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## **Impact of the economic and the political changes on consumers' wine preferences in Catalonia (Spain): a generalized multinomial logit approach.**

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## **Abstract**

The international economic crisis, which began in 2007, has had a devastating impact on the Spanish economy. Consequently, there is been a sharp drop in consumption and fixed capital investment. An example of the impact of the economic crisis in the Spanish food market is the growth of private labels which have raised their market share during all this period. Political changes have also occurred in the recent years. In this context, our main goal is to determine consumers' preferences towards wine in Catalonia as well as to assess whether consumers adjust themselves to the newer economic and political scenario. In particular, we will focus our interest in those preferences regarding the regional origin of the wine. To tackle this issue Discrete Choice Experiments were implemented and results were modelled by means of the Generalized Multinomial Logit model (GMNL). The GMNL can decompose unobserved heterogeneity into taste heterogeneity and scale heterogeneity. Two surveys were conducted: before and during the economic crisis, in 2008 and in 2010, with 400 and 401 consumers, respectively. The results show that consumers' wine preferences from both contexts have changed. During the crisis consumers tend to show less heterogeneous responses.

**Key Words:** Consumer preferences, wine, Choice Experiments, Generalized Multinomial Logit model.

**Topic:** Consumer behavior. Preference analysis.

## Introduction and Objectives

### *Catalonia as a wine region*

After Italy, Spain was the second largest wine-producing country in the world for the year 2013 after an outstanding harvest (OIV, current situation note 2014). Spain produced more than 53 million hectolitres of wine (MAGRAMA, Production and surfaces, 2014). Wine production in Catalonia accounted for more than 3.7 million hectolitres, showing a growing trend in the recent years (DAAM Agriculture Statistics, 2014). Thus, the wine sector in Catalonia, as well as that in overall Spain, accounts for an important fraction of the agriculture and food industry of the country. Its relevance is multifunctional and lies in its contribution to the economy, the social identity, and the landscape (Kallas, Z. et. al. 2012). In Catalonia, there are 12 Designations of Origin (DO), including the DO Cava<sup>1</sup>. The Catalan DO represents more than 90% of the grape-growing surface (IDESCAT, Agricultural Census, 2009), which shows a great specialisation for the production of quality wine.

In Catalonia, the household wine consumption shows a continuous downward trend for decades. In 2000 household wine consumption was 21.86 litres per capita to only. This cipher is 15.00 litres in 2013 (Household consumption data. MAGRAMA, 2014)<sup>2</sup>. On the other hand, the household consumption of quality wine has increased by 9.5% for the same period (2000-2013). These data show how consumers are experiencing a change of habits: they increase their demand for higher-quality wines while decreasing their consumption of other wines, specifically table wines.

Another characteristic of the Catalan wine sector is a relatively low market share of the Catalan DO wines in retailer channels and in the HORECA<sup>3</sup>: Catalan DO wines only account up to 33.7% of the total quality wine consumption in Catalonia (Nielsen Panel, 2014)<sup>4</sup>. This shows that the demand for quality Catalan wines in Catalonia is still low, and their main competitors in the domestic market are (some) Spanish quality wines, such as "La Rioja" (Kallas, Z. et. al. 2013).

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<sup>1</sup> The DO Cava exclusively produces Cava, which is a quality sparkling wine produced using the Traditional method (also called the *Champenoise method*, although this terminology was outlawed in Europe in 1994).

<sup>2</sup> Nevertheless, wine household consumption data showed its lower value in the year 2011 (12.86 litres per capita)

<sup>3</sup> HORECA is the acronym for Hotel, Restaurant, and Catering businesses.

<sup>4</sup> The latter figure represents an increase of 4.0 percentage points compared to 2008

In turn, the exportation of Catalan quality wines shows an increasing trend in recent years (in volume and value) (DATACOMEX, 2014). Thus, Catalan quality wines are every time more consumed and appreciated beyond our borders. Therefore, we are interested to analyse the wine preferences of consumers in Catalonia and try to explain why Catalan wines have such a relatively small share in the domestic market.

### *Socio-economic context in Catalonia*

Since 2007 the world economy has undergone a phase of marked instability. The Spanish economy has been much affected by the alterations in macroeconomic and financial conditions. Spain went into recession from the second semester of 2008, remaining in it until the first four-month period of 2010, when a there was a modest recovery. This recovery receded in the second half of 2011, as the sovereign debt crisis heightened and spread to an increasingly large number of countries (Ortega, E. and Peñalosa, J., 2012).

The economic crisis in Spain has had a devastating impact on the employment. In 2011 the unemployment level reached a peak of more than 6.2 million people (INE, 2014). The employment adjustment can be defined as virulent and protracted and it began in early 2008 (Ortega, E. and Peñalosa, J., 2012). Consequently, there is been a sharp drop in consumption and in fixed capital investment (Carballo-Cruz F., 2011).

The agro food sector has also faced the consequences of the crisis. An example of the impact of the economic crisis in the Spanish food market is the growth of private labels which have raised their market share during all this period (Nielsen Market trends, follow up 2008-14).

Political changes have also occurred in Catalonia in the recent years. The amount of Members of Parliament that are strongly in favour of an independent Catalonia (from Spain) has increased in the last elections of 2012 in 7.4%<sup>5</sup> (data from the Catalan Parliament, in comparison with the elections of 2010). Besides, the main nationalist party in Catalonia (CIU, for Convergència i Unió), which has been in charge of the Catalan government from 1980 to 2003, and from 2010 up to date, has shifted from nationalism to Catalan independentism (Guibernau, M., 2013; Hopkin, J., 2012; Serrano, I., 2014; La Vanguardia publications, amongst others). This shift became more acute after the long awaited decision of the Constitutional Court about the new

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<sup>5</sup> The clearly pro-independence parties in Catalonia are: ERC (Esquerra Republicana de Catalunya), CUP (Candidatura d'Unitat Popular), and the current non-represented SI (Solidaritat Catalana per la Independència).

Statute of Autonomy, which was delivered on July 10<sup>th</sup> 2010. The ruling of the Spanish Constitutional Court prompted a massive popular mobilization of protests in Catalonia (Serrano, I., 2014).

In this context, our main goal is to determine consumers' red wine preferences for a special occasion and their changes regarding the newer economic and political scenario. This paper relies on two surveys that measured consumers' preferences through a non-forced choice experiment.

Methodologically, this paper contributes to the literature of the Discrete Choice Modelling (DCM) using the recently developed Generalised Multinomial Logit Model (GMNL) of Fiebig et al. (2010). The GMNL allows the determination of preference (or taste) and scale heterogeneity. This is first application, in the literature of food and wine preferences studies to measure the impact of the economic and political crisis in Spain, or more specifically, in Catalonia.

## **Consumers' preferences towards wine**

Consumers face certain difficulties and confusion to choose a wine (Lockshin et al., 2006). The main difficulty lies in the immense number of cues that are associated with wine: wine can be differentiated by type (red, white, rosé, sparkling, liquored, and others), country and region of origin, brand name, price, awards, packaging.... Furthermore, quality and taste, grape variety (or varieties), vintage and alcohol content, which are defined as intrinsic cues, are also relevant for consumers. Consequently, amongst other factors, all of the complexities that wine encompasses, the enormous amount of labels that are available in the market, and the perceived formality of wine have led to the suggestion that the choosing of a wine can be intimidating (Lockshin and Halstead, 2005). Therefore, many consumers perceive wine as a complex product and are likely to exhibit some form of risk reduction behaviour during its purchase (Johnson and Bruwer, 2004).

Wine is an experience product and it cannot be assessed until the product has actually been consumed (Mueller et al., 2010, Bruwer et al., 2011; amongst others). Because of this, consumers will rely on extrinsic cues to assess the quality of a wine (Lockshin and Hall, 2003; Lockshin and Halstead, 2005; Lockshin et al. 2006; Remaud and Lockshin, 2009), and will make their decision

based on the information available on the label and bottle (which are proxies or indications of what lies inside the bottle).

However, consumers will only use a small amount of all the available information to make a decision (e.g., Foxall, 1983; Lockshin and Hall, 2003). For this reason, brand names help to address risk because of providing several product cues (including quality) (Lockshin and Hall, 2003). Generic types can perform as well as brand names and they can be built on the region of origin and/or the grape variety (Lockshin and Hall, 2003; Gluckman, 1990).

The origin of the wine plays a key role in the consumers' decision-making process: it can become one indicator of the quality of the wine (Gluckman 1990; Skuras and Vakrou 2002). In this line, some regions of origin have become luxury brands in themselves (Remaud and Lockshin, 2009), and, decidedly, can add value in the consumers' eyes (Gil and Sanchez, 1997; Quester and Smart, 1998; Angulo et al., 2000; Lockshin et al., 2006; Remaud and Lockshin, 2009, amongst others).

Price is a very important attribute that affects wine choice. It can be used as a proxy to infer the quality of the product, especially when there are a small number of other cues available, when the product cannot be evaluated before purchase, and when there is some degree of risk of making a wrong choice (Lockshin and Hall, 2003; Mitchell and Greatorex, 1988; 1989). Risk reduction in wine choice has been an issue of interest in previous research (Michell and Greatorex, 1988; Johnson and Bruwer, 2004; Schifman and Kanuk, 2006; Bruwer et al., 2011). In a recent work, Bruwer and Rawbone-Viljoen (2012) compiled the main risk reduction strategies (RRS) for wine choice from the literature. These are summarised below:

- *Information search:* from assistants, waiters, wine editorials, tasting notes, product packaging, word-of-mouth, family and friends, and opinion leaders (Mitchell and Greatorex, 1988). Information seeking is largely dependent on the level of consumer involvement.
- *Brand loyalty:* Also closely correlated with involvement. Uniformed buyers possess small brand repertoires and gravitate toward the safety of bigger brands that offer consistency in taste and quality (Lockshin and Spawton, 2001). Wine enthusiasts are likely to be more experimental.
- *Store image:* This becomes more important when looking for expensive and infrequently purchased items (Hisrich et al., 1972).
- *Well-known brands.* More likely to be trusted when consumers have no experience with the product (Mitchell and Greatorex, 1989).

- *Price*: Becomes more important when no other information about the product is available (Mitchell and Greatorex, 1989). If the consumer perceives a high price to quality relationship, he/she will buy a more expensive wine with the belief that it will have a higher quality (Gluckman, 1986).
- *Seeking reassurance*: through tastings and information seeking behaviour. The very act of wine tasting should be regarded as *information* gathering (Mitchell and Greatorex, 1989). Batt and Dean (2000) found that prior experience had the most influence on the purchase of wine.

## Methodology

### *Theoretical foundation of the Discrete Choice Experiments*

Discrete Choice Experiments (DCE) aim to identify the individual's indirect utility function associated with attributes of products by examining the trade-offs they make when making choice decisions. Thus, several alternatives that are described by several attributes with varying levels are presented to respondents in choice sets. The respondent is then asked to select its preferred alternative within each choice set, thereby revealing his/her preference for certain attributes and levels. Subsequently, the relative importance of the attributes can be indirectly recovered from respondents' choices.

DCE rely on Lancaster's Theory of Value (Lancaster, 1966) which proposes that utility of a product is decomposed into separable utilities for their characteristics or attributes. It is also based on the Random Utility Theory (RUT) laid out by Thurstone (1927). This theory proposes that subjects choose among alternatives according to a utility function with two main components: a systematic (observable) component and a random error term (non-observable):

$$U_{jn} = V_{jn}(X_j, S_n) + \varepsilon_{jn} \quad (1)$$

where  $U_{jn}$  is the utility of alternative  $j$  to subject  $n$ ,  $V_{jn}$  is the systematic component of the utility,  $X_j$  is the vector of attributes of alternative  $j$ ,  $S_n$  is the vector of socio-economic characteristics of the subject  $n$  and  $\varepsilon_{jn}$  is the random term.

### *The Multinomial Logit Model (MNL)*

To predict the subjects' preferences for attributes (k), we need to define the "probability of choice" that an individual  $n$  chooses the alternative  $i$  rather than the alternative  $j$  (for any  $i$  and  $j$  within

choice sets,  $T$ ). McFadden (1974) developed an econometric model that formalized respondents' decision-making process. This model is often referred to as the Multinomial Logit (MNL) model, which is considered the base model for DCE.

According to MNL model the utility to person  $n$  from choosing alternative  $j$  on choice scenario  $t$  is given by:

$$U_{njt} = \beta x_{njt} + \varepsilon_{njt} / \sigma_n \quad n=1, \dots, N \quad j=1, \dots, J \quad t=1, \dots, T \quad (2)$$

Where,  $x_{njt}$  is a  $K$ -vector of observed attributes of alternative  $j$ ,  $\beta$  is a vector of mean attribute utilities (utility weights) and  $\varepsilon_{njt}$  is the "idiosyncratic" error term that follows independent and identically distributed (i.i.d.) Type 1 extreme value distribution with scale parameter  $\sigma_n$ .

The probability ( $P_j | X_{nt}$ ) that an individual  $n$  will choose alternative  $j$  among other alternative of an array of choice set  $T$  is formulated as follows:

$$(P_j | X_{nt}) = \frac{\exp(\beta x_{njt})}{\sum_{j=1}^J \exp(\beta x_{njt})} \quad \forall j \in T \quad (3)$$

In this context, the MNL has an asymmetric heterogeneity structure: it may account for heterogeneous preferences only for the unobserved attributes (by estimating the scale parameter). When the scale parameter is estimated, the MNL model is named as Scale Heterogeneity model (or S-MNL), to differentiate it from the "simplified" MNL model, in which the scale parameter  $\sigma_n$  is generally normalized to one for identification.

Nevertheless, MNL model imposes homogeneity in preferences for observed attributes, only estimating average attributes' utilities, which is often unrealistic as consumers' preferences are, by nature, heterogeneous. The analysis of heterogeneity is an important issue, especially for the New Product Development (NPD), for which estimating only the average preferences may lead one to miss that a product with particular attributes would have great appeal for a subset of the population (Fiebig, *et al.*, 2010). Thus, the failure in understanding the preference heterogeneity may lead to a failure to optimally target potential adopters of the new product. Therefore, the mixed or *heterogeneous* logit models (MIXL) have been introduced to investigate such heterogeneity.

### The Mixed Logit Model (MIXL)

The Mixed or Heterogeneous Logit models (MIXL) (also in the literature is referred to as Random Parameter Logit model, RPL) are currently quite popular. They extend the MNL model allowing for unobserved heterogeneity by introducing random coefficients on attributes (Ben-Akiva et al., 1997). In MIXL the utility to person  $n$  from choosing alternative  $j$  in choice set  $t$  is given by:

$$U_{njt} = \beta_n x_{njt} + \varepsilon_{njt} / \sigma_n \quad n=1, \dots, N \quad j=1, \dots, J \quad t=1, \dots, T \quad (4)$$

Where,  $\beta_n = \beta + \eta_n$  and where  $(\eta_n)$  is the vector of person  $n$  specific deviations from the mean value of the  $\beta$  s. The  $\eta_n$  is described by an underlying continuous distribution for the attributes defined by the researcher. In most applications the multivariate normal distribution is the most used, MVN  $(0, \Sigma)$ . In this case,  $\sigma_n$  is also assumed to be one for identification.

For the MIXL model, the choice probability is:

$$(P_j | X_{nt}) = \frac{\exp[(\beta + \eta_n)x_{njt}]}{\sum_{j=1}^J \exp[(\beta + \eta_n)x_{njt}]} \quad \forall j \in T \quad (5)$$

However, recently Louviere and Mayer (2007), Louviere *et al.* (2008) argued that much of the preference heterogeneity captured by random parameters in MIXL can be better captured by the scale term; and thus known as “scale heterogeneity”. Besides, they stated that the normal distributions of the random attributed in the MIXL do not appear to be very close to it, as followed in almost MIXL applications. The MIXL turns to be likely a poor approximation to stated data if scale heterogeneity is not accounted for (Fiebig, et al., 2010)

The scale heterogeneity is the variation of the degree of randomness in the decision-making process over respondents and, therefore, it can be interpreted as the degree of individuals' certainty in their choices. It is based on the differences of the variance of the error term ( $\varepsilon$ ) across individuals-decision-makers. In this context, the analysis of the scale heterogeneity is important, especially for the stated preference studies (i.e. based on questionnaire). In this type of studies, consumers may interpret and process choice tasks and situations differently. They may have varying levels of attention paid to the task they are presented, as well as the level of certainty in their choice (Train

and Weeks, 2005). Thus, it would be expected that the scale of the error term could be greater for some consumers than for others.

#### *The Generalized Multinomial Logit Model (GMNL)*

On the basis of Keane (2006), Fiebig *et al.* (2010) developed the Generalized Multinomial Logit model (GMNL). Within this approach, the  $\sigma_n$  is no longer set to be one, and a particular specification of this term is assumed. In this case, multiplying equation (4) through by  $\sigma_n$ , Fiebig *et al.* (2010) identified that the utility to person  $n$  from choosing alternative  $j$  on choice set  $t$  is given by:

$$U_{njt} = [\sigma_n \beta + \gamma \eta_n + (1-\gamma) \sigma_n \eta_n] X_{njt} + \varepsilon_{njt} \quad (6)$$

where  $\gamma$  is a mixing parameter between 0 and 1; and  $\sigma_n$  is a scaling factor that proportionately scales the  $\beta$ 's up or down for each individual  $n$ .

To impose that  $\gamma \in [0,1]$  in the estimation, Fiebig *et al.*, (2010) used a logistic transform  $\gamma = \exp(\gamma^*)/[1 + \exp(\gamma^*)]$  and estimate  $\gamma^*$ . Thus  $\gamma$  is a mixing parameter, and its value determines the level of mixing or interaction between the scale heterogeneity coefficient  $\sigma_n$  and the parameter heterogeneity coefficient  $\eta_n$ .

Since the scale heterogeneity factor  $\sigma_n$  represents the person-specific scale of the idiosyncratic error, it should be positive. Fiebig *et al.* (2010) proposed that  $\sigma_n$  follows a log-normal distribution with mean 1 and standard deviation  $\tau$ ,  $\sigma_n \sim \text{LN}(1, \tau^2)$ , with the estimated  $\tau$  capturing the scale heterogeneity across consumers. Thus, to ensure it is positive, Fiebig *et al.* (2010) an exponential transformation of  $\sigma_n = \exp(\bar{\sigma} + \tau v_n)$  where  $v_n \sim N(0,1)$ .

Because  $\sigma_n$  enters the model as a product of  $\sigma_n \beta$  (equation 6), some normalization on  $\sigma_n$  is required to identify  $\beta$ . Fiebig *et al.* (2010) recommend setting the mean of  $\sigma_n$  to 1 so  $\beta$  is the mean of the utility weights. Because the mean of the log-normally distributed  $\sigma_n$  is

$\sigma_n = \exp(\bar{\sigma} + \tau v_n)$  and the  $E(\sigma_n) = \exp(\bar{\sigma} + \tau^2/2)$ , thus to ensure  $E(\sigma_n) = 1$ , we need to set  $\bar{\sigma} = -(\tau^2/2)$ .

Let  $y_{njt}$  be '1' if respondent  $n$  choose alternative  $j$  in choice set  $t$ , and '0' otherwise. The probability that consumer  $n$  choose alternative  $j$  in choice set  $t$  is:

$$(P_j | X_{nt}) = \frac{\exp([\sigma_n \beta + \gamma \eta_n + (1-\gamma) \sigma_n \eta_n] X_{njt})}{\sum_{j=1}^J \exp([\sigma_n \beta + \gamma \eta_n + (1-\gamma) \sigma_n \eta_n] X_{njt})} \quad \forall j \in T \quad (7)$$

Finally, it is important to include in our model an Alternative Specific constant that measures those intangible unobserved aspects that are not collected by the attributes that were specified in the choice tasks. *Here we can enlarge the explanation of the meaning but we can do it later in the results' discussion.* Greene and Hensher (2010) proposed three possible strategies to deal with ASC:

1. Consider the ASC ( $\beta_{0j}$ ) as fixed parameters, assuming homogenous preference for ASCs across consumers. In this case the equation (6) is specified as follows:

$$U_{njt} = (\beta_{0j}) + [\sigma_n \beta + \gamma \eta_n + (1-\gamma) \sigma_n \eta_n] X_{njt} + \varepsilon_{njt}$$

2. Consider the ASC as a part of the general specification of the GMNL model (i.e. to behave like the attributes). Then the utility of the ASCs ( $\beta_{0j}$ ) is scaled and considered to be random. The ASCs are considered as the  $\beta$ 's components. In this case equation (6) is specified as follows:

$$U_{njt} = [\sigma_n (\beta_{0j} + \beta) + \gamma (\eta_{0nj} + \eta_n) + (1-\gamma) \sigma_n (\eta_{0nj} + \eta_n)] X_{njt} + \varepsilon_{njt}$$

It is worth mentioning that Fiebig *et al.* (2010) observed that this may cause estimator to fail.

3. Consider the ASC only as a random parameter and force no special scaling for this variable. Thus, the scaling parameter  $\sigma_n$  is equal to 1; and  $\gamma$  equals 0. In this case, equation (6) is:

$$U_{njt} = (\beta_{0j} + \eta_{0nj}) + [\sigma_n \beta + \gamma \eta_n + (1-\gamma) \sigma_n \eta_n] X_{njt} + \varepsilon_{njt}$$

where  $(\beta_{0j} + \eta_{0nj})$  are the heterogeneous intercepts (which do not have scale heterogeneity), with  $\beta_0$  being the mean vector and the  $\eta_{0n}$  being the stochastic component.

The GMNL model is specified by default to consider the  $\eta_n$  as uncorrelated. That means, constraining the covariance matrix of  $\eta_n$  to be a diagonal matrix (a matrix in which all values above and to the right of the diagonal are equal to zero). In this case, there are only variances estimated, and no covariances. However, the GMNL can be specified to allow for correlated parameters. The presence of multiple observations on stated-choice responses for each sampled individual means that the potential for correlated responses across observations can be the product of many sources, including the sequencing of offered choice situations that results in mixtures of learning and inertia effects, among other possible influences on choice response (Hensher et al., 2005). Therefore, discrete choice data with repeated choice situations containing the same attributes and levels, may have unobserved effects which are correlated among alternatives. One way to recognize this is to permit correlation of random parameters of attributes that are common across alternatives observation (Hensher et al., 2005).

In the case of correlated random parameters, the set of random parameters has a full covariance matrix with estimated variances and covariances. Thus, when we have more than one random parameter the estimated standard deviations  $\eta_n$  are no longer independent, because they are a result of their attribute-specific standard deviation and their correlation with the rest of the attributes. In order to differentiate these standard deviations we follow the Cholesky decomposition method. This method decouples the contribution to each standard deviation parameter made through correlation with other random parameter estimates and the actual contribution made solely through heterogeneity around the mean of each random parameter estimate (Hensher et al., 2005). The correlated parameters GMNL model reports both the “confounding” standard deviation and its Cholesky decomposing matrix. The diagonal value of the Cholesky matrix represents the true standard deviation for each random parameter once the cross-correlated parameter terms have been unconfounded. The below-diagonal elements in Cholesky decomposition matrix are the covariances (cross-correlation) among the random parameter estimates.

From the abovementioned aspects of the GMNL model, in this case study, we used a GMNL model with correlated random parameters  $\eta_n$  and considering the ASC ( $\beta_{0j}$ ) as random parameters (third

option). We have come to this decision because it showed to have the best goodness of fit compared to other specification in terms of Pseudo-R<sup>2</sup>, AIC and improvement in the Likelihood functions and for the better interpretation of the estimates. We used the GMXLOGIT procedure in NLOGIT 5.

## Empirical application

### *Sample*

Data were collected from two identical survey performed in two different times: before and during the current economic crisis. The surveys recruited 400 and 401 consumers, respectively, who responded a structured face-to-face questionnaire over a 4-week period. We used a quota sampling procedure stratified by gender, age, and postal districts with proportional allocation to each stratum. The selection criteria were that respondents should be at least 18 years of age (legal drinking age), should have purchased a bottle of wine within the last 3 months, and should be the main wine purchase decision makers in their household. The respondents were recruited in major supermarkets and in one of the central streets of the city of Barcelona. The fieldwork was subcontracted to a company specialised in marketing research. Each respondent was given 20€ to participate in the experiment. The questionnaire was pretested a total of four times using a pilot sample of six different consumers each time and subsequently revised to improve readability and understanding. A summary of the survey technical sheets is shown in Table 1.

Table 1: Survey technical sheet

|                     | 2008   | 2010         |
|---------------------|--|--------------|
| Population          | Consumers over 18 years who purchase regularly food and are residents in the metropolitan area of Barcelona.     |              |
| Sample Design       | Stratified sample by age and postal districts using proportional affixation to the number of persons by stratum. |              |
| Field               | Metropolitan area of Barcelona   |              |
| Sample Size         | 400  | 401          |
| Confidence interval | ± 4.9  | ± 4.9%       |
| Confidence level    | 95.5% (k=2)  | 95.5% (k=2)  |
| Control measure     | Pilot survey (25 questionnaires)   |              |
| Date of field work  | January 2008   | October 2010 |

### *Attributes and levels*

It is of paramount importance a correct identification of the main attributes and levels that consumers consider when purchasing wine. From the literature review we were able to identify a

set of major attributes that affect the wine choice. However, some of these attributes had to be discarded because they would extremely complicate the design of the choice experiment (which increases exponentially with the number of attributes and levels). Therefore, to reduce the wine choice complexity, we delimited our wine selection by focusing on a red wine purchased for a special occasion, such as Christmas. Specifying the occasion leads our respondents to think of a similar context Lockshin and Hall, 2003; Lockshin et al. 2006). This is important because wine consumption can be explicitly related to a specific situation and to context (Bruwer et al. 2002; Quester and Smart, 1998; Lockshin and Hall, 2003).

Subsequently, the identified attributes were discussed in a focus group formed by university lecturers in the field of marketing and representatives from consumers' associations in Catalonia to determine the final set of attributes used in the study.

The wine origin is the factor that interested us the most, and "Catalan wine" was used as an attribute level. Correspondingly, the other introduced levels were "Spanish wine", which implies any wine produced in Spain with the exception of those produced in Catalonia, and, as a third level, "foreign wine". The grape variety was also considered. Mtimet and Albisu (2006) found that the consumers chose the only possible French variety that was presented (Cabernet Sauvignon). In our choice experiment, two French varieties were introduced (Cabernet Sauvignon and Merlot), and a typical traditional Spanish variety (Grenache). The aim of introducing two French varieties was to determine whether the consumers' preferences are for French wines in general or for the Cabernet Sauvignon grape in specific. As it was previously mentioned, certain strategies of risk reduction are likely to be exhibit during wine purchase (Johnson and Bruwer, 2004). Johnson and Bruwer (2004) concluded that the main risk reduction strategies (RRS) used by consumers when purchasing high-priced wines are reassurance and information seeking. Our wine was defined as a product to be consumed on a special occasion and, therefore, reassurance and information seeking may be the main RRS. In this sense, wine characteristics related to risk reduction were included as the third attribute of our experiment. The levels were the following: a previously known wine, a recommended wine, and a prestigious wine. Through this last level, we attempted to ascertain the effect of a known brand name (prestigious) on the other two alternatives. This third attribute was denoted "Wine References".

The set of attributes included in our experiment were the following: Wine Origin (Catalonia (regional), Spain (national), and imported (international)), Wine References (previously experienced, recommended, and prestigious), Grape Variety (Cabernet Sauvignon, Grenache, and Merlot), and Price (€6.00, €10.00, and €14.00). The price levels were chosen based on the fact that the purchase was meant for a special occasion, such as Christmas, and therefore do not reflect the mean wine market prices in Spain for conventional wines<sup>6</sup>.

These identified attributes and levels were endorsed by all of the participants of the focus group. A pilot questionnaire was then implemented to check for consistency. Following a full factorial design, a total of 81 hypothetical products were generated, which resulted in a set of 34x34 (6,561) possible combinations (choice sets). Finally, an orthogonal fractional factorial design was applied considering all of the main effects of the attributes, which enabled us to reduce the number of choice sets to nine.

All attributes, including the price, were coded with effect coding as discrete variables. The base level of each attribute was as follows: ‘imported’ for ‘origin’, ‘previously experience’ for ‘Wine References’, ‘Merlot’ for ‘grape variety’, and ‘6.0€ (low)’ for the ‘price’ attribute. Figure 2 shows one of these choice sets.

In order to avoid the base levels being confounded with the intercept (no purchase option), we use effects coding (Bech and Gyrd-Hansen 2005). In this case, the base levels are set equal to the negative sum of the parameter values of the other levels within an attribute. Consequently, effects of all levels can be estimated. All models were estimated by using 500 Halton draws.

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<sup>6</sup> The prices included in the choice sets were chosen using information provided from the pilot survey, which was implemented to cover the middle 90% of the observed values.

Figure 2: Example of a choice set

| ELECTION # 1   | Alternative “A”   | Alternative “B”     |                              |
|--|---|---------------------|------------------------------|
| Origin (A <sub>1</sub> )   |  | Catalonia           | Spain<br>(outside Catalonia) |
| Knowledge (A <sub>2</sub> )  |  | Personal experience | Recommended                  |
| Grape Variety (A <sub>3</sub> )  |  | Merlot              | Cabernet Sauvignon           |
| Price (A <sub>4</sub> )  |  | €6                  | €10                          |
| Considering that “A” and “B” are the <u>only</u> available products, which product would you <u>choose</u> ? |   |                     |                              |
|  |   | A      B            |                              |
| Would you purchase your chosen product?  | Yes   | No                  |                              |

## Results and Discussion

The results of the estimated GMXL models are shown in Table 2. In general, both models are statistically significant and exhibited a good fit with highly significant likelihood ratios. If we do not take into account the changes amongst both surveys, consumers' preferences are higher for the local (Catalan) origin of the product, for the grape variety Cabernet Sauvignon and, for wines that have been previously experienced compared with recommended and prestigious wines.

The results from the year 2008 (before the economic crisis) show that all the random parameters are significant, with the exception of the recommended level and the grape variety Grenache. This indicates that the attributes considered are significant determinants of the consumer's welfare. The positive (negative) sign of the attributes implies a positive (negative) contribution to the consumers' utility function. However, the results from the year 2010 (during the economic crisis) show that some of the previous significant parameters have turned into non-significant. One example of this is the Spanish origin of the wine. Thus, while Spanish wines gather the highest market share in Catalonia, consumers' utility for Spanish wines becomes non-significant.

In this sense, the political changes that have occurred through the period of study might explain this fact.

Furthermore, the no-choice option turns from negative to positive utility, with a remarkable high value in the survey of 2010. This greater utility for the no choice intercept may explain the shift of significance that some of the observable attributes have undergone. Thus, in 2010, consumers show a greater preference for not taking the product, indicating persistence in the unobserved attributes.

Another parameter that changes the coefficient sign ( $\beta$ ) from 2007 to 2010 is the price of 10€, which turns from negative to positive utility<sup>7</sup>. Because of the economic crisis, we would expect an opposite result for this parameter. However, the Spanish Agriculture, Food and Environment Ministry reports an increase on the per capita expenditure for a red quality wine in Catalonia: In January 2008, the household per capita expenditure was of 0.71€, which increased up to 0.81€ in October 2010 (dates when the surveys were performed, Table 1). Consumers' expenditure in January 2010 was even higher (0.85€). This rise in wine expenditure occurred in spite of a general decrease in the expenditure of food products during the same period of time. This trend could be explained by the evolution of wine consumption in Catalonia, which tends to diminish in quantity while not in quality.

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<sup>7</sup> Several studies have shown how wine can perform as a Veblen good to a certain extent, i.e., it can become more desirable as it increases in price. Mtimet and Albisu (2006) obtained a concave price-utility curve, which indicates an increase in the consumers' utility when the price is increased; however, this is only true up to a certain price level. At higher prices, the consumers' utility decreases when the price increases. This confirmed previous results obtained by Lockshin et al. (2006), who stated that the wine demand increases as the price increases and decreases at the highest price points. However, the point at which the demand drops depends on the different products attributes.

Table 2: Random parameter estimates and specifications of the GMXL model. Results for 2008 and 2010.

|  | 2008                  | 2010                    |
|--|-----------------------|-------------------------|
| Random parameter estimates   |                       |                         |
| <b>Spanish</b>   | <b>.42491***</b>      | .12845                  |
| <b>Catalan</b>   | <b>2.20855***</b>     | <b>.63037***</b>        |
| <b>Recommended</b>   | .19417                | .02310                  |
| <b>Prestigious</b>   | <b>-.19178*</b>       | -.07484                 |
| <b>Grenache</b>  | -.10651               | -.09077                 |
| <b>Cabernet sauvignon</b>  | <b>1.14638***</b>     | <b>.29827**</b>         |
| <b>Price-10€</b>   | <b>-.32333**</b>      | <b>.35270***</b>        |
| <b>Price-14€</b>   | <b>-.99064***</b>     | .17124                  |
| <b>No choice</b>   | <b>-1.18832***</b>    | <b>2.66169***</b>       |
| <b>Log-Likelihood (0)</b>  | <b>-3,955.00</b>      | <b>-3,964.89</b>        |
| <b>LL ratio test</b>   | <b>936.57 (0.000)</b> | <b>3,444.13 (0.000)</b> |
| <b>Pseudo R2</b>   | <b>.1184036</b>       | <b>.4343290</b>         |
| <b>AIC/N</b>   | <b>1.971</b>          | <b>1.277</b>            |
| <b>Variance parameter tau in scale parameter (<math>\tau</math>)</b> | <b>.26744***</b>      | <b>0.00</b>             |
| <b>Weighting parameter Gamma (<math>\gamma</math>)</b>               | <b>.10053**</b>       | <b>.57052***</b>        |

Significance levels: \*\*\* p<0.01; \*\*p<0.05; \* p< 0.10

Results from Table 3 also report consumers' scale and taste heterogeneity. As it is shown, the scaling factor tau ( $\tau$ ), which is the key parameter that captures scale heterogeneity, has turned to be not significant in 2010 (equal to zero), from a significant positive value in 2008 (+0.27). As the parameter tau decreases, the degree of scale heterogeneity decreases as well. This means that, in 2010, the variation of the degree of randomness in consumers' decisions has decreased significantly and, thus has the degree of uncertainty in the decision-making process. This finding might show a great impact of socio economic changes in the environment on consumers' decision-making towards wine. In this sense, external common circumstances may have had a homogenising influence.

In addition, the mixing parameter gamma ( $\gamma$ ), which values is in the range within 0 and 1, is significantly different from zero in both models. This means that taste heterogeneity is partially conditioned to scale heterogeneity, and it especially less pronounced in 2010, when the mixing

parameter gamma takes a higher value (+0.57). The closest that  $\gamma$  is to 1, the more independent from each other both unobserved heterogeneities are. This is in accordance to a value of  $\tau$  equal to zero in 2010. Therefore, in 2010, results do not show scale heterogeneity and, thus, it is independent from taste heterogeneity. Results of taste heterogeneity are shown on table 3.

Taste heterogeneity when modelling with GMNL with correlated parameters is expressed by the standard deviation of the random parameters, and not by the diagonal values of the Cholesky matrix, as it was explained on the methodology section. Our results from the survey in 2008 show that all the identified parameters had a significant attribute-specific standard deviation, with the exception of the level Spanish. In contrast, in 2010, some of the levels' standard deviation becomes statistically equal to zero, while the Spanish wine's standard deviation turns significant. Therefore, in spite of showing a not significant utility for the aggregate sample, preferences for Spanish wines turn to be significantly heterogeneous.

Still in regard to the origin of the wine, it is noteworthy that Catalan wine's standard deviation turns into zero in 2010. Therefore, the Catalan origin remains significantly positive in regard to consumer's utility and, moreover, this quality shows to be homogeneous across consumers. Furthermore, scale heterogeneity in 2010 is found to be equal to zero and, thus, consumers' preference towards Catalan wines has become more apparent because of its uniformity.

Finally, in 2008, the estimates of the covariance matrix of the random parameters are significant for some combinations of attributes. One of the positive correlations are the Recommended wine with the Catalan, the Grenache and the 14€ levels. Conversely, this same levels (Catalan, Grenache and 14€) are negatively correlated with the no-choice option. This might show a certain positive perception on the mentioned levels when they are grouped together. On the other hand, in 2010, none of the combinations show significant covariances.

Table 3: Results from model estimations for consumer data with and without information

|  |                                  | 2008               | 2010              |
|--|----------------------------------|--------------------|-------------------|
| Diagonal values in Cholesky matrix             | Spanish                          | .04461             | <b>.66391***</b>  |
|  | Catalan                          | <b>.52288**</b>    | .36832            |
|  | Recommended                      | <b>.46574***</b>   | .18871            |
|  | Prestigious                      | <b>.25072*</b>     | .15686            |
|  | Grenache                         | .05629             | .35212            |
|  | Cabernet sauvignon               | <b>.66986***</b>   | .04155            |
|  | Price-10€                        | <b>.33084**</b>    | .18157            |
|  | Price-14€                        | <b>.38923**</b>    | .20567            |
|  | No choice                        | <b>1.45100***</b>  | .40868            |
|  |                                  |                    |                   |
| Covariances of Random Parameters               | Catalan – Spanish                | -.07276            | -.12681           |
|  | Recommended – Spanish            | -.01794            | .13146            |
|  | Prestigious – Spanish            | -.00371            | .09543            |
|  | Grenache – Spanish               | -.03885            | .16940            |
|  | Cabernet sauvignon – Spanish     | .00764             | .00596            |
|  | 10€ – Spanish                    | .00988             | -.01064           |
|  | 14€ – Spanish                    | -.01204            | -.00691           |
|  | No choice – Spanish              | .04208             | -.27989           |
|  | Recommended – Catalan            | <b>.53993*</b>     | -.05820           |
|  | Prestigious – Catalan            | -.07075            | .01461            |
|  | Grenache – Catalan               | <b>1.32629***</b>  | .24222            |
|  | Cabernet sauvignon – Catalan     | -.03221            | .04418            |
|  | 10€ – Catalan                    | -.38823            | .03666            |
|  | 14€ – Catalan                    | .24656             | .18897            |
|  | No choice – Catalan              | <b>-1.48334***</b> | -.09863           |
|  | Prestigious – Recommended        | .04689             | -.01842           |
|  | Grenache – Recommended           | <b>.34290**</b>    | .17593            |
|  | Cabernet sauvignon – Recommended | -.05130            | .04455            |
|  | 10€ – Recommended                | <b>-.20816*</b>    | -.01383           |
|  | 14€ – Recommended                | <b>.31281**</b>    | -.07911           |
|  | No choice – Recommended          | .31897             | -.00909           |
|  | Grenache – Prestigious           | .04772             | -.03254           |
|  | Cabernet sauvignon – Prestigious | <b>-.28140**</b>   | -.08812           |
|  | 10€ – Prestigious                | .04407             | -.03200           |
|  | 14€ – Prestigious                | .06336             | .13117            |
|  | No choice – Prestigious          | -.28894            | -.13416           |
|  | Cabernet sauvignon – Grenache    | -.20151            | -.09951           |
|  | 10€ – Grenache                   | -.17095            | -.15209           |
|  | 14€ – Grenache                   | .25545             | -.28093           |
|  | No choice – Grenache             | <b>-1.07160**</b>  | .20737            |
|  | 10€ – Cabernet sauvignon         | -.26706            | .07589            |
|  | 14€ – Cabernet sauvignon         | .27154             | -.04879           |
|  | No choice – Cabernet sauvignon   | .67568             | -.08022           |
|  | 14€ – 10€                        | .02625             | .05031            |
|  | No choice – 10€                  | -.86940            | .22235            |
|  | No choice – 14€                  | <b>-1.56211**</b>  | -.32690           |
| Standard deviations of parameter distributions | Sd-Spanish                       | .04461             | <b>.66391***</b>  |
|  | Sd-Catalan                       | <b>1.71303***</b>  | .41490            |
|  | Sd-Recommended                   | <b>.65423***</b>   | .27907            |
|  | Sd-Prestigious                   | <b>.50088***</b>   | <b>.32330*</b>    |
|  | Sd-Grenache                      | <b>1.00272***</b>  | <b>.57437**</b>   |
|  | Sd-Cabernet sauvignon            | <b>.90646***</b>   | .42036            |
|  | Sd-Price-10€                     | <b>.73129***</b>   | <b>.53750*</b>    |
|  | Sd-Price-14€                     | <b>1.30448***</b>  | <b>.75440*</b>    |
|  | Sd-No choice                     | <b>3.08245***</b>  | <b>1.83369***</b> |

Significance levels: \*\*\* p&lt;0.01; \*\*p&lt;0.05; \* p&lt;0.10

## Conclusions

This work is, to our knowledge, the first application in the literature of food and wine preferences studies to measure the impact of the economic and political crisis in Spain. The empirical application was conducted in Catalonia (Spain) in two surveys carried out before and during the economic crisis, in 2008 and in 2010, with 400 and 401 consumers, respectively. The Generalized Multinomial Logit model (GMNL) was used to decompose unobserved heterogeneity into taste heterogeneity and scale heterogeneity.

From an empirical point of view, consumers' preferences are higher for the local (Catalan) origin of the product, for the grape variety Cabernet Sauvignon and for wines that have been previously experienced, compared to recommended and prestigious wines. The Catalan origin of the wine shows a significantly positive utility in both surveys, which reveals the importance of the Catalonian identity in the consumer behaviour. However, in 2010, this quality is homogeneous across consumers (does not show any unobservable heterogeneity).

This finding is in accordance with the political environment. Furthermore, consumers' utility for Spanish wines becomes non-significant in the survey of 2010. This occurs in spite of actually gathering the highest market share in Catalonia, which suggests again an influence of the political changes that have occurred throughout the period of study.

From the methodological point of view, the Generalised Mixed Logit Model has shown to be appropriated to decouple both unobserved heterogeneities. The GMNL model has provided us with more information about the source of consumers' heterogeneity. In 2010, the results for the scale heterogeneity indicate that the degree of uncertainty in the decision-making process has decreased significantly. This finding might show a great impact of socio economic changes in the environment of consumers' decision-making towards wine. In this sense, external common circumstances may have had a homogenising influence.

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