Are Australian wine consumers becoming more environmentally conscious?

Robustness of latent preference segments over time

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Abstract

Environmental concerns have gained increasing general media attention and a number of producers seized this opportunity by marketing their products with environmental claims. It is still unknown to which degree consumers reacted to the intensified environmental debate by changing their preferences towards eco-friendly products. In this study, we replicate a choice experiment by Remaud et al. (2008) in order to assess the extent to which Australian wine consumers' preferences for organic and environmentally friendly claims have changed between 2007 and 2009. The replication of the same experiment also allows us to test the stability of latent preference segments over time.

Between 2007 and 2009 we found Australian wine consumers generally increased their attention to region of origin and became less price sensitive when purchasing wine for a special occasion. This finding is also supported by AC Nielsen scanner data. While the environmental claim has the same importance (5%) for choice over all consumers, its influence strongly increased for one environmental sensitive segment. Surprisingly, we can also identify a segment where consumers seem to be 'eco-allergic', with a considerable negative utility from environmental claims. The replication of the choice experiment drawing a sample from the same wine consumer population, generated a remarkable stable market segmentation that is derived from differences in consumer choices. The robustness of this choice segmentation is an indication of stable underlying preference segments that can be uncovered with scale extended latent class choice models.

Keywords

Preference segmentation, environmental claims, Discrete Choice Experiment, organic wine.

Introduction

Marketing sustainability and promoting of environmental credentials has become part of the competition between wine producers. In particular new world wine producing countries react to the potential disadvantage in consumer perception from long transport distances to their main markets resulting in high food miles and large carbon food prints by initiating sustainable programs (Savage, 2009). For instance, more Australian wine growers are moving towards organic viticulture (Bourne, 2009), New Zealand cultivates its 'clean and green' image and Chile recently passed a country-wide sustainable code of conduct (Gibb, 2009). So far producers mainly reacted to pressure from large intermediaries such as national supermarket chains and it is unclear how far these trade interests indeed reflect increased consumer concerns. It is therefore of special interest to explore if wine producers' increased attention to environmental production methods is reflected by consumers' reinforced environmental preferences or if it largely anticipates potential future consumer concerns.

Most of the studies previously estimating consumers' preferences and willingness to pay for eco-friendly wines used different methods and are limited to one point in time, preventing to compare results between different samples or over time. In a study conducted in November 2007, Remaud et al. (2008) found that Australian wine consumers overall did very little value environmental claims. While eco-friendly claims (carbon neutral or environmentally friendly) accounted for only 5% of their decision to choose a wine, with 0.2% organic was almost negligible. Within the total population only one segment, comprising 15% of all consumers, valued environmental and organic claims more strongly (20% of their decision to choose).

In the meantime, Australian citizens elected a new government in 2007 that entered office with a political agenda full of environmental 'promises'. A former popular singer, known for its environmental engagement, has been appointed as Minister for the Environment and a newly established Ministry for Climate Change and Water was created. Key outcome of the new Labor government were Australia's ratification of the Kyoto protocol, a national water plan and preliminary discussion about a carbon-trading scheme. Also because of an extensive drought and extreme weather conditions, 'Environment' has been placed more than ever under media spotlights, potentially generating greater consumer awareness towards eco-friendly products, including wine.

Considering these changes, we investigated the extent to which Australian consumers' preferences towards eco-friendly wines have changed since our first study. In order to do so, 18 months later we replicated the original experiment from November 2007. Such a replication allows us to provide responses to the following research questions:

1) Did the relative importance of eco-friendly claims for wine choice change between 2007 and 2009?
2) Over time, how robust is a segmentation of Australian wine consumers that is based on behavioural measures in form of choices?

The paper is structured as follows: we start with a brief literature review with a focus on wine market segmentation, following by a description of the research design used in 2007 and 2009. Results are then presented and discussed.

Literature review

For a detailed literature review on the importance and willingness to pay for environmental claims and organic wine we refer to Remaud et al. (2008). The authors are not aware of any more recent publications in this specific field for wine.

Stability of segmentation

Segmentation is the process of dividing the marketing into consumer groups with similar preferences or purchase behaviour to enable the development and targeted distribution of products best suited to such groups. It has become a dominant concept in marketing literature and practice (Wind 1978). The key question, to what extent the different available segmentation techniques discover true underlying consumer segments that differ in their behaviour or merely model data artefacts, has haunted segmentation research for a long time (Wedel and Kamakura, 2000). In this regard three broad concepts can be distinguished: the analysis of internal validity (prediction within the data set, Schellinck and Fenwick, 1981), external validity (predictability of true market behaviour Wind, 1978) and stability of segments over time (Calantone and Sawyer, 1978).

Finite mixture models that simultaneously estimate cluster preferences and cluster membership have proven to be highly statistically efficient and have become increasingly popular (Wedel and Kamakura, 2000). Latent Class choice modelling is one specific type of finite mixture model suitable for stated preferences from discrete choice experiments (Magidson and Vermunt, 2001).

The internal and external validity of finite mixture models as well as their stability has so far been analysed for revealed preferences, especially from from purchase panel data. Ailawadi et al. (1999) found large segments derived from finite mixture models and their price elasticity to be fairly stable over time but smaller segments were less stable. In a simulation study, Andrews and Curim et al. (2003) reported strongly reduced error when segmenting with finite mixture models and when comparing several segmentation approaches. Andrews et al. (2010) found a better validation for finite mixture models for holdout samples. No previous insights on the stability of finite mixture models for stated preferences in choice models exist so far.

Latent class choice models are well-suited to segment consumers based on what product characteristics they use to make their purchase decisions. That is this segmentation approach is based on (simulated) purchase behaviour that was found to be a stronger and more stable predictor for actual purchase behaviour than attitudes, motives, intentions and sociodemographic characteristics (Wedel and Kamakura, 2000).

In most segmentation studies related to wine, consumers are segmented using variables that are not directly linked to the consumer buying behaviour. Such segmentations were based on socio-demographics variables (Thach and Olsen, 2006), psychographic variables such as wine involvement (Lockshin et al., 2001), attitudes towards various aspects of the consumers' lifestyle (Bruwer and Li, 2007), or price-tiers (Guibert and Dubois, 2006). Comparing two lifestyle related segmentations for South Australian consumers over time (Bruwer and Li, 2007 and Bruwer, Li and Reid 2002) revealed significant changes in the resulting clusters. Drawing samples from the national wine consumer population we aim to test the robustness of latent class segments over time.

Research Design

The same discrete choice experiment (DCE), as described in full detail in Remaud et al. (2008), was applied for this study. To recap very briefly, consumers had to choose wines for a special occasion that differed in four attributes: *price* ($12.50, $19, $25.50, $32), *region of origin* (South Eastern Australia, Heathcote, McLaren Vale, Barossa Valley), *environmental claims* (none, environmentally responsible, carbon neutral), and *organic claim* (none and certified organic). A 4^4 orthogonal main effects plan with 16 choice sets and choice set size of four controlled how attribute levels were allocated into choice stimuli. Its information efficiency was of 100% (Street and Burgess, 2007). To simulate a realistic choice scenario, attributes were combined graphically into wine labels in an off-white chateau style and had the same brand 'Hook Hill Estate'. Respondents were asked to choose a wine they most preferred for a special occasion and indicated whether they realistically would purchase their selected wine.

Sample

As for the 2007 survey, 756 (different) regular wine consumers living across Australia were recruited for the experiment using the same online panel provider. Both samples were drawn from the same population with a time difference of 18 months (November 2007 and May 2009). Both samples can be assumed to be representative for Australian wine consumers. Based on their response time and choice patterns (straight lining) about 10% of the respondents were identified as random choosers in both samples. These respondents were allocated to a random class and removed from the subsequent analysis as their choices could not be explained by product attributes.

Analysis

We analysed respondents' choices with a scale extended latent class choice model (Latent Gold 4.5 Syntax module). This allows us to derive different consumer segments (classes) based on choice behaviour differences between consumers. By modelling two independent scale classes we also consider respondents' choice consistency reflected in their error variance and thereby prevent a confound of preference heterogeneity with differences in choice consistency (Vermunt and Magidson, 2008; Mueller et al., 2010). The optimal number of classes was determined by the lowest Bayesian Information Criteria (BIC-value) and attribute importance was estimated by calculating partial R-Squares, that is the partial log-likelihood associated with each attribute across all its levels was calculated for each class according to Louviere and Islam (2008).

Results

While respondents' choices in 2007 was best explained by five classes and a random class, for the 2009 sample the BIC criteria suggested an optimal number of six classes and a random class. The part worth utility estimates of the six classes for all attribute levels are given in Appendix 1. Tables 1 and 2 compare the segment size, the attribute importance overall and for each segment for the 2007 and 2009 samples. For identification purpose, segments are abbreviated with *S* for the 2007 solution and with *C* in the 2009 results.

Preference segmentation stability

Comparing both segmentation solutions for 2007 and 2009 reveals remarkable similarities and only minor differences. As reported above the latent class choice model suggested the existence of one additional cluster in 2009 compared to 2007 (see Table 1).

The segment that highly valued low prices decreased in its size from 44% in 2007 to 30% in 2009 (S1 and C1 in Table 1). This is in accordance with the decreased in importance of price in the 2009 study that was later validated by AC Nielsen sales data for the Australia market (ACN, 2009). Some of these very price conscious consumers are likely to have moved to the next price-tiers, increasing the middle price segments size to a total of about 31% (C2a and C2b) compared to a segment size of 21% in 2007 (S2). In 2009, this mid-price segment includes one small group of consumers (11% of the population) who value an environmental claim (31% importance), and more precisely the claim 'environmentally responsible' (Appendix 1). The other segment (C2a) is mainly price focussed.

The size of the high price segment S3/C3 is stable over time (8%). The key difference is the importance of the eco claim. In 2007, this segment did not value positively or negatively any of the eco claims when choosing wine (Appendix 1). In 2009 we found the high price segment to react negatively to eco claims.

In both studies there appeared a segment that highly values the Barossa Valley region of origin when choosing wine (S4 and C4). Over time its relative size stayed stable with exactly 15% of the wine population. While this segment was positively impacted by environmental claims and very slightly preferred certified organic wine in 2007, it is moderately impacted by an organic claim in 2009. Finally, a segment preferring wine from the McLaren Vale (S5 and C5) is identified by identical choice drivers and has the slightly changed in size from 12% to 16% of the Australian wine population between 2007 and 2009.

Table 1: Relative attribute importance, segment size and characterisation for the 2007 and 2009 experiments

2007	**S1**	**S2**	**S3**	**S4**	**S5**	**Total Sample**
	Low price	**Mid price**	**High price**	**Region + environ**	**Region**	
Segment size	**44%**	**21%**	**8%**	**15%**	**12%**	**100%**
Price	98%	91%	96%	2%	12%	72%
Region	1%	0%	3%	77%	87%	23%
Environmental	0%	9%	1%	20%	0%	5%
Organic	0%	0%	0%	1%	0%	0.2%

2009	**C1**	**C2a**	**C2b**	**C3**	**C4**	**C5**	**Total Sample**
	Low price	**Mid price**	**Mid price + environ**	**High price**	**Region + organic**	**Region**	
Segment size	**30%**	**21%**	**11%**	**8%**	**15%**	**16%**	**100%**
Price	97%	95%	65%	83%	2%	17%	66%
Region	2%	2%	4%	3%	86%	83%	27%
Environmental	1%	2%	31%	15%	0%	0%	5%
Organic	0%	1%	0%	0%	11%	0%	2%

Changes in attribute importance

For the overall attribute importance (total sample) we can observe that price is slightly less important in 2009 when purchasing a wine for a special occasion (66% compared to 72% in 2007). While this might first seem surprising in a recession year, the move of Australian wine consumers to higher prices was later confirmed by AC Nielsen scanner data for 2008-09, reporting a 2.7% increase of the price segment >$20 and a 6.2% increase of the price segment $15-$20, while price tiers <$15 lost a total of 5.9% (ACN, 2009).

This decrease in price importance was off-set by a slight increase in the importance of region of origin (27% relative to 23% in 2007) and a strong increase of the organic claim from a very small basis (increase from 0.2% to 2.0%). This increase in stated attribute importance is also confirmed by moderate increases of organic wine sales in Australia (Speedy, 2009). The relative importance of environmental claims did not change on the aggregated level (5% for both samples). Nevertheless, we can observe changes in the importance of environmental claims when we consider preference heterogeneity. While in 2007 environmental claims were important only to one segment (S4, with about 15% of consumers), in 2009 we find one segment representing 11% of consumers for which these are positive (C2b: 31% importance) and one segment with a disutility from environmental claims (C3: 15% importance). This last segment had to be compensated with a lower price for having to purchase a wine with an environmental claim. The propagation of environmental programs in Australia seems to have polarised wine consumers by positively influencing some consumers while others reject it as marketing gimmick.

The segments' revealed choice preferences are also reflected in their associations with environmental claims (preference maps) that cannot be detailed here because of space limitations. 'Eco-allergic' wine consumers are more likely to be male and young to mid-aged. Compared to other segments they stronger disagree with the statement 'at heart, I'm an environmentalist' and tend to agree more with the idea that 'threats to the environment are exaggerated'.

As both negative and positive effect offset each other on the aggregated level, the conclusion that Australian consumers did not change would be misleading. Instead we have to conclude that some Australian wine consumers became more environmentally conscious, while others developed a negative attitude towards environmental claims. The potential to sell organic or environmentally friendly labelled wine has increased in Australia since 2007.

Discussion and Conclusion

Did the relative importance of eco-friendly claims for wine choice change between 2007 and 2009? Our results indicate that the influence of environmental and organic claims on wine choice Australia has increased slightly over time. Organic wine has strongly improved in consumer valuation, from a negligible basis of 0.2% in 2007 to 2% in 2009 over all consumers. Especially consumers purchasing red wine from the Barossa region value organic wine. Regarding environmental claims we find a stable overall importance of 5% that masks a polarisation of diverging consumer preferences. While for some consumers environmental claims have increased in importance when choosing wine, one segment strongly rejects these claims. The fact that the environmental conscious group more strongly values the claim 'environmentally responsible', a claim that is not currently defined with standard

specifications, indicates that it is easier to understand and is more meaningful than 'carbon neutral'.

For our second research question, how robust is the behavioural choice based segmentation of Australian wine consumers over time, our findings highlight that behavioural segments derived with finite mixture models are mostly stable over time. We found strong structural similarities between the Latent Class segments between 2007 and 2009. Further analysis will characterize each segment for both experiments and compare the extent each segment's profile changed over time or, as for the segmentation itself, these profiles are also stable.

References

ACN (2009), AC Nielsen Scan Track, scanner data for the Australian wine market red and white wine sales, financial year 2008-09, MAT to 14/06/2009.

Ailawadi, K.L, K. Gedenk, S.A. Neslin (1999), Heterogeneity and purchase event feedback in choice models: An empirical analysis with implications for model building, *International Journal of Research in Marketing*, 16, 177-198.

Andrews, R.L., Brusco, M.J., Currim, I.S. (2010), Amalgamation of partitions from multiple segmentation bases: A comparison of non-model-based and model-based methods. *European Journal of Operational Research* 201, 608-618.

Andrews, R.L., Currim, I.S., 2003. Recovering and profiling the true segmentation structure in markets: an empirical investigation. *International Journal of Research in Marketing* 20, 177-192.

Bourne, P. (2009), Wine organics, *The Sydney Magazine*, 15 September 2009.

Bruwer, J., Li, E., Reid, M., 2002. Segmentation of the Australian Wine Market Using a Wine-Related Lifestyle Approach. *Journal of Wine Research* 13, 217-242.

Bruwer, J., and Li, E., (2007), "Wine-Related Lifestyle (WRL) Market Segmentation: Demographic and Behavioural Factors", *Journal of Wine Research*, Vol. 18, No. 1, pp. 19-34

Calantone, R. and A.G. Sawyer (1978), The stability of Benefit Segments, *Journal of Marketing Research*, 25, 395-404.

Gibb, R. (2009), Chile unveils sustainability code, *Decanter*, 10 September 2009.

Guibert, N., and Dubois P.-L., (2006), "La segmentation: logique d'étude et logique d'action. Une application au marché du vin", *Décisions Marketing*, N. 42, Avril-Juin.

Lockshin, L., Quester, P., Spawton, T., (2001), "Segmentation by Involvement or Nationality for Global Retailing: A Cross-national Comparative Study of Wine Shopping Behaviours", *Journal of Wine Research*, Vol. 12, No. 3, pp. 223-236

Louviere, J., & Islam, T., (2007), "A comparison of importance weights/measures derived from choice-based conjoint, constant sum scales and best-worst scaling", *Journal of Business Research*, Vol. 61 Issue 9, pp. 903-911

Magidson, J. and J. K. Vermunt (2001). Latent class factor and cluster models, bi-plots, and related graphical displays. *Sociological Methodology*, Vol 31, 223-264.

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.

Remaud, H., Mueller, S., Chvyl, P., Lockshin, L. (2008), Do Australian wine consumers value organic wine? *Proceedings of 4th International Conference of the Academy of Wine Business Research*, Siena, 17-19 July, 2008.

Savage, G. (2009), Green warning for old world, *The Drink Business*, 28.10.2009 http://www.thedrinksbusiness.com/index.php?option=com_content&task=view&id=10512&Itemid=66

Schellinck, T. and I. Fenwick (1981), Testing the stability of market segmentation analysis, *Advances in Consumer Research*, 8, 723-727.

Speedy, B. (2009), Vintage performance for organic winemakers, *The Australian*, 27 July, 2009, p. 16.

Street, D., and Burgess, L., (2007), *The Construction of Optimal Stated Choice Experiments: Theory and Methods*. Hoboken, New Jersey: John Wiley & Sons, Inc

Thach, E., and Olsen, J., (2006), "Market Segment Analysis to Target Young Adult Wine Drinkers", *Agribusiness*, Vol. 22 (3), pp. 307-322

Vermunt, J. K., & Magidson, J. (2008). *Manual for Latent Gold 4.5® Syntax Module*. Belmont Massachusetts: Statistical Innovations Inc

Wedel, M., & Kamakura, W. A. (2000), *Market segmentation: conceptual and methodological foundations*, 2nd ed., Boston: Kluwer Academic.

Wind, Y. (1978), Issues and Advances in Segmentation Research, *Journal of Marketing* Research, 15, 317-337.

Appendix

	Class1			**Class2a**			**Class3**			**Class4**			**Class5**			**Class2b**			**Random**
Class Size	198			141			51			102			104			74			86
share of all	**26%**			**19%**			**7%**			**13%**			**14%**			**10%**			**11%**
share/random	29.7%			21.0%			7.6%			15.2%			15.5%			11.0%			
R^2	63%			54%			38%			47%			44%			36%			
	utility	z-value	s.	utility	z-value	s.	utility	z-value	s.	utility	z-value	s.	utility	z-value	s.	utility	z-value	s.	utility
price																			
$12.50	31.21	6.06	**	10.67	4.20	**	-25.99	-4.91	**	-5.28	-3.51	**	-2.24	-3.33	**	-9.55	-5.05	**	-
$19.00	14.32	5.07	**	35.11	5.91	**	-4.69	-2.27	**	6.67	4.17	**	13.21	5.20	**	4.32	3.9	**	-
$25.50	-10.14	-4.29	**	3.09	1.54		8.59	4.02	**	1.27	1.04		8.06	4.19	**	20.82	6	**	-
$32.00	-35.39	-5.47	**	-48.87	-5.49	**	22.08	5.82	**	-2.66	-3.02	**	-19.03	-5.46	**	-15.60	-5.39	**	-
region																			
South E. Australia	-6.36	-3.08	**	-1.93	-1.40		-4.19	3.34	**	-11.06	-4.97	**	-8.66	-4.71	**	-3.83	-3.74	**	-
Heathcote	-6.01	-3.81	**	-8.35	-4.16	**	-0.60	4.73	**	-10.11	-5.19	**	-27.01	-5.30	**	-0.62	-0.88		-
McLaren	2.71	3.34	**	4.81	3.17	**	3.63	-4.97	**	-4.82	-3.66	**	26.72	5.89	**	4.19	4.13	**	-
Barossa	9.66	4.73	**	5.47	3.52	**	1.16	-5.19	**	25.99	6.04	**	8.95	5.30	**	0.25	0.44		-
environment																			
none	-0.54	-1.12		-7.46	-4.15	**	10.24	4.67	**	-1.96	-2.46	**	0.34	0.91		-15.66	-5.37	**	-
environ respons	5.12	3.52	**	3.66	3.06	**	-3.30	-2.56	**	2.69	2.87	**	-0.26	-0.64		12.54	5.11	**	-
carbon neutral	-4.58	-3.04	**	3.80	2.93	**	-6.94	-3.75	**	-0.73	-1.36		-0.08	-0.52		3.12	4.19	**	-
organic																			
none	-1.10	-2.26	**	-4.71	-3.65	**	0.51	0.77		-11.07	-5.31	**	-0.04	-0.24		-0.37	-1.24		-
organic	1.10	2.26	**	4.71	3.65	**	-0.51	-0.77		11.07	5.31	**	0.04	0.24		0.37	1.24		-

R^2=0.477, LL=-10,572.7; BIC(LL)=22,556.4; Classification Error=0.06; n=756, #parameters=62; df=694; 7 Classes, 2 scale classes

Significance levels ** p<0.05