Examining generational preferences for sustainability attributes of wine: a discrete choice experiment in California

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Abstract

Millennials are the largest demographic segment in the USA (Wine Market Council, 2016) and have gained market share of high frequency wine drinkers while Baby Boomers and Gen-X generations are falling in market share (Franson, 2016). This demographic evolution in wine market composition has focused industry attention on expanding understanding of Millennial wine drinkers preferences as an important marketing dynamic. At the same time the wine industry has seen significant establishment of sustainable certification systems as preferences for sustainability have developed and been recognised as an avenue for product diversification in a highly competitive global market. While there is a recognition that preferences for the types of attributes sustainability programmes can deliver may differ between generations, scant research has explored this segmentation.

This paper reports on the application of a discrete choice experiment with the objective of comparing generational preferences for individual components of sustainability schemes active in the Californian Sauvignon blanc market. We find consumption behaviour and attribute preference differences over age cohorts. A central finding is that Millennial consumers are willing to pay more for sustainability attributes than both Gen-X and Baby Boomers, while conversely Baby Boomers are willing to pay more for country of origin attributes than both Gen-X or Millennials.

Keywords: Wine, sustainability, generational preferences, choice experiment

1. Introduction

Demographic evolution in USA wine market composition has focused industry attention on expanding understanding of Millennial wine drinkers preferences as an important marketing dynamic. Millennials are the largest demographic segment in the USA (Wine Market Council, 2016) and have gained market share of high frequency wine drinkers while Baby Boomers and Gen-X generations are falling in market share (Franson, 2016) and are considered a central driver for increasing wine consumption (Gillespie, 2010). At the same time the wine industry has seen significant establishment of sustainable certification systems as preferences for sustainability have developed (Sirieix et al., 2013) and been recognised as an avenue for product diversification in a highly competitive global market (Schmit et al., 2013).

The primary focus of generational segmentation analysis has thus far been in relation to behaviour and attitudes (Qenani-Petrela et al., 2007; Charter et al., 2011; Fountain and Lamb. 2011 ;Atkin and Thach, 2012; Chang et al., 2016; Wolf et al., 2018), whereas little is known about differences in preferences for wine attributes (Chrysochou et al., 2012). A broad literature indicates that for younger generations, environmental and corporate social responsibility can play an important part in the products they purchase and the companies they purchase from (Lategan and Pentz. 2017). Although wine consumer literature suggests that younger generations may be more environmentally aware than older generations (Thach and Olsen, 2006), findings of difference in concern for the environment are mixed with some suggesting no substantial differences between Millennials and other cohorts (MacDonald et al., 2013). While other authors find significant differences in concern for the environment (Mueller et al., 2011), that Millennials care more about the environmental impact of the wine industry (Vecchio, 2013), have a stronger interest in sustainability (Sogari et al., 2014) and are willing to pay (WTP) more for sustainability attributes (Vecchio, 2013; Sogari et al. 2016, Pomarici et al., 2018).

However these studies are limited in considering an age cohort in isolation and don't provide direct comparisons of preference for sustainability attributes of wine between generations (Vecchio, 2013; Kelly et al., 2016). What research has compared wine attributes preferences between generations has generally not included analysis of sustainability attributes. (de Magistris et al., 2011; Chrysochou et al., 2012). With little known about which consumers are most likely to purchase sustainable wines (Wolf and Higgins, 2017), empirical research on

Millennial consumer preferences for sustainability attributes of wine is currently meagre (Pomarici and Vecchio, 2014). Moreover, research related to generational segmentation is dated and in need of further study (Wolf et al., 2018) with more research required to evaluate the appropriateness of marketing wine based on generational cohorts (MacDonald et al., 2013).

The central objectives of this study are to expand understanding of the differences in preferences for wine sustainability across age cohorts and in doing so evaluate the appropriateness of marketing sustainability attributes in wine choice based on generational cohorts. To achieve this objective we conduct a discrete choice experiment (DCE) in the Californian Sauvignon blanc market to estimate consumer WTP for individual attributes of sustainability programs that are active in the Californian retail market. We select Sauvignon blanc as it is the fastest growing white wine category in the USA, and California as the largest wine producing and consuming state in the USA (McMillan, 2017). We estimate and compare separate wine choice models for Millennials, Gen-X and Baby Boomers. This study contributes to literature exploring the role of demographic trends in wine market dynamics by identifying differences in preferences for sustainability attributes across generational cohorts that will enable wine industry stakeholders to better understand potential for individual sustainability attributes. Furthermore, our study contributes a direct comparison with Gen-X consumers while the majority of attention has thus far been predominantly on Baby Boomers and Millennials (Thomas and Wolf, 2007; Youngblood and Thach 2018).

2. Materials and Methods

2.1 Discrete Choice Experiment

This study employs the survey based method of DCE to estimate Californian Sauvignon blanc consumers' WTP for individual sustainability attributes of wine production. This valuation approach is appropriate as the individual elements comprising a sustainability program are not directly observable to consumers in-market. Consumers are therefore unable to express their WTP for individual elements in a way that generates observable market data that could reveal preferences for individual elements. The method involves simulating the context in which consumers would normally make choices among a set of competing Sauvignon blanc

alternatives. This is achieved by designing an experiment in which wine attributes are systematically and independently varied to produce multiple choice scenarios from which respondents choose their preferred wine option. In this study, alternative Sauvignon blanc wines presented to consumers are described by the management practices of production, wine critic scores, country-of-origin and price.

Choice experiments are based in Random Utility Theory (McFadden, 1974) in which a respondent's utility is decomposed into an observable deterministic part and an unobserved random component; and Lancaster's characteristics theory of value in which a good can be decomposed into its component attributes (Lancaster, 1966). To analyse respondent choices we specify a Mixed Logit Model Error Components (MLEC) (Train, 2009). The error component specification is chosen as appropriate to accommodate correlation between the three wine alternatives versus the "none of these" option in each choice set. We specify attribute parameters to randomly vary according to a normal distribution across respondents but remain constant across choices for the same respondent (Revelt and Train,1998). To accommodate behavioural plausible heterogeneity in preferences towards the price attribute, while ensuring meaningful WTP estimates, the cost parameter is specified as a constrained triangular distribution with mean equal to standard deviation (Hensher et al., 2015; Bliemer and Rose, 2013). Simulated unconditional estimates of WTP for attribute *j* by consumer *i* are calculated as the ratio of the estimated model parameters accommodating the influence of the random component (Cicia et al., 2013) as:

$$WTP_i^j = -\left(\frac{\beta_j + \varepsilon_{ij}}{\beta_{price} + \varepsilon_{ip}}\right) \quad (1)$$

To evaluate if observed differences in WTP between generations are statistically significant we employ the Complete Combinatorial testing method (Poe et al., 2005). This is a non-parametric test that compares differences in WTP estimates for all possible WTP combinations to estimate a p-value for the null hypothesis of no difference in WTP estimates. The complete combination of two sets of 1,000 element vectors (as is the case when comparing two generations WTP estimates here) results in a vector of one million differences.

2.2 Survey development and administration

The selection of wine attributes to include in the DCE was driven primarily by identifying and reviewing individual elements of sustainability programs present on Sauvignon blanc being sold in the Californian market (September 2017). Market sales data from a range of retail channels were scrutinised for thematic similarities to develop a set of attribute descriptors. The individual components of thirteen programmes were scrutinised: Napa Green (www.napagreen.org), California Certified Sustainable (www.sustainablewinegrowing.org), Lodi Rules Certified Green (www.lodigrowers.com), Sustainability in Practice (www.sipcertified.org), Live Certified Sustainable (www.livecertifed.org), Oregon Certified Sustainable (www.oregonwine.org), Salmon Safe (www.salmonsafe.org), ISO 14001 Environmental Management System (www.iso.org), Biodyvin (www.biodyvin.com), USDA Organic (www.usda.gov), Sustainable Winegrowing New Zealand (www.nzwine.com), Certified Sustainable Chile (www.sustentavid.org), and Integrity and Sustainability Certified Wine South Africa (www.wosa.co.za). The review process identified seven themes: management of biodiversity, water, by-products, energy, green-house-gases, pests and diseases, and social responsibility. Alongside the review of in-market programs we conducted an in-depth literature review concentrated on wine consumer preference studies to identify attributes established as drivers of consumers wine choice. Including these attributes in the DCE is important to facilitate assessment of consumers relative preferences between sustainability attributes and those attributes considered conventional drivers.

Findings from the in-market review of sustainability programs and literature review were used to develop a scoping survey conducted in October 2017. The sampling strategy involved recruiting 200 Californian Sauvignon blanc consumers who had purchased Sauvignon blanc at least once in the previous month. A central purpose of the scoping survey was to assess respondent understanding and importance of wine attributes, with careful attention to evaluate those attributes identified in the review of programs. Importantly, responses were used to refine attribute descriptions used in the DCE to ensure clarity of attribute comprehension by respondents.

Table 1 presents the final selection of wine attributes alongside the descriptions shown to respondents and the attribute levels used in the experimental design. The term sustainability is mainly associated with the environmental aspects of wine production and typically omits

social responsibility (Szolnoki, 2013). While the certification programmes considered here generally include an element of social responsibility, definitions are mostly framed in terms of worker outcomes such as health and safety, and training. In the agri-foods DCE literature social responsibility has been defined in different ways, while no definition is clearly dominant the commonalty is an attention to business practices that recognise the impact of decisions on communities (Miller et al., 2017). Consistent with this view we specify a social responsibility attribute defined in terms of collective ownership and active inclusion of public interest into decision making. The literature review established the fundamental importance of country-of-origin in consumers wine choice as well documented and recognised as a key decision element (Lockshin and Corsi, 2012). Endorsement of wine quality by independent third parties is recognised as a significant quality que for wine consumers (Lockshin et al., 2006; Costanigro et al., 2014) and therefore we specify an attribute indicating a critic score out of 100 as an independent measure of a wines quality. The price attribute is framed as a per bottle price with the vector of price levels determined by an assessment of the range of Californian retail market price data.

The final survey instrument comprised three sections. The first section focused on consumption behaviour and included questions on consumption frequency, price usually paid, and wine experience and engagement. The second section of the survey presented the DCE and contained instructions of how respondents provide their responses to a series of choice sets, as well as the descriptions of the attributes used with respondents able to read the attribute descriptions at any time as they went through the choice sets. The DCE section also contained a series of debriefing questions designed to assess respondents understanding of attribute descriptions, as well as their ability to express what was important to them concerning wine labelling within the DCE exercise. The third section of the survey contained socio-demographic questions.

Table 1 Attribute descriptions and levels

Attribute Label	Attribute Description	Attribute Levels
Biodiversity Management	The winery or grower has set aside area for biodiversity restoration or enhancement on the same property as the vineyard, or off site.	No label, Certified
Water Management	Monitoring, measurement and limitation of water resources is undertaken.	No label, Certified
By-product Management	Production by-products are diverted from landfill and turned to beneficial use.	No label, Certified
Energy Management	Monitoring, measurement and limitation of energy resources is undertaken.	No label, Certified
Pest & Disease Management	Integrated control strategies used to optimise control and fruit quality and prioritise minimisation of the impact on the receiving environment.	No label, Certified
Organic Production	*100% Organic*: Both growing and processing are Organic. No GMOs. No added sulfites. No synthetic fertilisers or agrichemicals.	No label, Certified Made with Organic Grapes, Certified 100% Organic
	Made with Organic grapes: Grapes are Organic but some ingredients are not. Sulfites may be added. No GMOs. No synthetic fertilisers or agrichemicals in grape growing.	
Social Responsibility	Collective community ownership of vineyards and wineries can enhance social responsibility. Socially responsible vineyards and wineries actively include public interest into decision making.	No label, Certified
GHG Management	Monitoring, measurement and limitation of GHG emissions is undertaken.	No label, Certified
Critic rating	Score out of 100, from a well-known critic. A wine score is a simple way for a wine critic to communicate their opinion about the quality of a wine.	No label, 80-84, 85-89, 90-94, 95-100
Country of Origin	Country where the wine is made.	No label, New Zealand, Chile, South Africa, USA, France
Price	Price for a 750ml bottle of Sauvignon Blanc.	$7.97, $11.67, $13.49, $17.80, $20.99, $23.55, $27.76, $39.99

An experimental design was constructed based on three wine product alternatives employing a D-efficient fractional factorial approach using NGene™ (ChoiceMetrics, 2014) and included the ability of respondents to opt-out of making a choice ("None of these") (Fig. 1). Purchase occasion has been shown to influence wine preferences (Martinez et al., 2006) and we construct a split sample design in which half the sample are randomly assigned to a 'usual personal consumption' purchase occasion, while the rest of the sample are presented with a 'special occasion celebration' purchase occasion. For the initial experimental design, we looked at similar studies for design parameters, then updated these with coefficient estimates from a model fitted to pilot survey data (n=200). The resulting updated experimental design is applied to the remaining number of respondents. The full design consisted of 60 profiles and was blocked into six, with each respondent randomly assigned to a block of ten choice sets. The order of choice sets was randomised across respondents and choice set alternatives were randomly ordered left-to-right. A cheap-talk script reminded respondents of

hypothetical bias and to answer the hypothetical valuation questions as if they were a real and binding purchase (Mahieu et al., 2012). To improve reliability, surveys were targeted at household members who purchase Sauvignon blanc at least monthly. Samples of consumers were obtained from Research Now™ (researchnow.com) an international consumer research consultancy that maintains one of the largest global databases of consumers. Surveys were implemented online in December 2017 using Qualtrics™ survey software (www.qualtrics.com). The use of an online survey mode has been found to be superior to a traditional paper-and-pencil mode for identifying product attribute preferences when using DCE (Sethuraman et al., 2005).

Fig. 1. Example of choice set presented to respondents

3. Results and discussion

3.1 Sample characteristics

The sample consisted of 308 Millennials, 265 Gen-X and 164 Baby Boomers (Table 2) . Experts do not always agree on the cut-offs that are applied to different generations and no exact delimitation of the age group classifications is available with demographic segmentation varying including by country (Lancaster and Stillman, 2002). Considering Millennials, dates vary by source ranging from starting at 1984 and ending in 2004 (Gillespie, 2010). However, there is general agreement that Baby Boomers were born between 1946 and 1964 (Lancaster

and Stillman, 2002). We apply this range for Baby Boomers and 1984-1997 for Millennials and 1965-1983 for Gen-X respondents. Moving up through the generations, we see that there is a shift away from urban household location towards suburban and rural locations, and an increase in education levels and income. Household composition across generations reflect differing current life stages. While most Millennial households comprise mostly single individuals, Gen-X households are typified by couples with children, and nearly half of Baby Boomer households comprise couples without children. Importantly, the sample is not intended to be representative of California's overall population but rather the relevant population that we draw inference on are Sauvignon blanc consumers who purchase this wine at least monthly.

Table 2. Sample demographic characteristics

		Millennials (%)	GenX (%)	Baby Boomers (%)
Gender	Male	44	51	49
Age	21-24	33	-	-
	25-34	67	-	-
	35-44	-	60	-
	45-54	-	40	-
	55-64	-	-	56
	65-72	-	-	44
Location	Urban	53	42	27
	Suburban	43	53	65
	Rural	4	5	8
Household Composition	Single, no children	64	28	20
	Single with children	6	8	5
	Couple, no children	14	17	48
	Couple with children	13	47	25
	Live with unrelated persons	2	1	2
Education	Up to High School	4	1	1
	High School	17	7	7
	Tertiary qualification other than Degree	18	11	15
	University Degree	47	52	43
	Post-graduate Degree	14	28	31
Household Income	< $20,000	7	1	3
	$20,001 - $39,999	16	6	5
	$40,000 - $59,999	19	17	10
	$60,000 - $79,999	20	15	13
	$80,000 - $99,000	16	15	10
	$100,000 or more	18	43	59

Considering wine experience and engagement factors, Table 3 presents the average score from a five-point Likert scale (1= strongly disagree/disagree/neither/agree/5=strongly agree). Behaviourally we can see there are differences in wine engagement activities and experience across generational cohorts. For example, Millennials and Gen-X respondents are more likely to look up information on internet wine while baby Boomers are more likely to read information on wine labels. A greater proportion of Millennials consume wine more than once

a week compared to other cohorts, with consumption frequency generally decreasing as age increases. A result consistent with Mueller et al. (2011) who found wine involvement and consumption decreasing with age in North America, and with Thatch and Olsen (2006) which identified Millennials as drinking more wine than the previous Gen-X. The most common price per bottle paid for usual at-home consumption in all cohorts is $11-$15. However, distributions of expenditures differ across generations. Baby Boomers spending is concentrated in the $9 to $15 range (64%) while Millennials spending shows greater spread with more spending less than $9/bottle than other cohorts, and a greater proportion of Gen-X and Millennials spending more than $20/bottle than Baby Boomers. The likelihood of purchasing a sustainability labeled wine decreases as age increases with Millennials the most likely (85%) and Baby Boomers the least likely to purchase(55%).

Table 3. Sample behavioural characteristics

	Millennials	GenX	Baby Boomers
Experience and engagement *(Five point Likert Scale (1)Strongly Disagree – (5)Strongly Agree)*	Mean (St.Dev.)	Mean (St.Dev.)	Mean (St.Dev.)
I visit wineries in production areas	3.0(1.6)	3.1(1.6)	3.2(1.6)
I read the information on wine labels	3.5(1.6)	3.4(1.5)	3.7(1.3)
I read wine journals	2.6(1.6)	2.4(1.5)	2.0(1.3)
I regularly receive wine information catalogues	2.6(1.6)	2.6(1.5)	2.1(1.3)
I attend wine tasting courses	2.9(1.7)	2.5(1.5)	2.1(1.4)
I read the information about wines published in the press	2.9(1.6)	2.7(1.6)	2.7(1.5)
I look up information on internet wine sites	3.1(1.6)	3.2(1.5)	2.8(1.5)
I feel competent in my knowledge about wine	2.9(1.6)	2.7(1.6)	2.6(1.5)
Composite experience and engagement score	25(8.8)	27(7.4)	24(7.2)
Consumption frequency	Percent of sample	Percent of sample	Percent of sample
More than once a week	25	18	21
About once a week	31	35	30
Two to three times a month	25	28	29
About once a month	16	17	19
A few times a year	3	2	1
Usual price paid per bottle for usual personal consumption			
$2-5	8	3	2
$6-8	14	8	10
$9-10	19	20	26
$11-15	30	28	38
$16-20	14	25	15
$21-25	8	7	6
Over $25	7	9	2
Purchased sustainability labeled wine in previous month	85	72	55

3.2 Statistical analysis

Statistical analysis was conducted using econometric software Nlogit6® (www.limdep.com). For modelling we specify several covariates interacted with the price attribute to examine additional sources of preference heterogeneity in wine choices across generations. We specify a measure of consumers wine experience and engagement as wine consumers level

of experience has a significant role in purchase behaviour (Lockshin et al., 2006). A composite experience and engagement measure is constructed as the arithmetic mean of responses to the Likert scale statements indicating the degree to which respondents actively engage in information seeking and wine related experiences (Table 3). With a higher score indicating a greater degree of experience and engagement, from a total possible score of 40. Likewise, we specify price interactions with variables measuring purchase frequency, and usual price paid per bottle (Table 3) as these behaviours have been shown to influence wine preferences (Thatch and Olsen, 2015). Finally we include price interactions of dummies indicating whether a respondent has purchased a sustainability labeled bottle of Sauvignon blanc in the previous month (46%), whether they are male, and whether the choice set framed the purchase occasion as for a celebration.

Respondents may select the 'none of these' option in a choice set. This is usually a truthful indication of their *unwillingness to pay* for the wines and associated attributes presented to them in a particular choice scenario. The number of opt-out choices increases over generations with Millennials opting out of 2% of choices they faced, Gen-X opting out of 5%, and Baby Boomers opting out of 12% of the choices they faced. These participants were asked a follow-up question to ascertain their main reason, with Millennials and Gen-X considering that not enough information was provided, while Bay Boomers indicated that they could not afford to pay more for wine shopping. When choosing their preferred option in each choice task, respondents may ignore some attributes and base their decisions on those remaining. This behaviour is commonly referred to as attribute non-attendance and can influence WTP estimates (Kragt, 2013). In a separate analysis we test for this influence using attribute attendance debriefing questions following each choice task (Carlsson et al., 2010) and find no qualitative improvement over model estimates presented in Table 4.

Debriefing questions were also used to assess respondents understanding of the attributes presented in the DCE and their ability to answer the choice sets. Using a five-point Likert scale (agree, partly agree, neutral, partly disagree, disagree), most respondents agreed (disagreed) with the statement 'I understood the meaning of the wine attributes': Millennials 80%(4%); Gen-X 85%(4%); Baby Boomers 78%(6%). Likewise a majority of respondents agreed (disagreed) with 'I was able to express what was important to me concerning wine labelling': Millennials 80%(7%); Gen-X 79%(3%); Baby Boomers 70%(9%). Furthermore a majority of

respondents agreed (disagreed) with the statement 'it was easy to understand how I should provide my choices': Millennials 86%(2%); Gen-X 81%(2%); Baby Boomers 86%(7%).

Table 4. Random Parameter Logit models of wine choice across generations

	Millennial		Gen-X		Baby Boomer	
Mean of Random Parameters in Utility Functions						
Biodiversity Management	0.24***	(0.07)	0.29***	(0.08)	0.51***	(0.15)
Water Management	0.31***	(0.08)	0.39***	(0.09)	0.55***	(0.16)
By-products Management	0.39***	(0.07)	0.45***	(0.08)	0.54***	(0.13)
Energy Management	0.17**	(0.08)	0.11	(0.08)	0.44***	(0.15)
Pest & Disease Management	0.35***	(0.07)	0.51***	(0.09)	0.61***	(0.14)
GHG Management	0.21**	(0.09)	0.32***	(0.08)	0.41***	(0.12)
Social Responsibility	0.35***	(0.08)	0.21***	(0.09)	0.57***	(0.16)
Made with Organic grapes	0.45***	(0.10)	0.57***	(0.12)	0.47***	(0.17)
100% Organic	0.47***	(0.10)	0.81***	(0.13)	1.02***	(0.22)
Critic Score	0.004***	(0.00)	0.01***	(0.00)	0.014***	(0.00)
Made in Chile	0.18	(0.13)	0.45***	(0.15)	0.74**	(0.30)
Made in South Africa	0.02	(0.12)	0.42***	(0.15)	0.81***	(0.29)
Made in France	0.42**	(0.20)	0.87***	(0.14)	1.47***	(0.26)
Made in USA	0.48***	(0.13)	1.11***	(0.12)	2.40***	(0.28)
Made in NZ	0.24*	(0.13)	0.96***	(0.12)	1.82***	(0.46)
Price	-0.09***	(0.02)	-0.29***	(0.02)	-0.32***	(0.04)
Opt-out	-5.18***	(0.70)	-5.34***	(0.63)	-4.20***	(0.13)
Celebration purchase*Price	0.01	(0.02)	0.03*	(0.02)	0.06***	(0.03)
Consumption frequency*Price	-0.02***	(0.00)	-0.03***	(0.01)	-0.03*	(0.02)
Usual purchase price*Price	0.01	(0.01)	0.01***	(0.01)	0.02***	(0.00)
Ecolabel purchaser*Price	0.06***	(0.02)	0.07***	(0.02)	0.02	(0.03)
Wine experience*Price	0.01***	(0.00)	0.01***	(0.01)	0.01	(0.02)
Male*Price	0.05***	(0.01)	-0.4***	(0.01)	0.03	(0.03)
Standard Deviation of Random Parameters						
Biodiversity Management	0.00	(0.40)	0.39***	(0.12)	0.03	(0.44)
Water Management	0.42***	(0.11)	0.65***	(0.13)	0.69***	(0.16)
By-products Management	0.38***	(0.13)	0.64***	(0.12)	0.40*	(0.22)
Energy Management	0.18	(0.23)	0.11	(0.08)	0.41*	(0.21)
Pest & Disease Management	0.41***	(0.12)	0.41***	(0.14)	0.33	(0.28)
GHG Management	0.44***	(0.11)	0.13	(0.21)	0.33	(0.27)
Social Responsibility	0.53***	(0.09)	0.73***	(0.11)	0.65***	(0.16)
Made with Organic grapes	0.23	(0.26)	0.59***	(0.17)	1.02***	(0.17)
100% Organic	0.60***	(0.11)	1.05***	(0.13)	0.64**	(0.27)
Critic Score	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
Made in Chile	0.18	(0.13)	0.56***	(0.25)	0.88***	(0.27)
Made in South Africa	0.02	(0.12)	0.73***	(0.21)	0.17	(0.52)
Made in France	0.89***	(0.19)	0.87***	(0.14)	1.48***	(0.26)
Made in USA	0.84***	(0.14)	0.82***	(0.16)	1.35***	(0.27)
Made in NZ	0.24*	(0.15)	0.96***	(0.12)	0.80	(0.73)
Price	0.09***	(0.02)	0.27***	(0.03)	0.32***	(0.04)
Opt-out	1.44***	(0.63)	0.19	(0.51)	0.64	(0.84)
Celebration purchase*Price	0.01	(0.02)	0.28*	(0.02)	0.06***	(0.03)
Consumption frequency*Price	0.01*	(0.01)	0.01	(0.01)	0.01	(0.01)
Usual purchase price*Price	0.01***	(0.00)	0.01***	(0.01)	0.01***	(0.00)
Ecolabel purchaser*Price	0.13	(0.02)	0.03	(0.02)	0.02	(0.03)
Wine experience*Price	0.01***	(0.00)	000	(0.00)	0.00	(0.00)
Male*Price	0.05***	(0.01)	0.04***	(0.01)	0.03	(0.03)
Latent random effects	2.912***	(0.67)	4.14***	(0.54)	3.69***	(0.73)
Number of obs.	3,080		2,659		1,638	
McFadden Pseudo-R^2	0.294		0.335		0.361	

***,**,* denote significance at 1%, 5% and 10% level. Standard errors in brackets.

Choice probabilities for MLEC models were simulated based on 2,000 Halton draws. The McFadden Pseudo-R^2 values indicate acceptable levels of explanatory power for each model (McFadden, 1974). All parameters display a priori expected signs (**Error! Reference source not found.**) with critic score, country-of-origin and sustainability attributes having a positive effect on consumer choice, and higher prices having a negative effect. All attribute parameters were significantly different from zero at conventional levels of significance. The standard deviations of the majority of attribute parameter distributions are statistically significant indicating that significant taste heterogeneity exists within the data for most attributes. In particular, examination of the magnitude of parameter standard deviations reveals that consumer preferences within the Millennial cohort appear to be the most varied for made in France, while the Gen-X cohort has the highest degree of preference heterogeneity for 100% Organic, and Baby Boomers preferences are also most dispersed for made in France. Looking at the opt-out option parameter estimate reveals that, overall, respondents in each generation preferred the wine product alternatives offered in the choice sets rather than to opt-out of making a selection.

Examining the covariate parameter estimates indicates some similarities and differences across cohorts. Gen-X and Baby Boomers are WTP more for wine that is intended to be consumed for a celebration occasion while Millennials are not. For all generations, WTP is higher for consumers with higher purchase frequency. Gen-X and Baby Boomers whose usual price paid is greater are WTP more for the types of wines offered in the DCE, while this effect is insignificant for Millennials. WTP is also higher for Millennials and Gen-X respondents who have previously bought eco-labeled wine, or whom are more experienced and engaged, while both these factors are insignificant for Baby Boomers. Lastly, male(female) Millennials (Gen-X) have higher WTP. These findings are consistent with Pomarici et al. (2016) who in a study of Italian wine consumers interest in environmentally friendly wines found that the almost one third of respondents who were particularly interested comprised higher spending and more experienced consumers. And is also consistent with Thatch and Olsen (2015) who profiled high frequency wine consumers in the US market and found that males, more experienced, or younger consumers had relatively higher spend.

3.3 Willingness to pay estimation and tests of differences between generations

We simulate the unconditional distributions of WTP for wine attributes and report the upper and lower quartiles (Table 5). The interpretation of WTP is the change in price of a 750ml bottle of Sauvignon blanc that attains a particular attribute relative to a bottle that does not. Consistent across all generations is the finding that country-of-origin is one of the most important attributes with made in the USA valued more than other attributes. Considering sustainability attributes, results demonstrate significant positive WTP across all age cohorts for sustainability attributes. Organic attributes are the most preferred across all generations. Outside of Organics, we find that Millennials highest WTP was for By-products Management ($4.3/bottle) followed by Social Responsibility ($3.9). Their lowest for was Energy Management ($1.9) followed by GHG Management ($2.3). For Gen-X respondents the highest valued (non-organic) sustainability attribute was Pest & Disease Management ($1.9) followed by By-products Management ($1.7). Their lowest was for Energy Management ($0) followed by Social Responsibility ($0.80). Baby Boomers valued Pest & Disease Management($1.9) highest followed by Social Responsibility ($1.8). Their least was GHG Management ($1.3) followed by Energy Management ($1.4). These findings show that overall, Organics, Pest & Disease Management and By-products Management are some of the most preferred sustainability attributes across generations, while Energy and GHG Management are some of the least preferred.

Comparing the distributions of WTP between age cohorts we find that Millennials are WTP significantly more for sustainability attributes than both Gen-X and Baby Boomers (Table 5). The exceptions are for biodiversity and energy management where no significant differences were found. This differs from previous results suggesting that Millennials and Gen-X cohorts did not significantly differ from each other (Mueller et al., 2011). What also stands out is that Baby Boomers are WTP more for country-of-origin attributes than both Millennials or Gen-X respondents. And that Millennials are WTP more for wines with higher critic scores that both Gen-X and Baby Boomers. These findings are consistent with Atkin and Thatch (2012) who found that Millennials rely less on geographical cues such as region of origin to determine wine quality and pay more attention to medals won. Comparing Gen-X and Baby Boomers preferences for sustainability attributes, we find that Baby Boomers have higher WTP for Social Responsibility than Gen-X respondents, and that their WTP for Organic attributes are

lower. Although these two cohorts exhibit differences, overall ranking of attributes suggests that Gen-X and Baby Boomers have more similar preferences than other generation comparisons.

Table 5. Willingness to pay estimates and tests of generational differences

	Millennial	Gen-X	Baby Boomer
Biodiversity Management	2.7 (2.2, 3.1)	1.1^{LM} (0.8, 1.3)	1.6^{NM,NX} (1.3, 1.8)
Water Management	3.4 (2.9, 3.9)	1.5^{LM} (1.2, 1.7)	1.7^{LM,NX} (1.4, 2.0)
By-products Management	4.3 (3.8, 4.8)	1.7^{LM} (1.4, 1.9)	1.7^{LM,NX} (1.5, 1.9)
Energy Management	1.9 (1.3, 2.4)	-	1.4^{NM} (1.0, 1.7)
Pest & Disease Management	3.9 (3.4, 4.5)	1.9^{LM} (1.7, 2.1)	1.9^{LM,NX} (1.7, 2.2)
GHG Management	2.3 (1.9, 2.7)	1.2^{LM} (0.9, 1.4)	1.3^{LM,NX} (1.1, 1.5)
Social Responsibility	3.9 (3.2, 4.5)	0.8^{LM} (0.5, 1.0)	1.8^{LM,HX} (1.6, 2.1)
Made with Organic grapes	4.9 (4.3, 5.6)	2.1^{LM} (1.8, 2.4)	1.5^{LM,LX} (1.2, 1.8)
100% Organic	5.2 (4.7, 5.8)	3.0^{LM} (2.8, 3.3)	2.2^{LM,LX} (2.9, 3.6)
Critic score, each point >80	0.51 (0.3, 1.3)	0.35^{LM} (0.15, 0.55)	0.41$^{LM,\ NX}$ (-0.12, 0.96)
Made in Chile	-	1.6 (1.3, 2.0)	2.3^{NX} (1.7, 2.9)
Made in South Africa	-	1.5 (1.3, 1.8)	2.6^{NX} (2.1, 3.0)
Made in France	4.6 (3.6, 5.8)	3.2^{LM} (2.9, 3.5)	4.6^{NM,HX} (4.3, 4.9)
Made in USA	5.2 (4.0, 6.4)	4.1^{NM} (3.8, 4.5)	7.6^{HM,HX} (6.8, 8.3)
Made in NZ	2.6 (1.6, 3.7)	3.5^{NM} (3.3, 3.8)	5.7^{HM,HX} (4.8, 6.6)

Notes: WTP in US dollars in 2018.
Median WTP (lower and upper quartiles in brackets).
Poe test significance assessed at 10% level for two-tailed test.
^{LM} Significantly lower than Millennial; ^{HM} Significantly higher than Millennial, ^{NM} Not significantly different to Millennial.
^{LX} Significantly lower than Gen-X; ^{HX} Significantly higher than Gen-X, ^{NX} Not significantly different to Gen-X.

4. Conclusions

Understanding differences in wine attribute preferences between generational cohorts has important implications for the wine industry. The individual elements of sustainability programmes are not readily observable in-market to consumers and identifying the elements that are relatively more important to each generation has been the focus this study.

An important high level finding consistent across all generations is that, country-of-origin is one of the most important attributes and can be a stronger determinant of product choice than sustainability attributes, but not at all times. For Millennials, many sustainability attributes are valued higher than country-of-origin. This study's main findings of significant WTP for sustainability attributes suggest an opportunity for marketing sustainability attributes in consumers wine choice based on generational cohort characteristics, with a particular focus on Millennials. Moreover, results suggest that the role of sustainability

attributes in wine consumer choices may be significantly determined by specific environmental and social outcomes rather than overall programs. Growers and wineries implementing sustainability programs or considering market strategies incorporating sustainability may benefit from increasing attention on attributes more valued by consumers in their target age cohort. The ability to communicate specific attributes to these cohorts is therefore an important consideration.

It follows that these results have implications for sustainability label design. The use of symbols or icons is often used in agri-food and beverage markets to summarise diverse information, shortening processing time, as well as being visually attractive. However, there is concern that symbol and icon type formats may by overly simplistic, leading to the so-called halo effect in which a risk lies in consumers generalising about how a product performs on elements that are not able to be explicitly identified in the label. Moreover, simplified label approaches may obfuscate the ability of consumers to assess specific outcomes and therefore create an information asymmetry that potentially dampens demand. With few consumers able to identify specific aspects of sustainable practices inherent in simplified label formats, there is a need for further research on developing labels that better communicate the environmental attributes that are preferred by consumers.

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