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The demand for alcoholic beverages in Spain

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Abstract

The objective of this study is to analyze the main determinants of alcoholic beverages consumption at home. Data comes from the latest Spanish Household National Survey, which provides information on expenditure and quantities of different food products by household. Because households are interviewed only 1 week, a large number of zeros have been recorded. Among the existing censured demand models (the double hurdle (DH) model; the purchase-infrequency model; and the Tobit purchase-infrequency model, among others) and after carrying out model selection tests, the DH model has been finally estimated. All expenditure elasticities are positive, corresponding the highest value to spirits. Own price elasticities are negative and also in this case the spirits exhibit the highest value. Socio-economic variables also play an important role in explaining consumer purchase and consumption decisions.

JEL classification: D1; C5

Keywords: Alcoholic beverages; Censored demand models; Spain

1. Introduction

The Spanish beverages market is changing in the last few years. This change is mainly due to a shift in demand for alcoholic beverages. While total wine consumption has slightly decreased, beer, cava (sparkling wine) and spirits consumption have increased, and therefore, their market shares have risen. Moreover, the demand for alcoholic beverages is different when considering consumption at home and away from home. It means that the evolution of both types of consumption and factors affecting them are different. The demand for alcoholic beverages away from home may be considered very close to the demand for leisure goods and also, their determinants seem to be much alike. In this case, alcoholic beverages are consumed in a search for socializing with friends, family and colleagues at restaurants, bars, etc. However, the demand for alcoholic beverages at home is quite similar to the demand for food and, therefore, it depends on traditional economic factors (income and prices) and, also on household socio-demographic characteristics. However, it is not possible to analyze the determinants of alcoholic beverages consumption away home, as the main source of available data only provides information on consumption at home. Beverages consumption away from home is included in a very broad category ‘food away home’ in which only a distinction is made taking into account the specific eating places (restaurants, bars, hotels, etc.).

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Table 1
Beverage consumption in Spain in 1990 (Liters)[a]

	Wine	Beer	Spirits	Cava	Non-alcoholic beverages
Total	1693	12.11	1.65	0.95	44.13
Town size (inhabitants) (average consumption = 100)					
Less than 10,000	130	92	92	88	78
10,000–100,000	88	98	104	91	99
100,000–500,000	94	96	103	94	109
More than 500,000	89	115	100	134	116
Household size (average consumption = 100)					
One member	92	88	98	121	157
Two members	165	145	172	176	154
Three members	115	109	125	120	109
Four members	92	108	97	104	98
Five members	81	90	79	70	75
Six and more members	79	71	66	61	80
Meal planner age (average consumption = 100)					
Less than 29-year-old	69	135	143	110	111
30–44	88	98	96	96	96
45–49	96	88	87	99	90
More than 60	156	98	99	103	117
Seasonal variations (l)					
December	189	0.93	0.55	0.52	0.36
Average (January/November)	132	1.016	0.100	0.039	3.684

[a] MAPA (1991).

Table 1 shows differences in beverages consumption at home by type of household. It can be observed that alcoholic beverage consumption varies across households depending on their socio-demographic profiles as well as along the year (mainly in December due to Christmas). While wine consumption is higher in small villages, cava, beer and non-alcoholic beverages consumption is higher in the largest towns. In general terms, the highest consumption of all types of beverages is located in households with two members, decreasing as the number of members increases. Wine consumption is higher in households where the head of the family is over 60-year-old, being lower as the age of the meal planner decreases. However, for beer and spirits, the highest consumption is located in those households where the head of the family is less than 30-year-old. Finally, alcoholic beverages exhibit a quite deterministic seasonal pattern (except for beer). Consumption levels are larger in December in comparison to the monthly average during the rest of the year. The most noticeable product is cava, as its consumption along the year is almost zero.

The demand for alcoholic beverages has been studied in several papers but most of them have used time series data to estimate a demand system with the aim of calculating income and price elasticities (Clements and Johnson, 1983; Clements and Selvanathan, 1987; Selvanathan, 1988, 1989; Salisu and Balasubramanyam, 1997; Andrikopoulos et al., 1997, among others). In some studies, other exogenous variables have been considered. The most commonly used variable is advertising (Johnson, 1985; Selvanathan, 1989; Lariviere et al., 2000). Blake and Nied (1997) estimate a demand system including some socio-demographic variables. Finally, Holm (1995) analyses how alcohol content affects the consumption of alcoholic beverages.

The number of studies dealing with cross-section data is more limited (e.g. Crooks, 1989; Atkinson et al., 1990; Yen, 1994). The main advantage of the former approach is that, it is possible to study the effect of some socio-economic as well as demographic variables on alcoholic beverages consumption. Because of the importance of such factors on the Spanish alcoholic beverages consumption, this is the approach followed in this study. Then, the main objective of the study is to analyze the demand for alcoholic beverages in Spain. As mentioned before, and due to data limitations, the study will be focused only on the consumption at home, considering its main determinants like income, prices and socio-demographic factors.

The latest Spanish Household National Survey (1990–1991) was used. This survey provides information on expenditure and quantities of different food products consumed at home by household. It also gathers information on socio-demographic characteristics of consumers. Because households are interviewed only for 1 week, a large number of zeros on alcoholic consumption have been recorded. Therefore, a model which takes into account the censored nature of data must be used to analyze the demand for alcoholic beverages. Several specifications were used depending on the assumption of zero expenditure. Those models can be broadly divided into three main categories: (i) double hurdle (DH); (ii) purchase-infrequence and (iii) Tobit purchase-infrequence. In this study, the three models have been specified and estimated and the best one is selected to analyze the demand for different alcoholic beverages in Spain.

The study is structured as follows. Section 2 describes the data used for estimation. The most relevant censured demand models are considered in Section 3. Section 4 outlines some criteria to select the most appropriate specification for the demand for alcoholic beverages in Spain. Results in terms of estimated parameters and price and income elasticities as well as socio-demographic effects are shown in Section 5. Finally, some concluding remarks are outlined.

2. Data and preliminary transformations

Data are taken from the 'Encuesta de Presupuestos Familiares' (Spanish National Expenditure Survey) from a stratified random sample of 21,155 households in Spain from April 1990 to March 1991.[1] Information on expenditure and purchased quantity of different food products are collected for each household during 1 week. There are also data on a limited number of household characteristics including age and sex of family members, geographical location, household income, level of education and activity of the head of the household. Only those households which recorded a positive beverage expenditure were selected (15,087).[2]

The dependent variables are the proportions of total beverage expenditure allocated to wine, beer, spirits, cava, other alcoholic beverages and non-alcoholic beverages. Weak separability has been assumed including the logarithm of households' total beverage expenditure as a measure of purchasing power. The last equation was dropped for estimation purposes to overcome the singularity problem of the covariance matrix of residuals due to the adding-up restriction. Relevant socio-demographic variables have been also added to the models (see Table 2 for a complete description of variables). Only results for alcoholic beverages are presented.

Finally, as prices are not recorded, unit values for each beverage are calculated by dividing expenditure by quantities. These values may reflect not only spatial variations caused by supply shocks (i.e. transportation costs, cost of information, seasonal variations, etc.) but also differences in quality which can be attributed to brand loyalty or marketing services among other factors (Cramer, 1973; Cox and Wohlgenant, 1986). For this reason, unit values must be adjusted before using them in demand analysis (Cowling and Raynor, 1970; Deaton, 1989). Following Gao et al. (1995), the quality-adjusted price can be defined as the difference between the unit price and the expected price, given its specific quality characteristics.[3] The expected price is calculated by a hedonic price function

[1] This survey is carried out in every 10 years, so the last one available was used.

[2] A possible sample selection bias is tested through the Heckman method (Heien and Wessells, 1990; Chiang and Lee, 1992). This is a two-step procedure. In the first step, the decision to buy beverages or not was estimated through a probit model. Then, the inverse Mills ratio was calculated and used as an instrument in the second step, which consisted of estimating a demand equation, taking into account only the positive beverage expenditure observations. Results indicate that the null hypothesis of non-significance of the inverse Mill ratio cannot be rejected at the 5% level of significance. As a consequence, the inclusion in the sample of only those households recording a positive expenditure on beverages has not been posed in any sample selection problem.

[3] In those cases where unit values do not exist as household do not buy a specific beverage, they have been estimated from a regresion of the observed unit values of households, which actually buy the product on dummy variables reflecting household characteristics, such as region, season and income. Estimated parameters are then used to predict unit values for a specific household.

Table 2
Variables definition in the estimated equations

Variables	Description
Dependent	Share of wine, beer, spirits, cava and other alcoholic beverages on total beverages expenditure
Independent (quantitative)	
Lbevexp	Log of total beverage expenditure
Prices	Log of wine, beer, spirits, cava and other alcoholic and non-alcoholic beverages prices[a]
Male	Percentage of male members in the household
Nper	Percentage of income earners in the household
Size	Family size
Child	Percentage of household members aged 1–15
Young	Percentage of household members aged 16–29
Adult	Percentage of household members aged 30–59
Elderly	Percentage of household members aged 60 and above
Independent (dummy)	
TS1	Household situated in towns smaller than 10,000 inhabitants
TS2	Household situated in towns between 10,000 and 100,000 inhabitants
TS3	Household situated in towns between 100,000 and 500,000 inhabitants
TS4	Household situated in towns bigger than 500,000 inhabitants (only as a reference)
Educ1	Household head without studies
Educ2	Household head has primary school
Educ3	Household head has secondary school
Educ4	Household head has an undergraduate degree
Educ5	Household head has a graduate degree (only as a reference)
Dec	Dummy for December

[a] Quality adjusted prices.

such that

$$P_j = \upsilon_j + \sum_s \tau_s K_{js} + v_j \tag{1}$$

where P_j is the unit price and K_{js} variables affecting the consumer choice of qualities, such as income and household characteristics, which are used as proxies for household preferences for unobservable quality characteristics. Regional and seasonal dummy variables are not included, because, although they reflect systematic supply variations, their average effects are taking into account in the intercept υ_j. The quality-adjusted price is then defined by

$$P'_j = P_j - \sum_s \hat{\tau}_s K_{js} = \hat{\upsilon}_j + \hat{v}_j \tag{2}$$

3. Censored demand models

When cross-sectional data are used for demand analyses of specific products, a large number of zero purchases is expected due to the short period in which data are recorded.[4] In general terms, the reasons for recorded zero expenditure are mainly three: (i) the survey period is too short to allow consumers to report any purchase of a specific product (infrequency of purchase (IP)); (ii) consumers are not willing to buy the product (abstention) and (iii) consumers do not purchase the product at current prices and income levels (corner solution). When zero purchases are present, the estimation of demand models by ordinary least squares (OLS) based on all or positive observations would generate biased parameter estimates (Amemiya, 1984). In addition, excluding zero observations would also cause efficiency losses. To avoid such problem, a model which takes into account the censored nature of data must be specified. In early studies, the Tobit model was widely used, but is only appropriated if the zero observation is a corner solution. In other words, it assumes that all households actually con-

[4] As it has been mentioned in the previous section, in Spain, households only record information on food consumption during 1 week.

sume the product. In recent studies, several models which take into account the alternative explanations for zero purchases mentioned above have been used.

Censored demand models can be classified into two broad categories: (1) DH models and (2) infrequence of purchase models. Different versions of these models have been used in the last few years (Blundell and Meghir, 1987; Jones, 1989; Blaylock and Blisard, 1992; Gould, 1992; Blisard and Blaylock, 1993; Lin and Milon, 1993; Burton et al., 1994; Yen, 1994; Gao et al., 1995; Yen, 1995; Yen and Su, 1995; Burton et al., 1996; Ramajo, 1996; Su and Yen, 1996; Wang et al., 1996; Yen and Jones, 1997).

3.1. The double hurdle (DH) model

The idea behind the DH model is that a consumer has to overcome two hurdles before recording a positive expenditure: (1) participate in the market (potential consumer) and (2) actually consume. The model is characterized by a latent participation variable d_i^*, which determines the probability to consume (potential consumers) and a latent consumption variable y_i^*, which determines the quantity that a potential consumer will eventually consume (consumption decision). Both variables are defined in the following way

$$d_i^* = z_i\alpha + u_i \tag{3}$$

$$y_i^* = x_i\beta + v_i \tag{4}$$

where d_i^* is a latent participation variable which takes the value 1 if the consumer decides to buy and 0 otherwise, y_i^* a latent consumption variable, z_i the explicate set of variables in the participation equation, x_i the explicate set of variables in the consumption equation and u_i and v_i error terms with different probability distributions depending on how both participation and consumption decisions are considered.

A positive consumption y_i is observed if both latent variables d_i^* (participation decision) and y_i^* (consumption decision) are positive.

$$\begin{array}{ll} y_i = y_i^* & \text{if } d_i^* > 0 \text{ and } y_i^* > 0 \\ y_i = 0 & \text{otherwise} \end{array} \tag{5}$$

From Eq. (5), zero expenditures are recorded in those cases where consumers either decide not to participate in the market or having decided to participate, they eventually do not to consume. In the first decision, any value of the exogenous variables (price, income, etc.) is irrelevant, so non-consumption is due to conscientious abstention. In the second one, potential consumers do not buy the product due to the existing levels of the exogenous variables. Therefore, the DH model is the appropriate specification when zero consumption results from true non-consumption responses determined either by conscientious abstentions or by economic factors.

Both decisions can be jointly modeled, if they are taken simultaneously by the consumer; independently, if decisions are taken separately; or sequentially, if one decision is taken first and affects the other one (dominance model). If both decisions are taken independently (independent DH), then the error terms are distributed as follows

$$u_i \sim N(0, 1)$$

$$v_i \sim N(0, \sigma^2)$$

If both decisions are jointly adopted (dependent DH), then error terms can be defined as follows

$$(u_i, v_i) \sim \text{BVN}(0, \Gamma) \quad \text{where } \Gamma = \begin{bmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{bmatrix}$$

where ρ is a correlation coefficient.

3.2. Infrequency of purchase models

This model also assumes that consumer faces two decisions before a positive consumption is recorded. The first decision is whether to purchase or not (purchase decision) which can be modeled as follows

$$\text{PD}^* = z_i\alpha + u_i \tag{6}$$

where PD* takes the value 1 if the consumer decides to purchase and 0 otherwise and z_i is a set of explicate factors of the purchasing decision. It is assumed that the error term is $u_i \sim N(0, 1)$. Thus, the probability of purchasing is given by the distribution function $\Phi(z_i\alpha)$.

The second decision (consumption decision) can be defined as follows

$$y_i^* = x_i\beta + v_i \tag{7}$$

where y_i^* is the latent consumption which depends on x_i, a set of explicate factors. The error term v_i is distributed as a $N(0, \sigma^2)$.

The relation between the latent consumption (y_i^*) and the real consumption y_i can be defined as follows

$$y_i = \frac{y_i^*}{\Phi(z_i\alpha)} \quad \text{if DP}^* > 0 \text{ and } y_i^* > 0 \qquad y_i = 0 \quad \text{otherwise} \tag{8}$$

Thus, a zero expenditure can reflect two alternative situations. On the one hand, consumers who decide not to purchase due to the IP (not due to conscientious abstention as in the DH model). On the other hand, consumers, who having decided to purchase, do not consume based on economic factors (corner solution) (in this case the interpretation is similar to that in the DH model). This model is called the Tobit infrequency of purchase (TIP).

As a particular case, if once consumers have decided to purchase, they always consume a positive amount of product (there are no corner solutions), the IP model defined by Blundell and Meghir (1987) is obtained. The censored rule of this model is as follows

$$y_i = \frac{y_i^*}{\Phi(z_i\alpha)} \quad \text{if DP}^* > 0 \qquad y_i = 0 \quad \text{otherwise} \tag{9}$$

4. Model selection

As a first step, the three models defined above: (1) the DH model; (2) the TIP and (3) the IP were estimated. Heteroscedasticity was tested in all of them through the likelihood ratio test. Models with heteroscedastic errors were estimated by allowing the S.D., σ_i, to vary across observations. In particular, σ_i was reparametized as follows

$$\sigma_i = \exp(\text{lbevexp}_i\gamma) \tag{10}$$

where as mentioned in Table 2, lbevexp is the log of total beverage expenditure. The exponential specification has the desired property that the S.D., σ_i, is strictly positive. Results from heteroscedasticity tests are shown in Table 3. As it can be observed, only in the DH model for spirits and other alcoholic beverages, the null hypothesis of homocedastic errors cannot be rejected. Therefore, heteroscedasticity was introduced in the rest of models.

As a second step, a statistical test for non-nested models (Vuong, 1989) was implemented in order to determine the model that fits better the data. Let us briefly describe the procedure. Given a function f, say $f(y_t|r_i,\alpha)$, corresponding to the specification of one model, another function g, say $g(y_t|z_i,\theta)$, corresponding to the specification of other competing model, Vuong (1989) defines the variance of the difference between the two likelihood functions as

Table 3
Likelihood ratio test for heteroscedasticity

	Double hurdle	Infrequency of purchase	Tobit infrequency of purchase
Wine	11.4*	266.4*	515.6*
Beer	27.57*	30.0*	11.8*
Spirits	0.1	695.9*	171.8*
Cava	9.3*	461.5*	18.7*
Other alcoholic beverages	0.5	35.4*	23.8*

* An asterisk indicates that the null hypothesis of homocedastic error is rejected at 5% level of significance. Critical value is $\chi^2(1) = 3.84$.

$$w_n^2 = \frac{1}{N}\sum_{t=1}^{N}\left[\log\frac{f(y_t|r_i,\alpha)}{g(y_t|z_i,\theta)}\right]^2 - \left[\frac{1}{N}\sum_{t=1}^{N}\log\frac{f(y_t|r_i,\alpha)}{g(y_t|z_i,\theta)}\right]^2 \tag{11}$$

Three competing hypotheses can be tested for the null hypothesis of model equivalence.

$$H_0 : E\left[\log\frac{f(y_t|r_i,\alpha)}{g(y_t|z_i,\theta)}\right] = 0$$

is tested either against

$$H_A : E\left[\log\frac{f(y_t|r_i,\alpha)}{g(y_t|z_i,\theta)}\right] > 0$$

which is equivalent to say that function f is preferred to function g, or against

$$H_A : E\left[\log\frac{f(y_t|r_i,\alpha)}{g(y_t|z_i,\theta)}\right] < 0$$

i.e. g is preferred to f.

Under the null hypothesis, the test statistic is

$$Z_0 = \frac{\text{LR}_N(\alpha,\theta)}{N^{1/2}w} \tag{12}$$

where Z_0 is a standard normal variable. As it can be observed, this statistic is equal to the normalized

Table 4
Vuong test for model selection

	Dependent DH vs. independent DH	Tobit infrequency of purchase vs. Infrequency of purchase
Wine	3.62*	25.05*
Beer	6.70*	20.00*
Spirits	4.26*	6.74*
Cava	0.30	9.65*
Other alcoholic beverages	0.92	8.87*

* An asterisk indicates that the null hypothesis of model equivalence is rejected at 5% level of significance.

difference between the maximum log-likelihood values of the two models. The normalization is equal to the square root of Eq. (8) multiplied by the square root of the number of observations in the data set.

The model selection process has been divided in three steps. In the first one, the dependent versus the independent DH models are tested for all beverages. That is, if consumer decisions (participation and consumed quantity) are adopted simultaneously or separately. Results from such tests are shown in the first column of Table 4. As it can be observed, for wine, beer and spirits, the dependent DH is preferred over the independent one, while for cava and other alcoholic beverages, both versions of the DH model are not significantly different.

In the second step, the TIP model is tested against the IP one, which as mentioned above is a special case of the former. Results from these tests are displayed in Table 4 (column 2). In all cases the TIP model is statistically preferred.

Considering the previous results, in the third stage of the selection process, the dependent DH model is tested against the TIP model for all beverages. Vuong tests are equal to 5.03, 13.52, 14.29, 6.82 and −0.78 for wine, beer, spirits, cava and other alcoholic beverages, respectively. The null hypothesis of model equivalence is rejected at 5% level of significance except for other alcoholic beverages, which means that the DH model fits better to data. In the last case, other alcoholic beverages, both the models (DH and TIP) are not statistically different.

The selection of the DH model means that in the case of Spain, consumers decide not to consume alcoholic beverages, either because they are not willing to buy a specific type of beverages, for reasons such as health or tastes, among others (abstention), or because although having decided to purchase, the current level of income and prices make their purchase not desirable. Moreover, as the dependent specification is selected, Spanish consumers simultaneously decide to participate or not in the market and the quantity to purchase.

5. Estimated parameters and elasticities

The selected dependent DH model was estimated by maximizing the logarithm of the likelihood functions associated with Eqs. (3) and (4).[5] Based on ML estimated parameters, several types of elasticities can be calculated.

The first one is the so-called elasticity of participation. It measures the effect of an exogenous variable z_{ij} on the likelihood of participating in the market, $P\,(d_i^* > 0)$. It is straightforward calculated from the marginal response of the participation probability, which based on the dependent DH structure and on the normality assumptions of the error terms, is equal to

$$\frac{\partial P(d_i^* > 0)}{\partial z_{ij}} = \frac{\partial \Phi(z_i\alpha)}{\partial z_{ij}} = \phi(z_i\alpha)\alpha_j \qquad (13)$$

The second one is the elasticity of the probability of consumption. It reflects the effect of the variable on the probability of consumption. Similar to the former case, it is calculated from the marginal effect of x_{ij} on the probability of consumption and adopts the following expression

$$\frac{\partial P(y_i > 0)}{\partial x_{ij}} = \frac{\partial \Phi(z_i\alpha(x_i\beta/\sigma)\rho)}{\partial x_{ij}} \qquad (14)$$

[5] Estimation results are not presented due to space limitations but they are available from authors upon request.

The third one is the elasticity of the conditional level of consumption. It measures the effect of a variable on consumption once the decision to consume has been made. It is calculated from the following marginal effect

$$\frac{\partial E(y_i|y_i > 0)}{\partial x_{ij}} \tag{15}$$

where

$$\begin{aligned} E(y_i|y_i > 0) &= \int_0^{\infty} y_i f(y_i|y_i > 0)\mathrm{d}y_i \\ &= \left[\Phi\left(z_i\alpha\left(\frac{x_i\beta}{\sigma_i}\right)\rho\right)\right]^{-1}\int_0^{\infty} y_i \\ &\quad \times \Phi\left[\frac{z_i\alpha + \rho/\sigma_i(y_i - x_i\beta)}{\sqrt{1-\rho^2}}\right]\frac{1}{\sigma_i} \\ &\quad \times \phi\left(\frac{y_i - x_i\beta}{\sigma_i}\right)\mathrm{d}y_i \end{aligned}$$

The last one is the elasticity of the unconditional level of consumption or total elasticity. It provides an overall assessment of the effect of a variable on consumption and, as in the previous cases, it is calculated from the following marginal effect

$$\frac{\partial E(y_i)}{\partial x_{ij}} = \frac{\partial P(y_i > 0)E(y_i|y_i > 0)}{\partial x_{ij}} \tag{16}$$

From Eq. (16), it is immediate to note that this elasticity is simply obtained by adding up Eqs. (14) and (15).

Standard errors for all elasticities have been obtained by mathematical approximation. If we denote the parameters vector of the model as $\vartheta = (\alpha, \beta, \rho, \sigma)'$; $\hat{\vartheta}$ as the maximum likelihood estimator of ϑ with variance–covariance matrix $\hat{\Sigma}$; $\hat{E}_f = \hat{E}_f(\hat{\vartheta})$ as the *f*th elasticity, expressed as a function of model parameters and J_f as the Jacobean of the transformation from $\hat{\vartheta}$ to $\hat{E}_f$, then, following Fuller (1987) (pp. 85–88), the variance of $\hat{E}_f$ can be approximated by the following expression

$$\mathrm{Var}(\hat{E}_f) \simeq J_f'\hat{\Sigma}J_f$$

where J_f can be evaluated at the maximum likelihood estimates and at the sample mean of exogenous variables.

In the present study, the previous elasticities with respect to all the continuous variables, together with their respective standard errors, are calculated for all alcoholic beverages. Results are presented in Table 5.

The four elasticities with respect to total beverages expenditure are positive for all products. Hence, as total beverages expenditure increases, probabilities of purchase and consumption as well as levels of consumption (conditional or unconditional) also increase. However, important differences among the different products can be observed. First, highest elasticities are consistently found in the case of spirits while the lowest ones correspond to wine (with the only exception of the elasticity of the conditional level of consumption). Second, decomposition of the elasticities of the unconditional level of consumption (total elasticity) into the two components shows, for instance, that total beverages expenditure affects wine consumption mainly through the conditional level and not through the probability of consumption. That is, an increase (decrease) in total beverages expenditure is not likely to induce (dissuade) many marginal consumers into wine consumption, but additional sales will likely come from the existing consumers. The opposite takes place in relation to spirits, cava and other alcoholic beverages consumption, while no clear conclusion can be drawn for beer.

All own-price elasticities are negative and significant. However, important differences appear in terms of magnitudes. Considering the elasticity of participation, wine is the only product that presents an inelastic response. Among the elastic responses, spirits exhibit the highest value (−3.59%). All the unconditional level of consumption elasticities are higher than unity. However, whereas wine consumption is affected by its own price mainly through the conditional level, in other cases, main effects come through the probability of consumption. As a consequence, a reduction in wine price will increase the level of consumption mainly due to the increasing consumption of the existing consumers while in other three cases, additional sales will likely to come from potential consumers who decide to drink those beverages.

In relation to cross price elasticities, Table 5 shows that if one beverage price increases (decreases) the probability of purchasing other beverage increases (decreases) or is not affected. On the other hand, the elasticities of the unconditional level of consumption show a complementary relationship between spirits and wine or cava, cava and beer; and finally, between

Table 5
Alcoholic beverages elasticities calculated at mean values[a]

	Elasticity of participation					Elasticity of probability of consumption					Elasticity of the conditional level of consumption					Elasticity of the unconditional level of consumption				
	Wine	Beer	Spirits	Cava	Other	Wine	Beer	Spirits	Cava	Other	Wine	Beer	Spirits	Cava	Other	Wine	Beer	Spirits	Cava	Other
Bevex	0.40*	0.88*	1.78*	1.11*	1.22*	0.33*	0.81*	1.72*	1.08*	0.99*	0.81*	0.87*	0.91*	0.68*	0.63*	1.14*	1.68*	2.63*	1.76*	1.62*
Pwine	−0.47*	0.10*	−0.15	0.66*	0.75*	−0.48*	0.07	−0.17	0.65*	0.70*	−1.04*	−0.02	−0.02	−0.06	−0.10*	−1.52*	0.05	−0.19	0.59*	0.60*
Pbeer	−0.01	−1.11*	0.19	0.11	−0.79*	0.11*	−1.27*	0.21	0.12	−0.65*	0.34*	−1.17*	0.02	0.16*	0.24*	0.45*	−2.44*	0.23	0.28	−0.41*
Pspir.	−0.18*	0.45*	−3.59*	−1.05*	−0.02	−0.21*	0.56*	−3.61*	−1.06*	−0.04	−0.07*	0.13*	−1.04*	−0.12	−0.04	−0.28*	0.69*	−4.65*	−1.18*	−0.08
Pcava	0.29*	−0.18	0.34	−2.36*	0.23	0.36*	−0.35*	0.36	−2.34*	0.22	0.19*	−0.18*	0.03	−0.65*	−0.02	0.55*	−0.53*	0.39	−2.99*	0.20
Poth.	−0.06*	0.03	−0.55*	−0.23	−1.78*	−0.07*	0.07	−0.60*	−0.22	−1.68*	−0.04	0.05*	−0.08*	0.10	−0.82*	−0.11*	0.12*	−0.69*	−0.12	−2.50*
Pnon.	0.02*	0.19*	0.14	−0.22	0.26*	0.01	0.22*	0.17*	−0.21	0.22	−0.02	0.06*	0.05*	0.06	−0.07	−0.01	0.28*	0.22*	−0.16	0.15
Size	0.16*	0.08*	−0.44*	0.14	0.53*	0.19*	0.02	−0.54*	0.13	0.51*	0.07*	−0.07*	−0.14*	−0.14*	−0.03	0.26*	−0.05	−0.69*	−0.01	0.48*
Child	−0.13*	0.08*	−0.01	−0.02	−0.16*	−0.16*	0.13*	−0.02	−0.01	−0.18*	−0.09*	0.06*	0.01	0.08*	−0.02	−0.25*	0.18*	−0.01	0.07	−0.20*
Young	−0.08*	0.11*	−0.01	0.01	−0.09	−0.11*	0.13*	−0.01	0.01	−0.09	−0.10*	0.02*	0.01	0.04*	−0.00	−0.21*	0.15*	0.00	0.05	−0.09
Adult	−0.02*	0.05*	0.09	0.05	−0.09	−0.03*	0.06*	0.10	0.05	−0.12	−0.02*	0.01	0.02	−0.05	−0.06	−0.05*	0.07*	0.12	−0.00	−0.18*
Male	0.11*	0.01	−0.01	0.02	−0.20	0.13*	0.03	−0.02	0.01	−0.19	0.07*	0.03	−0.02	−0.12*	0.03	0.21*	0.06	−0.04	−0.11	−0.16
Nper	−0.09*	−0.01	0.003	0.53*	0.10	−0.10*	0.01	0.01	0.54*	0.08	−0.02	0.02	0.01	0.08	−0.03	−0.12*	0.03	0.02	0.62*	0.05

[a] See Table 2 for a definition of variables.
* Elasticities are significant at 5% level of significance.

Table 6
Marginal effects of dichotomous exogenous variables on the demand for alcoholic beverages[a]

	Effects of participation					Effects of probability of consumption					Effects of the conditional level of consumption					Effects of the unconditional level of consumption				
	Wine	Beer	Spirits	Cava	Other	Wine	Beer	Spirits	Cava	Other	Wine	Beer	Spirits	Cava	Other	Wine	Beer	Spirits	Cava	Other
Level of education																				
Educ1	−0.000	−0.026	−0.006	−0.012	−0.003	0.022	−0.027	−0.004	−0.012	−0.002	0.001	−0.262	−0.044	−0.042	−0.065	0.119	−0.190	−0.027	−0.027	−0.009
Educ2	0.037	−0.067	−0.005	0.003	0.000	0.028	−0.047	−0.004	0.003	0.000	−0.020	−0.050	0.014	−0.007	−0.001	0.082	−0.082	0.013	0.003	0.006
Educ3	−0.039	0.075	0.009	0.008	−0.013	−0.055	0.062	0.007	0.007	−0.012	0.186	0.162	−0.005	0.044	0.008	−0.111	0.161	−0.009	0.014	−0.021
Educ4	−0.064	0.139	0.026	0.022	0.029	−0.074	0.106	0.020	0.021	0.022	−0.041	0.473	0.027	0.060	0.118	−0.289	0.393	0.011	0.036	0.026
Size of the town																				
TS1	0.088	−0.161	0.019	−0.006	−0.001	0.118	−0.119	0.016	−0.006	−0.001	1.770	0.019	0.103	0.080	0.020	1.715	−0.151	0.067	0.001	0.002
TS2	−0.017	0.005	0.008	0.003	0.004	−0.026	0.004	0.005	0.002	0.004	−0.225	−0.001	−0.048	−0.033	0.008	−0.321	0.002	−0.029	−0.002	0.003
TS3	−0.036	0.072	−0.018	0.003	−0.006	−0.042	0.053	−0.014	0.002	−0.004	−0.952	−0.015	−0.039	−0.081	−0.093	−0.793	0.095	−0.026	−0.005	−0.007
Seasonality																				
Dec	0.139	0.190	0.142	0.183	0.150	0.088	0.069	0.126	0.183	0.140	1.353	0.661	0.283	0.487	0.981	0.674	0.226	0.213	0.355	0.389

[a] See Table 2 for a definition of variables.

other alcoholic beverages and spirits. These results are as expected because those products used to be drunk at different occasions. Moreover, a substitutability relationship appears between wine and beer consumption, on the one hand, and between spirits and beer, on the other. Obviously, beer consumption is gaining market share against wine consumption and, at the same time, spirits are competing with beer through differences in prices.

Elasticities with respect to the size of the household indicate that if the number of household members increases (decreases), the probability of purchasing wine, beer and other alcoholic beverages increases (decreases), while the probability of purchasing spirits decreases (increases). In terms of consumption, Table 5 shows that total elasticities for wine and other alcoholic drinks are positive while in the case of spirits the elasticity is negative. Hence, if household size increases, households are more likely to consume wine and other alcoholic beverages while reducing spirits consumption. Finally, it can be concluded that household size changes will affect the total level of consumption of wine, spirits and other alcoholic beverages mainly through changes on the probability of consumption.

Household composition has also a significant effect on alcoholic beverages consumption. As shown in Table 2, this variable is measured through the percentage of household members aged between several intervals. Results show that the addition of a new member over 65 years (the category that has been taken as the base model), will increase the probability of purchasing and consuming wine as well as its level of consumption. The opposite takes place in the case of beer, while scarce reactions are found for spirits, cava and others. These results suggest that while wine is mainly purchased and consumed by the oldest members of the household, beer is preferred by the youngest.

The percentage of male members in the household only has significant and positive effects in the case of wine. In other words, with the only exception of wine, it can be said that nowadays men and women exhibit similar consumption patterns in relation to alcoholic beverages. Finally, an increase in the number of income earners in the household will increase the probability of purchasing cava while decrease that of wine. Changes in the total level of consumption of cava and wine are mainly due to the changes in the number of consumers and not to changes in the individual consumption level of the existing consumers (elasticities of the conditional level of consumption are not significant).

The effects of the binary explanatory variables (dummies) on different alcoholic beverages consumption are shown in Table 6. They are calculated as marginal effects, so they cannot be strictly considered as elasticities.

Results indicate that the probability of purchasing wine is higher in those households in which the head has lower education level. For the rest of alcoholic beverages the probability of purchasing increases as education level also increases. The effect of the education level on the quantity consumed is quite similar to that of the probability of purchasing. In households headed by a person without studies the consumption of wine is significantly higher than in other households while the consumption of the rest of beverages is lower. The consumption of beer is higher as the education level increases. Differences in consumption levels of the rest of the products (spirits, cava and others) are not relevant.

Analyzing differences taking into account the size of the town in which the household is situated, it can be observed that in the smallest towns (TS1, less than 10,000 inhabitants) the probability of purchasing beer, cava and other alcoholic drinks is lower, while households living in those areas are more likely to purchase wine and spirits. In relation to the quantity consumed, in smaller towns the consumption of beer is lower than that in other town sizes while the consumption of wine and spirits of wine and spirits are significantly higher.

Finally, there seems to exist a strong seasonal pattern in alcoholic beverages consumption as the probability to purchase as well as consumption levels are higher in December.

6. Concluding remarks

The demand for alcoholic beverages in Spain is changing in the last years and is different when considering consumption at home and away from home. The lack of data on alcoholic beverages consumption away from home has prevented us to analyze the different factors determining both types of demand. Thus, this study has focused on the demand for alcoholic beverages at home in Spain. In other words, to determine factors affecting individuals' decision to purchase alcoholic beverages to be consumed at home. Such decision involves a two-step procedure: (1) consumers decide to purchase or not a specific alcoholic beverage and (2) once they have decided to buy it, they actually decide the amount to purchase. Both decisions depend on current levels of prices and income as well as on socio-demographic consumers characteristics. Moreover, Spanish consumers decide not to consume alcoholic beverages either because, they are not willing to buy a specific type of beverages for reasons such as health or taste, among others (conscientious abstention), or although having decided to purchase, the current level of income and prices makes their decision not desirable.

The set of elasticities obtained in the estimation drives to the following conclusions. All the elasticities with respect to total beverages expenditure are positive corresponding the highest value to spirits and the lowest to wine. Therefore, when consumers spend more money on alcoholic beverages at home, share of wine is losing in relation to other beverages (especially spirits). Moreover, an increase in total beverages expenditure is not likely to induce new consumers to buy wine while existing consumers will likely buy more.

Own-price elasticities are negative and significant. Moreover, the elasticities of participation and unconditional level of consumption are elastic for all products with the only exception of wine. It seems that pricing policies addressed to encourage wine consumption by decreasing prices are not going to be very effective as it will only generate new consumers. Wine and beer consumption shows a substitution relationship and therefore, beer and wine are competing to gain beverage expenditure share at home.

Finally, socio-demographic variables explain some differences in alcoholic beverages consumption at home. As household size increases, the probability of purchasing wine, beer and other alcoholic bevereges increases while the probability of purchasing spirits decreases. Young consumers are less inclined to drink wine but more to drink beer. Finally, wine is more likely to be purchased and consumed by households whose head has a low level of education and by those who live in the smallest towns (less than 10,000 inhabitants).

Results obtained are useful for a better understanding of main determinants of the demand for alcoholic beverages and provide useful information to producers to develop appropriate marketing strategies. It seems that wine is a traditional product drunk by old people and living in smallest towns, while beer is gaining market share among younger and female population. Promotion campaigns lead to young people living in larger towns are needed. Such campaigns have to be addressed to give more information on how to appreciate wine characteristics and when it is more appropriate to be consumed.

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