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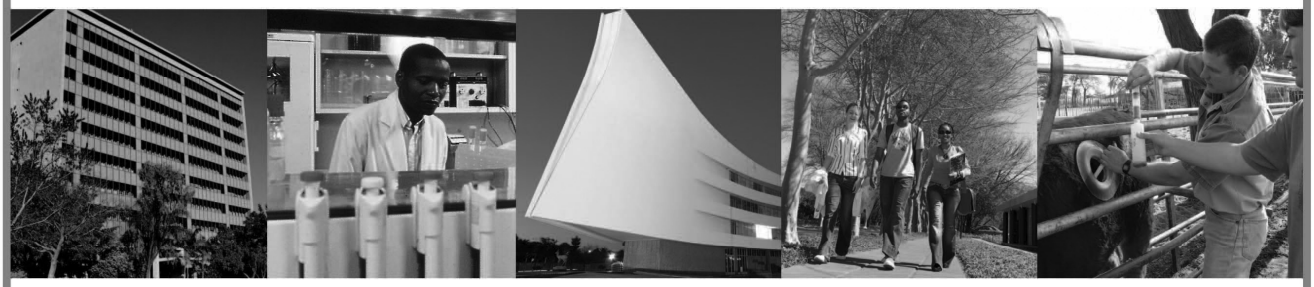

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Leading Minds

Modelling the determinants of wine choice among South Africa's "Black Diamonds"

By

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Abstract

This paper uses a choice based conjoint analysis in an attempt to develop a consumer profile for the new market for black consumers. Although the different statistical packages used variants of the MNL model, the results were significantly similar with no contradictions in their results and the model provided here had the best statistical significance. Despite the models' imminent statistical insignificance, they suggested valuable notions about black consumers' wine choice determinants. Age, gender and the choice of favourite red wine may be used to segment the market and the other significant coefficients will affect the marketing and distribution choices to be followed by wine companies.

Key words: random utility models, wine choice, determinants

1. INTRODUCTION

The choice based conjoint (CBC) analysis is undertaken in an attempt to develop a consumer profile for the new market for black consumers, as well as changing consumer attitudes toward wines. CBC is used because it can reveal the interactions of the attributes as well as the consumer's characteristics and the purchase situation through discrete choice experiments (Louviere & Woodworth, 1983 in Gil & Sanchez, 1997).

Johnson, *et al.* (1991) employed conjoint techniques to benefit segmentation in the Australian wine market (Engels, *et al.*, 2004; Gil & Sanchez, 1997), as did Mtimet and Albisu (2006) in their segmentation of the Spanish consumer market. In the last years, the use of choice experiments to analyze wine consumption and wine consumer behaviour has been growing as can be seen from the studies of Berti, 2003; Lockshin, Jarvis, Perrouty, & d'Hauteville, 2006; Perrouty, d'Hauteville, & Lockshin, 2006; Rasmussen, 2001 (Mtimet & Albisu, 2006:3). The discrete choice analysis was also used to gain insight into consumer preferences for New Mexico wine in the study by Allimova, *et al.*, (2006) and by the US firm Tragon, (Penn, 2007). Applications of conjoint analysis to food products can be found, among others, in Johnson *et al*. (1991) for Australian wine, Loader (1990) for fruit and vegetables in the UK, and Ness and Gerhardy (1994) for British eggs (Gil & Sanchez, 1997).

In choice-based conjoint (CBC) analysis the respondent expresses preferences by choosing concepts from sets of concepts, rather than by rating or ranking them. In this study all the respondents are combined, as in the alternate hypothesis which asserts that there are no differences and therefore no segments, and by studying subsets defined by specific market segments, such as gender and other differences in the null hypothesis. "Utility values" are produced for each group of respondents that summarize the choices made by those individuals. And, as in other conjoint methods, the utility values can be used to simulate and predict respondent reactions to product concepts that may not have actually appeared in the choice tasks (questions). The calculation of utilities is completed across the respondent base, typically using aggregate multinomial logit. This operational version of our proposed random utility model (PRU) generalizes the widely MNL model of wine choice (Sawtooth, 1999:2; Pazgal, *et al.*, 2005: 12; Poynter, 2005:7).

2. DATA MODELLING

Random utility (RU) models are well-established methods for describing discrete choice behaviour. Utility maximization is the objective of the decision process and leads to observed choice in the sense that the consumer chooses the alternative for which utility is maximal. Individual preferences depend on characteristics of the alternatives and the tastes of the consumer. A RU model defines a mapping from observed characteristics into preferences. All the factors affecting preferences are treated as random variables (Baltas & Doyle, 2001:116). The Multinomial Logit (MNL) model is the appropriate treatment of unobserved product attributes. Although in theory, other models (e.g. a restricted probit) can be cast as members of the same class, but in practice, only the MNL has been used. MNL regression is used when the dependent variable in question is nominal (a set of categories which cannot be ordered in any meaningful way) and consists of more than two categories. For example, in this study MNL regression is deemed appropriate for trying to determine what factors affect black consumers' choice of wines, in terms of whether they prefer red, white or sparkling wines.

2.1 ASSUMPTIONS OF THE RU MODEL

In accordance with the hypotheses of the study, the MNL model assumes that:

i. The emerging black middle class as a consumer segment are heterogeneous
ii. Various independent factors affect black consumers' wine choice, each of which has a single value for each case, is not linearly correlated to another and of which the odds of wine choice do not depend on other alternatives that are available (i.e., that including additional alternatives or deleting alternatives will not affect the odds on the dependent variable among the alternatives that were included originally)
iii. There are significant differences in terms of wine choice according to gender
iv. Women prefer sparkling and white wines
v. The new emerging "black diamond" consumer market are willing to pay for their wine
vi. Black consumers are willing to become wine drinkers and engage in the ensuing lifestyle
vii. Wine choice variable cannot be perfectly predicted from the independent variables for any case.

3. THE RU MODEL

In CBC, the utility that the ith person (i = 1,….,I) derives from the jth alternative may be represented as Uij. This utility is considered a linear function of the alternative product attributes, represented by

$$Uij = \beta\, xij + \varepsilon ij$$

Where β is a vector of coefficients, x is a vector of attributes represented by choice *j* and respondent *i*, and ε is a stochastic error term. The probability Pij the *i*th respondent chooses the *j*th alternative from choice set C is the probability that the utility for the *j*th choice is greater than the utility for all other *k* choices in the choice set. This can be represented mathematically as follows:

$$\Pr(y_i = j) = \frac{\exp(X_i\beta_j)}{1 + \sum_j^J \exp(X_i\beta_j)}$$

and assuming that the error terms (εij) are independent and identically distributed with an extreme value distribution (also referred to as Weibull, Gumbel and double exponential distributions) and scale parameter equal to 1, the probability that respondent *i* chooses alternative *j* is:

$$\Pr(y_i = 0) = \frac{1}{1 + \sum_j^J \exp(X_i\beta_j)},$$

where for the *i*th individual, y_i is the observed outcome and X_i is a vector of explanatory variables. The unknown parameters β_j are typically estimated by maximum likelihood. It is noteworthy that different distributional assumptions yield different operational versions of the traditional random utility model. For example, in this study, the errors are assumed to be distributed IID Gumbel with an unknown scale parameter μ (and location parameter equal to zero), this renders the traditional random utility model to be the MNL (Pazgal, *et al.*, 2005:20; Mtimet & Albisu, 2006:346).

4. OBJECTIVES

The paper seeks to assess and interpret the Random Utility Model (RUM) used in order to determine the determinants of wine choice among South Africa black middle class consumers.

5. METHODOLOGY

When using MNL regression, one category of the dependent variable is chosen as the comparison category. In this study, the choice of red wines as the favourite wine choice was chosen as the comparison category. Separate relative risk ratios are determined for all independent variables for each category of the independent variable with the exception of the comparison category of the dependent variable, which is omitted from the analysis. Relative risk ratios, the exponential beta coefficient, represent the change in the odds of being in the dependent variable category versus the comparison category associated with a one unit change on the independent variable. This results in a set of numbers comparable to conjoint "utilities," except that they describe preferences for a group rather than for an individual.

CBC's MNL regression reports logit coefficients as well as t and chi square statistics. The regression estimates all main effects (default) and two-way interactions optionally. CBC analysis allows for the selection of main effects and interactions to be included in each logit analysis. When only main effects are estimated, a value is produced for each attribute level that can be interpreted as an "average utility" value for the respondents analyzed. When interactions are included, effects are also estimated for combinations of levels obtained by cross-classifying pairs of attributes (Bierlaire, 1997; Sawtooth, 1999:19).

The main effects model consists of different estimated coefficients. Identification of the wine choice model parameters requires one of the discrete choice indicators in the MNL model to be normalized to zero. Therefore, the structural parameters consist of marginal utilities of attributes of the selected coverage levels relative to the excluded alternative. Initial parameter values for this model were obtained by specifying a “null” model where all wine consumers prefer red wine except for the choice-specific intercept value. The coefficients pertain to alternative specific constants and these constants are estimated relative to the red wine choice alternative which has an implicit value of 0. The rest of the attribute coefficients were estimated relative to one of the attribute levels. That attribute level is omitted from the model since its effect can be defined from the estimated effects of the other three attribute levels.

For example, for the gender attribute, females are omitted. The estimated effects of gender are relative to the wine choice. Any statistical differences that occur are estimated relative to

the attribute level that is omitted. The other omitted attribute levels in this model are very low expenditure on wine for personal consumption, favourite red wine and participation in a wine course (Lockshin & Haelstaed, 2005; Mayen & Marshall, 2005:11; Mtimet & Albisu, 2006:350).

The discrete choice data was analysed using the SPSS 15.0 MNL statistical package. Although various programs ran different models using various attributes to ascertain the essential attributes to the model, only the SPSS is reported here as it produced the model with the most acceptable statistical significance. Using SPSS, of the attributes selected, two separate models (with the intercept only and with all the coefficients) were run using the same MNL analysis. Of the attributes selected, two separate models (with the intercept only and with all the coefficients) were run using the same MNL analysis. However, it should be noted that there are other variables that were not captured in this model.

This model assumes that:

Wine choice (in terms of red, white or sparkling) = f (gender, expenditure on wine for personal consumption, engagement in any form of wine education)

The pertinent null and alternate hypotheses are given as:

H_0 *= consumers prefer red wine, there are significant differences according to gender; the type of red wine preferred as well as the attendance to a wine course affects wine choice.*

H_A *= consumers are homogenous and prefer white and sparkling wines.*

The variables used within the model, as well as their definitions, expected signs and interpretations for these signs are given in Table 1. It should be noted that the first three variables are the dependant variables and the rest are the independent variables. The independent variables included in this model have been found through a process of trial and error and other results can be obtained if other explanatory variables different from those included in this model are used.

Table 1: Variables used within the MNL model

Variable	Definition	Expected Sign	Interpretation
fav_wine = 0	red wines		The more positive the sign on the variable coefficient means that consumers prefer red wines

fav_wine = 1	white wines		As the variable coefficient moves towards zero it means the consumers prefer white wines
fav_wine = 2	sparkling wines		The more negative the sign on the variable coefficient means that consumers prefer sparkling wines
gender=0	females	negative	More likely to favour white and sparkling wines
gender=1	males	positive	More likely to favour red wines
own_spen=0	R50 - R100	positive	More likely to favour red wines
own_spen=1	< R20	negative	More likely to favour white and sparkling wines
own_spen=2	R21 - R35	negative	More likely to favour white and sparkling wines
own_spen=3	R36 - R49	positive	More likely to favour red wines
own_spen=4	> R100	positive	More likely to favour red wines
own_spen=5	Do not purchase	negative	More likely to favour white and sparkling wines
own_spen=6	Free	negative	More likely to favour white and sparkling wines
fav_rw=0	Baronne	positive	More likely to favour red wines
fav_rw=1	Do not drink red wine	negative	More likely to favour white and sparkling wines
fav_rw=2	Pinotage	positive	More likely to favour red wines
fav_rw=3	Shiraz	positive	More likely to favour red wines
fav_rw=4	Rose	positive	More likely to favour red wines
fav_rw=5	Cabernet	positive	More likely to favour red wines
fav_rw=6	Red blends	positive	More likely to favour red wines
fav_rw=7	Merlot	positive	More likely to favour red wines
fav_rw=8	Cabernet Sauvignon	positive	More likely to favour red wines
fav_rw=9	Pinot Noir	positive	More likely to favour red wines
wine_cou=1	Attended wine course	positive	More likely to favour red wines
wine_cou=2	Have not attended wine course	negative	More likely to favour white and sparkling wines

The results of the model are presented in the ensuing chapters, as well as a compilation of the findings of the descriptive analysis.

6. DESCRIPTIVE RESULTS

The results presented in this paper were collected from a consumer behavior survey undertaken at the 2007 Standard Bank Soweto wine festival in Johannesburg, Gauteng. The sample represents a cross section of the black emerging middle class in South Africa. Gauteng is the chosen province for the consumer behavior survey as various studies have shown it to be the province with the highest concentration of “Black Diamonds”.

In terms of demographics, the sample was relatively evenly distributed with regards to age, gender and income. However, there were slightly more respondents who earned more than R15000 per month which corresponds with the prevalence of white collar employees. The main findings were that:

- Most of the sample was to all intents and purposes amateur wine drinkers.
- The sample generally consisted of beer drinkers.
- The sample preferred red, white and sparkling wines in that order.
- There were limited levels of brand awareness.
- Most of the consumers are irregular wine drinkers.
- Women drink wine less often than men.
- Brand name and packaging were the most important product attributes.
- Nearly all consumers prefer the 750ml bottle.
- Local supermarkets and liquor stores are the preferred retail outlets.
- Consumers are willing to spend more than R36 on wine.
- Men prefer to spend more for “premium” brands.
- Social networks were identified as the most important influencer of wine choice.
- Radio and print media were the most important media influences.
- The consumers were found to be adventurous and receptive to the “wine culture”.

7. THE SPSS MODEL

The discrete choice data was analysed using the SPSS 15.0 MNL program. The program ran different models using various attributes to ascertain the essential attributes to the model. Of the attributes selected, two separate models (with the intercept only and with all the coefficients) were run using the same MNL analysis. The results are given in Table 2.

Table 2: Results of model log likelihood tests

Model	-2 Log Likelihood	Chi-Square	Degrees of Freedom	Significance
Intercept Only	553.3845484			
Final	469.5927298	83.79181853	48	0.001060119

The data clearly indicated that the said attributes were indeed viable and provide the best fit to the data. The null model serves as a benchmark against which we compare the fit of the final choice model and because the null model is nested in the more complete model with other wine choices, a likelihood ratio test statistic is valid. By this statistic, the coverage

model provides a good fit to the data as the chi-square value of 83.79 (given in Table 3) is far greater than the critical value of -30.015 at 48 degrees of freedom.

Table 3: Model goodness-of-fit

	Chi-Square	Degrees of Freedom	Significance
Pearson	922.3862492	495	3.6212E-28
Deviance	350.4496196	495	0.999999844

The model also has acceptable Pseudo R squared values as illustrated in Table 4. This means that although the model has a relatively low explanatory power, it explains at least 20% of the wine choice preferences.

Table 4: Pseudo R-Square

Cox and Snell	0.195132209
Nagelkerke	0.227144096
McFadden	0.110783242

This model was accepted as the valid model. Table 5 provides all parameter estimates from this stage. In this study, the structural parameters are interpreted as marginal utilities with respect to each explanatory variable (Richards, 1998:19; Minbo, 2001:5).

Table 5: SPSS output for MNL model

Coefficients	Interpretation	Estimate	Standard Error	Significance
[fav_wine = 0]	red wines	-30.015	1.812	0.00
[fav_wine = 1]	white wines	-22.574	1.318	0.00
[fav_wine = 2]	sparkling wines	-20.903	1.306	0.00
[gender=0]	females	0.439	0.222	0.05
[gender=1]	males	0.000	.	.
[own_spen=0]	R50 - R100	-0.866	2.155	0.69
[own_spen=1]	< R20	-2.319	1.216	0.06
[own_spen=2]	R21 - R35	-1.556	1.116	0.16
[own_spen=3]	R36 - R49	-2.211	1.089	0.04
[own_spen=4]	> R100	-2.507	1.085	0.02
[own_spen=5]	Do not purchase	-2.645	1.090	0.02
[own_spen=6]	Free	0.000	.	.
[fav_rw=0]	Baronne	-20.467	0.922	0.00
[fav_rw=1]	Do not drink red wine	-21.599	0.931	0.00
[fav_rw=2]	Pinotage	-21.475	0.940	0.00
[fav_rw=3]	Shiraz	-20.873	0.907	0.00
[fav_rw=4]	Rose	-21.120	0.905	0.00
[fav_rw=5]	Cabernet	-21.533	0.997	0.00
[fav_rw=6]	Red blends	-18.927	0.000	0.00

[fav_rw=7]	Merlot	-20.291	0.917	0.00
[fav_rw=8]	Cabernet Sauvignon	-20.500	0.942	0.00
[fav_rw=9]	Pinot Noir	-20.568	1.295	0.00
[wine_cou=1]	Attended wine course	0.403	0.242	0.10
[wine_cou=2]	Have not attended wine course	0.000	.	.

Link function: Logit.

Major findings from the SPSS model

The model has five main findings, on the basis of wine choice, gender, expenditure on wine for personal consumption, choice of favourite red wine and engagement in wine education.

i. Wine Choice:

The model findings assert that wine choice (in terms of red, white or sparkling) is influenced by gender, expenditure on wine for personal consumption and engagement in any form of wine education.

The null hypothesis tests that consumers prefer red wine, there are significant differences according to gender; the type of red wine preferred as well as the attendance to a wine course affects wine choice. Few other authors have empirically studied possible market segments in the wine industry. Some authors segment the market by consumption (eg. Judica & Perkins, 1992; Gluckman, 1990), by geographical region (eg. Sánchez & Gil, 1997), or consumers' behaviour (Johnson, Ringham & Jurd, 1991; Dodd, Pinkleton & Gustafson, 1996). There have even been cases of segmentation according to commercial restraints by Johnson, Ringham and Jurd (1991) but the aforementioned authors offered little empirical background and assumed that red and white wine drinkers were mutually exclusive groups. This study asserts the same premise and the model confirms this.

ii. Gender:

The model finds that there is a positive relationship between red wine as a favourite wine and females. The significance of this attribute means that gender could be a significant segmentation attribute. It also means that there is a significant difference in wine choices according to gender and women prefer red wine more than men. This could be due to the fact

that females drink wine less often and this consumption is frequently on special occasions where a glass of red wine is more preferred.

iii. Expenditure on wine for personal consumption:

The null attribute for personal expenditure is statistically insignificant. However, the negative relationship between red wine choice and expenditure for own consumption means that red wine drinkers tend to spend more on wine for personal consumption than white wine and sparkling wine drinkers. This is highly plausible given that white wines are significantly cheaper than red wines and white wine consumers spend less on a 750ml bottle of wine for their own consumption than red wine drinkers.

iv. Favourite red wine:

The negative relationship between red wine as a favourite wine and the choice of red wine means that Baronne wine drinkers are more likely to favour white and sparkling wines. This can be explained by the dominance and Mzansi Youth and Start-Me-Ups in this group who prefer sweeter wines. This could also be due to the incongruities found between consumers that claimed to prefer Baronne wine but had no established experience drinking red wine. The study suggests that perhaps Baronne has been established as a premium wine and consumers, even though they do not drink red wine and actually prefer white and sparkling wine, will claim to drink it just to create the impression that they are not amateur wine consumers.

v. Engagement in wine education:

There is a positive relationship between the choice of red wine and attendance at a wine course. This suggests that educated wine drinkers prefer red wine significantly more. This could be explained by the perception that with more experience one develops a taste for the drier red wine types such as the Shiraz, Merlot and Pinotage.

9. LIMITATIONS OF THE MODEL

The model was run in three different statistical programmes (STATA, SAS and SPSS) all of which were either statistically insignificant or had very low R squared statistics. The model described here as the accepted model had the highest of these low statistics. Possible reasons for these results could be the dominance of ordinal and discrete data which makes statistical

modelling difficult. Statistical inferences were also particularly difficult due to the categorical and multi-nomial nature of the dependant variable. Another possible reason for the low statistical significance could be the inconsistencies in the respondents' responses due to their need to avoid exposing their inexperience or limited knowledge regarding wines and their reluctance to divulge personal information.

There is room for further studies which could possibly reduce the statistical insignificance of the results. In future studies, possible upgrades may include more nominal and continuous responses to the questions, as well as a wider, more diverse sample taken from various different sites, instead of focusing on a single study site. The latter will increase the possibilities of more varied and less biased responses and the former will ensure easier statistical modelling.

10. CONCLUSIONS

Although the different statistical packages used variants of the MNL model, the results were significantly similar with no contradictions in their results. Despite the models' imminent statistical insignificance due to other data inconsistencies, they suggested valuable notions about black consumers' wine choice determinants. The model suggests that women prefer red wine; white and sparkling wine drinkers are willing to spend less for a bottle of wine; Baronne wine drinkers prefer white and sparkling wines and educated wine drinkers prefer red wine.

In most societies, it takes four to five generations for a person to rise from poverty to affluent middle class, however, in contemporary South Africa, this is happening within a few years. This thrust out of poverty raises concerns about acceptance and social practices and explains why black consumers are still unsure about what wine attributes are important in choosing a wine. The study found that although there is limited consumer knowledge about wines and low levels of brand awareness, black consumers are willing and yearning to learn more about wines as they view them as an aspirational lifestyle beverage. The strong dominance of social networks as an influencer of wine choice suggests that black consumers' choice of wines is significantly determined by word of mouth recommendations because although they have limited knowledge and yearn to learn they still are not comfortable choosing on their own and view these knowledgeable friends as their "holy grail". Convenience is also a major

determinant of wine choice as is evidenced by the choice of supermarkets and liquor stores as retail outlets and promotions and tastings being more effective than adverts.

It is interesting to note that age, gender and the choice of favourite red wine may be used to segment the market as they are often significant determinants of wine choice. The other significant coefficients affect the marketing and distribution choices to be followed by wine companies. In light of these findings the industry's target market should be focused especially on women and the "Start me up" age group as they show the highest willingness to learn about wines and pay for brands that they consider to be premium brands. This has also been the case in all new wine markets such as the USA and China. A recent American study showed evidence of both a generation and gender gap in relation to wine and with this in mind one wine merchant in France has decided to follow-up this new line of thought with a line of nearly thirty wines developed just for women. Apparently, the fairer sex prefers more subtle, supple and elegant wines. A Japanese study has also identified gender, price and consumer behaviour segments.

Although the study asserts notions about black consumers in respect to wine choice, more research needs to be undertaken and the data collection tool upgraded to ensure more reliable results. This study signals the beginning of a new era in the marketing of wine in South Africa and the world; it illustrates the need for further research in the areas of wine choice modelling and market segmentation and as these are indeed integral tools in identifying target markets. By understanding the local markets and providing solutions for their problems the industry is one step further towards solving global challenges through modelling and replication.

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