marketing and can be utilised in the short term to package and label wines for different price tiers.

At this stage it is unclear to what degree those price premiums and discounts we found are related to stable consumer perceptions and how uniform they are in different international markets and for other wine categories like white wine. Unlike regional differences that do not change in the short term, producers can adapt their packaging rapidly. Therefore it is likely that price premiums will be eroded by offering more wines with those packaging characteristics, which recently attracted a price premium. Further research is necessary to address these questions.

Acknowledgements

This project was supported by Australia's grapegrowers and winemakers through their investment body the Grape and Wine Research Development Corporation with matching funding from the Australian Government. Gergely Szolnoki's research visit in Adelaide was supported by the Geisenheim Research Center and funding from the School of Marketing at the University of South Australia.

References

- Bentzen, J. & Smith, V. (2008). Do expert ratings or economic models explain champagne prices?. *International Journal of Wine Business Research*, 20(3), 203-243.
- Caputo, T. (2008), How to break into the U.S. market, *Meininger's Wine Business International*, 2/2008, p. 34-35.
- Combris, P., Lecocq, S., & Visser, M. (1997). Estimation of a Hedonic Price Equation for Bordeaux Wine: Does Quality Matter?. *The Economic Journal*, 107 (2), 390-402.
- Combris, P., Lecocq, S., & Visser, M. (2000). Estimation of a Hedonic Price Equation for Burgundy Wine. *Applied Economics*, 32 (8), 961-967.
- Costanigro, M., McCluskey J. J., & Mittelhammer, R. C. (2007). Segmenting the Wine Market Bases on Price: Hedonic Regression when Different Prices mean Different Products. *Journal of Agricultural Economics*, Vol. 58 (3), 454-466.
- Deliza, R., & MacFie, H. J. H. (1996). The generation of sensory expectation by external cues and its effect on sensory perception and hedonic ratings: A review. *Journal of Sensory Studies*, 11(2), 103-128.
- Landon, S., & Smith, C.E. (1997). The Use of Quality and Reputation Indicators by Consumers: The Case of Bordeaux Wine. *Journal of Consumer Policy*, 20 (3), 289-323.
- Lange, C., Martin, C., Chabanet, C., Combris, P., & Issanchou, S. (2002). Impact of the information provided to consumers on their willingness to pay for Champagne: comparison with hedonic scores. *Food Quality and Preference*, 13(7-8), 597-608.

- Ling, B., & Lockshin, L. (2003). Components of wine prices for Australian wine: how winery reputation, wine quality, region, vintage, and winery size contribute to the price of varietal wines. *Australasian Marketing Journal*, Vol. 11 (3), 19-32.
- 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.
- Mueller, S., Lockshin, L. & Louviere, J. (2010), What you see may not be what you get: Asking consumers what matters may not reflect what they choose, *Marketing Letters*, Vol. 21, forthcoming.
- 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), 50-56.
- Mueller, S., & Szolnoki, G. (2009), Conjoint analysis: Modelling consumer heterogeneity with latent class regression, Poster, 8th Pangborn Sensory Science Symposium, Florence, 26-30 July 2009.
- Nerlove, M. (1995). Hedonic Price Functions and Measurement of Preferences - The Case of Swedish Wine Consumers. *European Economic Review*, 39 (1), 1697-1716.
- Oczkowski, E. (1994). A Hedonic Price Function for Australian Premium Table Wine. *Australian Journal of Agricultural Economics*, 38 (2), 93-110.
- Oczkowski, E. (2001). Hedonic Wine Price Functions and Measurement Error. *The Economic Record*, 77 (239), Dec. 2001, 374-382.
- Orth, R. U., & Malkewitz, K. (2008). Holistic Package Design and Consumer Brand Impressions. *Journal of Marketing*, 72, 64–81.
- Port, J. (2008), Sting in the tail, *The Age*, July 22, 2008.
- Steiner, B. (2004). French Wines on the Decline? Econometric Evidence from Britain. *Journal of Agricultural Economics*, Vol. 55 (2), July 2004, 267-288
- Schamel, G., & Anderson, K. (2003). Wine Quality and Varietal, Regional and Winery Reputations: Hedonic Prices for Australia and New Zealand. *The Economic Record*, 79 (246), Sept. 2003, 357-369.
- Szolnoki, G. (2007). Die Messung des Einflusses der äußeren Produktgestaltung auf die Kaufbereitschaft – Dargestellt am Beispiel Weißwein. *Geisenheimer Berichte*, Geisenheim, Band 61.
- Szolnoki, G. & Mueller, S. (2009), On the bottle or inside the bottle? The relative influence of wine packaging on hedonic liking and purchase intent, Poster, 8th Pangborn Sensory Science Symposium, Florence, 26-30 July 2009.