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PREFERENCES OF WINE CONSUMERS FROM DOLORES HIDALGO, GUANAJUATO: A CHOICE EXPERIMENT APPROACH

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ABSTRACT

The objective of this study was to determine which are the most relevant attributes of wine for consumers of this drink, in the region of Dolores Hidalgo, Guanajuato, Mexico. This with the purpose of providing information that may be useful to wine producers in the decisions to be made. The attributes to be evaluated were origin, variety, aging time in barrels, and price, paying special attention to the influence of the origin attribute. We used the method of choice experiments, for which 120 surveys were applied to wine consumers older than 18 years, in the municipality of Dolores Hidalgo, Guanajuato. Using the mixed logit model, we found that the most valued attribute was the aging time in barrels, followed by origin, and the variety at third place. The favourite product was a wine produced in Guanajuato, in 750 mL bottles, aged in wooden barrels for twelve months, Merlot variety, for which the respondents reported willingness to pay $750 MXN pesos.

Keywords: wine, choice experiments, logit model.

INTRODUCTION

The study of consumer behaviour involves analysing what they consume, why, when, where, how often and under what conditions, as well as the final result of the process and their satisfaction (Henao and Córdoba, 2007). These types of studies are extremely important for actors or companies that operate in competitive markets. According to Sánchez and Gil (1997), this is a structural characteristic that generally prevails in the wine market.

Wine is a difficult and confusing product for consumers to choose from (Lockshin *et al*., 2006). This difficulty is due to the immense amount of both extrinsic and intrinsic attributes that wine has in comparison to other products. There are several types of wine: red, white, rosé, sparkling, liqueur, etc. Within each category, the number of characteristics is still very large, starting at the country of origin and Designation of

Origin for European wines, up to the brand, price, awards, type of container, and labels.

Intrinsic attributes are also important in the wine market; they refer to quality and flavour, vintage, grape variety (or varieties) or alcohol content (Kallas *et al*., 2012). Since there is a wide range of wines on the market, consumer choices are more difficult than the choice of other goods. That is, the consumer finds himself in a highly segmented market, with high product differentiation and a great proliferation of brands, all of which translates into a high level of uncertainty at the time of making the purchase (Bernabeu *et al*., 2005). Another important aspect in researching the consumption of goods and services is to determine the structure of consumer preferences for different products. After doing so, producers can offer goods to satisfy the needs expressed in preferences (Lesschaeve, 2007).

Currently the state of Guanajuato, Mexico, is the fourth largest wine producer nationwide with a 4.5 % share, after Baja California (57 %), Coahuila (8.5 %) and Querétaro (5 %) (CMV, 2020). According to the Secretary of Tourism of the State of Guanajuato (2021), several types of projects have been identified in the state: 22 wineries, with vineyard plantations, that produce wines and develop tourism. It also has 11 wine projects with young plantations and two new plantation projects; in addition, Guanajuato has 100 000 ha with wine potential. On the other hand, wine consumption in Mexico has increased in recent years, practically tripled in seven years, going from 450 mL in 2013 to 1.2 L in 2020.

This demand for wine is mostly covered by imported wine, since the production of national wine is only enough to satisfy 30 % of the domestic demand (CMV, 2020). However, with the aim of continuing to promote the production and consumption of Mexican wine, in May 2018, the Mexican Wine Council, together with the National Commission of Governors, launched the campaign "Todos Unidos por el Vino Mexicano" (All United to Support Mexican Wine). This initiative is aimed at increasing the market share in a period of 10 to 15 years, until reaching 45 % of consumption (CONAGO, 2019).

The aforementioned initiative generates the need to strengthen sales strategies for existing wines, as well as for the creation of new products that contain the attributes that consumers demand. To identify the structure of wine consumer preferences in the selection process, an analysis was carried out using the methodology of choice experiments. This method was initially used in market research (marketing) since the 1960s with Luce and Tukey; starting in the 1980s, applications were made in the fields of geography, tourism, transportation, and more recently in the valuation of environmental goods (Espinal and Gómez, 2011).

There are several studies focused on the subject of food, such as the one carried out by Cortiñas *et al*. (2007), where they analyse the formation of consumer preferences for canned asparagus, considering the attributes: brand, origin, and price. In Castilla-La Mancha, Spain, the attributes most valued by wine consumers are price, colour, certifications, and Designation of Origin (Bernabeu *et al*., 2005). In Catalonia, Spain,

advertising is a key factor to increase consumer awareness of local wines and the most preferred product is a Catalonian wine made with the "Cabernet Sauvignon" variety and previously tasted by the consumer (Kallas *et al*., 2012).

The objective of this research was to study the preferences of consumers to determine which are the most relevant attributes for wine consumers, in the region of Dolores Hidalgo, Guanajuato, Mexico, in order to provide useful information to wine producers when making strategic decisions. Our hypothesis was that the consumer is capable of distinguishing between attributes and translating them into monetary valuations.

MATERIALS AND METHODS

Study area

This study was carried out in the municipal seat of Dolores Hidalgo, Guanajuato, Mexico. This municipality is located within the most important wine region of the state of Guanajuato, north-central region. The Guanajuato wine museum is located in that municipality.

The choice experiments

Choice experiments belong to the type of stated preference methods (Kallas *et al*., 2012). The choice experiments methodology involves the generation and analysis of choice data, by constructing a hypothetical market that is presented to respondents (Melo *et al*., 2020a), where they are asked which product they would buy from a set of competitive products at different prices (Kallas *et al*., 2012). It involves showing the respondents a series of choice sets (cards) of alternatives that contain common attributes of a product, but with different levels, and asking them to choose the alternative they prefer from each set. Each choice set is between a constant alternative (*status quo*), that is, the current state of the product without implementing a change, and a series of proposed improvement alternatives (at least two).

The choice made by the respondent indicates a preference for the attributes of one alternative over the others, which implies valuing changes in the attributes of the product, which would allow transforming the responses to monetary magnitudes estimates (Espinal and Gómez, 2011).

According to Tudela (2010), choice experiments have a theoretical basis on Lancaster's (1966) consumption choice model, and an econometric basis in random utility models (Luce, 1959; McFadden, 1974). Lancaster breaks with the traditional theory of consumer behaviour by assuming that consumers demand goods by virtue of their characteristics or properties; and that these characteristics generate utility, not the goods themselves. On the other hand, the theory of random utility starts from a perfectly rational individual who always opts for the alternative that will supposedly bring a greater utility.

In choice experiments, subjects choose from a set of options according to a utility function with two components: a systematic (observable) component and a random (unobservable) term as follows:

$$U_{ij} = V_{ij}\,(Z_j,\, S_i,\, M_i) + \varepsilon_{ij}$$

Where:
V_{ij} = Indirect utility function
Z_j = Attribute level
S_i = Socioeconomic characteristics of users
M_i = User income
ε_{ij} = Unobservable random error component

In each alternative of the choice set, the indirect utility function depends on the levels that the attributes take, the socioeconomic characteristics of users and income.
The probability that an individual chooses alternative *m* over any option *j* from the choice set C is expressed as the probability that the utility of the first is greater than that of the rest; namely:

$$Pr(im) = Pr\,[(U_{im} > U_{ij})\ \forall\ j \neq m] = P[(V_{im} - V_{ij}) > (\varepsilon_{ij} - \varepsilon_{im})]$$

The indirect utility function (V) is expressed as a linear model of the parameters in the following form:

$$V_{ij} = \alpha_j + \beta' Z + \gamma\,(M_i - \text{Tariff}) + \delta' \text{S}$$

where: α_j = alternative specific constant; β' = vector of utility coefficients associated with the vector Z of explanatory variables; γ = coefficient associated with the *j* alternative price tariff; M= individuals´ income; δ = vector of coefficients associated with the socioeconomic variables S.

Under the assumption that the error terms are independently and identically distributed, according to a Gumbel or extreme value type I distribution, the probability of choosing the alternative m was expressed with a multinomial logit model (LMN) containing the attributes to be assessed and the characteristics of individuals (McFadden, 1974).

$$\Pr(im) = \frac{\exp^{wv_{ij}(Z_j,\ S_i,\ M_i)}}{\sum_j \exp^{wv_{ij}(Z_j,\ S_i,\ M_i)}}$$

where: ω = the non-estimable scale parameter, regardless of the function parameters, Álvarez-Farizo *et al*. (2005) normalized to one.

One of the features of the LMN is the implicit assumption of independence of irrelevant alternatives (IIA), which indicates that the disturbances are independent and homoscedastic. When this assumption is not met, biased results are obtained,

therefore the Hausman and McFadden test of independence (Greene, 2003) must be applied. On the other hand, by adding an error component to the random term in the utility function ξ_{ij}, it is possible to model differences in individual preferences, which can be a limitation in the LMN model, generating the mixed logit model.

In this case, the probability that individual i chooses alternative j from the choice set C_i is:

$$P_{ij} = \int \frac{\exp\left(X_{ij}\beta + \xi_{ij} \right)}{\sum_{C \in C_i} \exp\left(X_{ik}\beta + \xi_{ik} \right)} f\left(\xi_{ij} \parallel \gamma \right) d\xi_{ij}$$

Where ξ_{ij} is an error component term with distribution $f(\xi_{ij}|\gamma)$ and parametric vector γ.

The estimated parameters of the additive model can be interpreted as marginal effects of the attribute of the product to be valued on the probability of choosing one of the plans; in this sense, the marginal willingness to pay (DAPMg) is the willingness to pay for a unit change in each of the intervention areas, while the rest remains constant. The willingness to pay for a marginal change in any of the analysed attributes results from the ratio of dividing the estimated coefficient of each attribute (- βi) by the coefficient of the fee attribute (γ) (Alpizar *et al*., 2001).

Choice experiment design

An analysis of wine production in the state of Guanajuato was carried out, identifying the main types of wine produced (red, rosé, white, etc.), strains produced, time spent by wines in wooden barrels, types of bottles used, region brands, prices, etc. In addition, a review of the literature was made to find out which attributes have been previously used in other studies on wine valuation, where the following stand out: origin (Kallas *et al*., 2012; Tait *et al*., 2019), variety (Cerda *et al*., 2010; Araya *et al*., 2020), and of course the price (Lockshin *et al*., 2009; Araya *et al*., 2020). Other attributes considered are the type of bottle, brand, aging, type of cap, etc.

Selection of attributes and levels

Based on the above and according to the objectives of the present study, four attributes were chosen, the first two intrinsic, to assess: grape variety or strain and aging time in barrels; and extrinsic: origin and price (Table 1).

The chosen varieties (or strains) were based on the main varieties produced in the region, while the aging in barrels was set only on the number of months spent in barrels, since in the state there is no Designation of Origin, therefore they cannot be classified as Crianza, Reserva, or Gran Reserva. On the other hand, for setting prices, the average prices of wines already on the market were accounted, as well as the knowledge and recommendations of the staff of the Museo del Vino de Guanajuato (Guanajuato Wine Museum) and the Tres Raices winery.

Table 1. Assessed attributes and levels of the choice experiment.

Attribute	Level
Origin	Imported National (Mexican) Guanajuato
Variety (strain)	Cabernet Sauvignon Malbec Merlot
Aging (time in months in wooden barrels)	6 12
Price (Mexican pesos, MXN $)	350 450 550 650

Accounting for the aforementioned attributes and levels, there are 72 possible combinations (3^2 x 2^1 x 4^1); which means that applying the survey with the same number of cards would be very complicated. Therefore, a fractional factor analysis was used to minimize the correlation between attributes (Bennett and Adamowicz, 2001). Making use of the orthogonal design process in the SPSS® computational package (IBM SPSS Statistics, 2015), 16 cards or alternatives were made. These optimal scenarios are orthogonal (there is no correlation between levels and attributes) and balanced (each level appears in the attribute the same number of times) (Tudela, 2010). Following Melo *et al*. (2020a), the 16 combinations were divided by factorial blocking in order to reduce the number of choice tasks and avoid possible sources of bias; thus, the number of versions (blocks) was included as an additional attribute in the orthogonal design. The procedure generated four different versions of the questionnaire, each containing four choice cards.

Design and implementation of the survey

Following Tudela and Leos (2017), three sections were included in the questionnaire, socioeconomic information of the interviewee, questions to assess goods, and finally the presentation of the alternatives for their choice (Table 2).

The socioeconomic questions and wine evaluation presented were chosen because they were considered relevant for this study; since they allow a better understanding of the reasons for the answers, as well as checking their coherence. To facilitate the application of the questionnaire in questions such as: gender, marital status, educational level, occupation and income level, some options were given, while in questions regarding age and economic dependents interviewees were asked openly.

The surveys were carried out personally in the municipality of Dolores Hidalgo, Guanajuato, Mexico from July 8 to 11, 2021 to wine consumers older than 18 years.

Table 2. Example of election card.

Attribute	Options		
	A	B	C
Origin	Guanajuato	Imported	None (If all options are ruled out)
Strain	Merlot	Cabernet Sauvignon	
Aging	Six months	Twelve months	
Price	350	450	

Price shown in MXN pesos.

The surveys were conducted at the main square of the municipality, in restaurants located around it and in the Guanajuato wine museum located in the downtown area of Dolores Hidalgo.

The sample size was determined based on the simple random sampling technique (MAS), using the following formula:

$$n = \frac{NZ^2pq}{(N-1)e^2 + Z^2pq}$$

where: n = sample size, N = total population of the municipality of Dolores Hidalgo, Guanajuato (163 038 inhabitants) (INEGI, 2020), p = 0.5, q = 0.5; assuming maximum variance, Z = confidence level Z=1.96, which corresponds to a confidence level of 95 % and e = permissible margin of error, which can range from 1 to 9 %; in this study margin used was 9 %. Substituting values in the formula, a sample size of 120 surveys was obtained.

Coding of the attributes to be assessed

Following the scheme developed by Holmes and Adamowicz (2003), codes were used to determine the effects of the attributes, which transferred the category rating scale to code the system that would be used in the econometric analysis.

In this particular case, for example, regarding the origin attribute, if the interviewee chose imported wine, the value 1 was assigned to origin, while national and Guanajuato wines would be assigned 0; if the national level is chosen, it would be assigned 1, and for imported and Guanajuato should be assigned 0. The same procedure was implemented with the other attributes.

RESULTS AND DISCUSSION

General features

Of the 120 respondents, 51.7 % were men and 48.3 % women, the majority between 18 and 35 years old (58.3 %), and 60.8 % said they were single. Regarding the educational level, the participation of those undergraduate (Bachelor) degree was the highest (52.5 %), followed by those with a postgraduate degree (37.5 %); 60 % of those surveyed

said they had between 1 and 4 economic dependents; regarding the level of income, 30.8 % earned incomes from $7001 to $15 000 per month, and 30 % reported incomes of more than $25 000. In third place are those who earn monthly incomes between $15 001 and $25 000, accounting for 26.7 % of the respondents, and lastly those who earn less than $7000 MXN pesos per month with a participation percentage of 12.5 %. Therefore, the average respondent turned out to be a man between the ages of 18 and 35, single, undergraduate (Bachelor) degree, having 1 to 4 economic dependents, and with a monthly income of $7001 to $15 000 (Table 3).

Within the wine evaluation questions, the respondents were presented with a list of five attributes and were asked to rank them according to the importance of each of them when choosing a wine. The results showed that the characteristic or attribute that the interviewees considered most important in choosing a wine was the type of wine (red, white, rosé). In second place is the grape variety, followed by the origin; in fourth place, there is the aging time in barrels and in last place the price. The origin, aging and price attributes turned out to be the most important in consumer decision-making in the study carried out by Sánchez and Gil (1997).

Some people said that in addition to the attributes already mentioned, when buying wine, they considered other characteristics, such as the degree of alcohol and the brand. The latter was one of the relevant attributes in the study by Lockshin *et al*.

Table 3. Socioeconomic variables of the interviewed wine consumers (n = 120).

Variable	Description	Quantity	Percentage
Gender	Woman	58	48.3
	Man	62	51.7
Age	18-35 years old	70	58.3
	36-55 years old	45	37.5
	More than 55 years old	5	4.2
Marital status	Single	73	60.8
	Married	47	39.2
Educational level	Secondary	1	0.8
	High school	7	5.8
	Technical career	4	3.3
	Bachelor degree	63	52.5
	Postgraduate	45	37.5
Economic dependents	None	45	37.5
	From 1 to 4	72	60.0
	From 5 to 9	3	2.5
Income	From $0 to $7000	15	12.5
	From $7001 to $15 000	37	30.8
	$15 001 to $25 000	32	26.7
	More than $25 000	36	30.0
Total		120	100.0

Values based on results from the surveys applied. Prices in MXN pesos.

(2006). The respondents also mentioned other attributes considered important, such as region, price, and awards.

Econometric analysis

The mixed logit model was chosen for this study. In general, in this model the coefficient signs of the explanatory variables were as expected. The variables that are highly significant with 1 % significance are: national, Guanajuato, six months of aging, twelve months of aging, and price. The latter showed a negative sign which is consistent with the economic theory, which indicates that if prices rise consumption will fall. The variable "Merlot" was significant at 10 %, that is, it has a positive contribution to the consumer satisfaction. There was a good fit (0.26) in terms of the adjusted pseudo-R squared. The Chi-square test rejects the hypothesis that the slopes of the model are equal to zero ($p \leq 0.01$) (Table 4).

On the other hand, the socioeconomic characteristics of gender (GEN) and income (ING) reflect the interaction effect with the specific constant for each alternative, with high statistical significance. This means that if they are men and have higher incomes, they have a greater perception of indirect utility in the consumption of wine. The income variable has also been significant in other studies, such is the case of those carried out by Tudela (2010) and Melo *et al*. (2020b), for an improvement plan in the Molino de Flores national park and El Chico national park, respectively. They found that the higher the income, the higher the indirect gain received from the improvements in recovery and conservation of each of the parks.

Table 4. Econometric results of the mixed logit model of the choice experiment.

Variable	Coefficient
National	1.1776 (4.173)¤
Guanajuato	1.4411 (4.436)¤
Merlot	0.3070 (1.340)†
Six months of aging	1.6509 (2.689)¤
Twelve months of aging	2.3127 (3.489)¤
Price	-0.0054 (-4.334))¤
1_GEN1	1.1802 (2.946)¤
1_ING1	0.1128 (2.044)¶
2_GEN2	1.0458 (2.606)¤
2_ING2	0.1673 (2.927)¤
Log likelihood	-382.0065
Chi squared	290.6548
Pseudo R-squared	0.2756
Pseudo R-squared adj.	0.2633

Values based on results of N-Logit 4.0. Significant value in †$p \leq 0.1$, ¶$p \leq 0.05$ and ¤$p \leq 0.01$ and in parentheses, EE: standard error.

Table 5. Marginal willingness to pay (DAPMg) for a change in each attribute.

Wine attributes	DAPMg by levels		Total DAP	Percentage
Aging	Six months 305.11	Twelve months 427.42	732.52	57.5
Origin	National 217.63	Guanajuato 266.32	483.95	38.0
Variety	Merlot 56.74		56.74	4.5
Total				100.0

Values calculated based on the mixed logit econometric model.

Analysis of marginal willingness to pay

The marginal willingness to pay (DAPMg) refers to paying for a unit change in this attribute, keeping the other constant. Based on the coefficients of the variables, the estimates of the DAPMg were obtained for each of the explanatory variables (Table 5). The most valued attribute by the interviewees was the barrel aging time, giving preference to wines that spend twelve months in wooden barrels rather than those that spend only six months. This implies that they prefer better quality wines, since according to González (2015), it is possible to raise the quality of a wine through aging. This result agrees with Albisu and Zeballos (2014), who found that the aging time together with the Designation of Origin were the main criteria when choosing a wine. In second place is the attribute of origin, where local wines as those from Guanajuato, are preferred over those produced in other states of the country, which implies that respondents have generated a sense of identity. In addition, in this area wines are greatly promoted through wine tourism. The result agreed with what Kallas *et al*. (2012) reported in their study, where they concluded that local (Catalonian) wine was preferred to wine produced in other regions of Spain. In this sense, Cortiñas *et al*. (2007) determined that origin is of great importance when choosing a product.

Finally, there is the variety attribute with correspond to Merlot. This attribute was the most important in the study conducted by Cerda *et al*. (2010). Similarly, the variety attribute was considered in the research conducted by Kallas *et al*. (2012), where the favourite variety was Cabernet Sauvignon followed by Garnacha and Merlot.

After considering all the above, the willingness to pay for a wine produced in Guanajuato, aged twelve months in wooden barrels and of the Merlot variety, shall be the sum of the marginal willingness to pay (DapMg) for each level, giving a total of $750 MXN pesos.

CONCLUSIONS

In this study on preferences of wine consumers in Dolores Hidalgo, Guanajuato, Mexico, conducted under a choice experiment approach, it was found that the

attributes that have the greatest relevance in the choice of a wine are the aging time in barrels. A percentage of more than 50 % prefer wines aged for 12 months over those aged for only 6 months, followed by 38 % choosing origin (at national and state level). Therefore, these two attributes are those that drive the choice behaviour of wine consumers. In third place there is the variety attribute, which in this case was Merlot. Thus, it was concluded that the product preferred by consumers in Dolores Hidalgo, Guanajuato, is a wine from Guanajuato, in a 750 mL bottle, aged in wooden barrels for twelve months, Merlot variety, for which consumers are willing to pay $750 MXN pesos.

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