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Current and regular prices hedonic models for the wine industry

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Abstract

The purpose of the current research is to address the use of regular price to assess the long term attributes of products in the hedonic model within the Chilean wine industry. Regular price is widely used in marketing, but has not been used to assess the stable characteristics of a product across time. Using regular price when permanent attributes are being assessed allows for the avoidance of potential bias in hedonic functions due to margin changes in the product, and it allows the control of endogenous movements within prices. To show its best performance, we used a store panel that includes a two-year period. Two hedonic functions are constructed. One of them uses transaction price and the other one uses regular price. Regular price function performs better because it displays a better adjustment of the data and its results show that the product's permanent key characteristics are its most significant attributes.

Additional key words: Chilean wine; margin of manufacture; stable attributes; treatment of price.

Resumen

Precio de transacción y precio regular en el modelo hedónico de la industria del vino

Esta investigación tiene como propósito plantear la utilización del precio regular para evaluar los atributos de largo plazo de los productos, dentro del modelo hedónico, en la industria chilena de vino. El precio regular, que es un concepto muy utilizado en los modelos de marketing, no ha sido utilizado para la evaluación de las características del producto estables a través del tiempo en los modelos hedónicos. El utilizar el precio regular cuando se están evaluando atributos permanentes de un producto tiene el beneficio de evitar posibles sesgos en las funciones hedónicas debido a cambios de margen del producto y también ayuda a controlar movimientos endógenos de los precios. Para mostrar su mejor desempeño, se utilizó un panel de tiendas que considera un periodo de dos años, con el cual se construyen dos funciones hedónicas, en una de ellas se utiliza el precio de transacción y en la otra el precio regular. La función que utiliza el precio regular tiene un mejor desempeño debido a que se ajusta mejor a los datos y sus resultados muestran que las características permanentes y esenciales del producto son las únicas significativas.

Palabras clave adicionales: atributos estables; margen del productor; tratamiento del precio; vinos chilenos.

Introduction

The kind of price used in the hedonic function has an impact on coefficient estimates in hedonic models. In spite of the theoretical relevance of prices in the hedonic model, there is very little empirical evidence on the impact of the selection of which price to use as the dependent variable in hedonic regressions. The main objective of this paper is to discuss a methodological proposal for the use of regular prices as dependent variable when

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Abbreviations used: AIC (Akaike Information Criterion), CPI (consumer price index), DO (designation of origin), INE (Instituto Nacional de Estadisticas), OIV (International Organisation of Vine and Wine), OLS (ordinary least squares), SAG (Servicio Agrícola y Ganadero), SKU (stock keeping unit), Ln (natural logarithm).

hedonic models are fitted to determine the value of the more permanent product characteristics. This proposal is tested with data for wine, a product which has been widely studied using the hedonic model.

The main theoretical underpinning for this paper can be found in Rosen's (1974) classic paper, which serves as the basis for many hedonic studies. One of the main hypotheses of this paper is that a market equilibrium in perfect competition for differentiated products, is one in which a product's price is related to its attributes. This implies that $p(z) = (z_1,\ldots z_n)$, where z is an attribute. In this model, consumers are willing to pay for a product's attributes, and producers are willing to use resources to create each of these attributes.

The equilibrium market assumption presents several implications on the stability of the hedonic function, since this function would be modified due to changes in the manufacturer's cost expectations, competitive product characteristics, consumer preferences distribution, and ownership structure. Therefore, any change in these dimensions should imply changes in the hedonic function over time (Pakes, 2003).

Prices are related to producer's margins. Manufacturers expect to obtain surplus margins in oligopoly markets which change over time (Feenstra, 1995). Depending on the speed and direction of the change in margins, we can obtain biased hedonic estimates (Pakes, 2003). However, there are several possibilities to solve this situation. One of these solutions is the use of a linear functional form, which counterbalances the effect of the margin's presence (Feenstra, 1995). Another way is to consider an instrumental variable that represents the scale economies associated with the manufacturer's margin (Ioannidis and Silver, 1999). Finally, if the hedonic study takes a consumer perspective and a consumer price is used, the manufacturer's margin is not a concern (Diewert, 2003b). In general, researchers have focused their attention on how to control the effects of the manufacturer's margin. However, in this research study the focus is placed on the prices used in hedonic research.

The price in the hedonic model

In a hedonic model, price is considered to reflect an equilibrium for the market, where manufacturers and consumers exchange goods. Many hedonic studies have used several sources of information for collecting prices, from published prices (magazines, internet, specialized product guides) to direct in-store price data collection (Oczkowski, 1994; Combris *et al*., 1997; Carroll, 2001; Diekmann, 2008, to name but a few).

More specifically, in the case of the wine market, for example, some studies used wine guides with suggested retail prices (Oczkowski, 1994; Haeger and Storchmann, 2006). The main advantage of these recommended prices is that they are prices that do not take into account seasonal discounts and that are independent of retailer characteristics. Hence, they are in line with the product's characteristics (Oczkowski, 1994). However, these prices are not necessarily those one would find in the market. When one carries out a survey of prices in a store, there may be products that are out of stock, where the absence of a product (which may be highly valued) may have an impact on the results (Nerlove, 1995).

Another way to collect information about wine prices is to ask manufacturers about retail prices reports or winestores' price (Benfratello *et al*., 2009). This process can have drawbacks, as prices may not be updated, or may not be representative of the total market.

In order to conduct a hedonic valuing of product characteristics, the price to be used must be a reflection of the value the market places on the different characteristics of the products. Published prices are not necessarily the prices that could be found in the market, and may not reflect the attribute valuing from the perspective of consumers, because they may be not be prices of market equilibrium. Prices collected from stores may be promotional prices which are not associated with product's characteristics from the seller's perspective, due to the objective of selling more items in a shorter time period (Narasimhan *et al*., 1996). Moreover, a manufacturer's profit margin is typically lower during promotional periods than during non-promotion periods (Neslin *et al*., 1995; Ailawadi *et al*., 2006). These would cause changes in margins, thus affecting the hedonic estimates.

Structural changes in demand (income, taste, or demographic changes) could determine the kind of products supplied. Innovation affects the cost structure of existing characteristics, or the increase of new varieties (Hulten, 2003), which are not necessarily reflected in current prices, since changes in costs, demand or market structure are reflected in regular prices (Bronnenberg *et al.,* 2006), and can be considered similar within a

two-year period (Ailawadi *et al.,* 2007). On the other hand, if characteristics are similar during long time periods, greater price stability can be expected, because changes would only be determined by technological changes (Melser, 2006).

According to the marketing literature, it is well known that current prices are formed mainly by regular and promotional prices. Promotional prices are seasonal discounts on the regular price. The regular price is the baseline price which can be found in the most usual conditions (Gupta, 1988; Bijmolt *et al*., 2005; Fok and Paap, 2006). Regular prices can be useful in order to control short term endogenous movements, since it could be expected that all stores within a chain will change regular prices simultaneously (Van Heerde, 1999).

This study examines wine, because there are several studies about it using the hedonic model (Oczkowski, 1994; Nerlove, 1995; Combris *et al*., 1997; Schamel and Anderson, 2003; Schamel, 2006; Cardebat and Figuet, 2009). The main reasons for using this category in the Chilean market are the importance of the wine industry for Chilean agriculture, and the very little research on the value of Chilean wine attributes (Troncoso and Aguirre, 2006), and last but not least, because Chile is one of the most important wine exporters in the world (OIV, 2006).

The Chilean wine market

The Chilean wine market can be characterized as a competitive oligopolistic market. This can be explained by the fact that there is a group of companies (Concha y Toro, Santa Rita and San Pedro) that hold 64% of the Chilean market share (Nielsen, 2006), and impose their conditions on the market. The remaining companies follow them, as can be seen in Table 1, Herfindahl Concentration Index[1] shows low concentration, but the Instability Index[2] is stable, which indicates a low degree of competition in the supermarket channel. Thus, one can expect additional margins for some manufacturers.

Although wine is an important component of Chilean food culture (Palma, 2004), Chilean consumers do not know much about some of the characteristics of wine, such as grape varieties (Schnettler and Rivera, 2003) and they also present a strong regionalist attitude (Vergara, 2001).

Table 1. Evolution of the Herfindahl concentration index and the instability index for wines by years (supermarkets channel)

Index	Years			
	2003	**2004**	**2005**	**2006**
Concentration index	0.14	0.15	0.15	0.16
Instability index	—	0.01	0.01	0.01

Data source: Nielsen Scantrack (with authors' calculations).

According to *Instituto Nacional de Estadísticas de Chile* (INE) and *Servicio Agrícola Ganadero de Chile* (SAG, 2006) the most important varieties are: Cabernet Sauvignon (36.1%), Merlot (11.7%), Carmenere (5.5%), Chardonnay (6.9%) and Sauvignon Blanc (6.7%). These five varieties represent 70% of the total of planted varieties, which is reflected in the Chilean wine consumer's lack of knowledge about varieties (Schnettler and Rivera, 2003).

In Chile, an increase in the purchase of wine is associated with special occasions, family celebrations or social gatherings (Schnettler and Rivera, 2003), and the increase in purchases occurs during the celebration of the Chile's Independence Day (September) and end-of-the-year holidays (December). These seasonal purchases constitute 36.8% of the yearly wine consumption (Nielsen, 2006).

In the case of Chile, wine Designation of Origin (DO) was established in 1995 (DL 464), which seems rather late if we consider that the OIV established wine DO in 1947. This has led to the fact that the average Chilean wine consumer will not use the origin as a discriminatory factor among wines, because s/he does not know of its impact on quality (Ayala and Durán, 2004).

Regarding the distribution channel, supermarkets are the most relevant distribution channel, with 45.9% of total share. After supermarkets importance came the traditional channels such as, liquor stores or clerk stores, represent 33% of market share, and finally, on-trade consumption, with a share of 21.1% (Nielsen, 2006).

[1] The Herfindahl Concentration Index is defined as the sum of the squares of the market shares of firms within the industry, where the market shares are expressed as percentages.

[2] The Instability Index is defined as the sum of the absolute differences between market shares of two periods in a company, divided by 2.

Database and hedonic estimation

Database

Store panels[3] have been used in hedonic analysis of different products (Ioannidis and Silver, 1999; Silver and Heravi, 2001; Heravi *et al*., 2003).

The store panel used for the current study (Nielsen Scantrack[4]) includes 340 supermarkets at the national level, and it provides census information of sales, prices, and percentages of market share, numerical[5] and weighted distribution[6] in terms of bar code products. It includes cities and supermarket chains that represent 81% of the total sales in supermarkets in the country[7]. The database covers a time period that runs between the week starting on September 19th 2004 and the week ending on September 10th, 2006. This represents a total of 104 weeks. The price is in Chilean currency (*peso chileno*), and the attributes for wine are color, brands, weighted distribution, bottle size and type of packaging (*e.g.,* glass or plastic). Many of these variables will be treated as dummies due to their dichotomic nature. Only bottle size and weighted distribution will be treated as continuous variables.

Unfortunately, this information is aggregated, and there is no information by store or supermarket chains as a result of a confidentiality agreement of cooperation between supermarkets and Nielsen Chile.

Data aggregation

Many research studies have used aggregated data, because it provides a clear global perspective and therefore simplifies modeling, or because data sources are bound by confidentiality. However, this is an important source of bias (Foekens *et al*., 1994; McGuckin and Stiroh, 2002), because this database is aggregated at geographic and store level, and it produces an impact on the price that is reported in the output.

In order for prices to reflect only the values of product's characteristics, these must not be affected by changes in the weights among stores. One way to control for weight changes of stores over price is through the weighted distribution per SKU[8]. The weighted distribution indicates the importance of the stores where an item is sold. If this distribution is stable over time, price changes should not be affected by changes in the importance of the stores. However, when analyzing the database, one SKU may have a change in its weighted distribution sales (due to manufacturing, logistics, distribution problems, etc.). In order to decrease the impact of this situation, the ratio between weighted and numeric distribution can be used. That is, if the average sales of stores are stable in time, the larger or smaller amount of stores will not have an effect on the weight of prices. On the contrary, if there is a change in the ratio, it means that the average sales per store would affect the weighted average of prices.

Although minimizing the potential bias of the data aggregation is not the best way to eliminate observations, it allows us to control their impact on prices reported in the database. Because it was not possible to find an elimination criterion for this kind of price, a conservative criterion is to eliminate all the observations having more than one standard deviation with regard to the average between ratio of weighted and numerical distribution for the time period available in the database.

Regarding time aggregation, it is possible that it will cause very few effects on hedonic regressions because the database is structured on a weekly basis and it is expected that prices will not change within periods that are shorter than one week.

Determination of regular price

Regular prices have generally been approached from the point of view of promotional prices (Fok and Paap,

[3] Store panel is a data from a number of observations over time on stores, specifically for this case, supermarket store.
[4] Nielsen Scantrack is the name of database used in this study.
[5] Numeric distribution is the percentage of stores in numbers of all the existing supermarkets in Chile, which find a specific product (Nielsen Chile).
[6] Weighted distribution is the percentage of stores in volume of category, which sell a specific product. Its frame of reference is all the existing supermarkets in Chile.
[7] A supermarket is defined as a store having more than three cash registers, and one which operates as a self-service purchasing place (Nielsen Chile).
[8] Stock keeping unit (SKU) is a code identifier for each distinct product (Nielsen Chile).

2006). The promotional prices can be decomposed into two dimensions: the length of time and the depth (amount) of discount (Jedidi *et al*., 1999).

Discount or promotional prices are the most relevant promotional activities in the market, along with displays, ads, etc. (Van Heerde *et al*., 2000). In order to classify wine prices as discount or promotional, it is necessary to check whether there are flyers, ads, etc., for some SKUs. Unfortunately, it is very unlikely that a database will include such information. Another way of approaching it is to activate the time and depth dimensions of the promotion. With regards to time, it has been estimated that a price drop should not last longer than three weeks (Guadagni and Little, 1983; Gupta, 1988). Regarding depth level, there have been several criteria: for example, if there is a 5% drop and a follow-up 3% increase in relation to the initial price, in an eight-week period (Abraham and Lodish, 1993), or a 15% discount over the average price of the categories (Narasimhan *et al*., 1996), or finally, considering a standard deviation of the expected price (Pauwels *et al*., 2002). Therefore, one may conclude that special prices last less than four weeks, and that the depth of the promotion may vary according to the category characteristics.

Wine is a product with high differentiation, and there may be different levels in terms of discounts. It is advisable to use a value which is relative to the characteristics that are unique to each wine. This leads us to choose the one standard deviation criterion over the discount percentages options, since in this way, the differentiating features across products will be respected.

Once regular prices were determined, both current and regular prices were adjusted with the consumer price index (CPI) for alcoholic beverages (provided by INE), because for the period considered for this study inflation in Chile has been 10.5% in two years (time period covered by this study). Inflation is reported on a monthly basis and in order to adjust it to the weekly basis of the database, the monthly inflation was divided by four or five weeks, depending on the length of each month.

The database was also checked for completeness and all products without a detailed description in the database were eliminated.

The hedonic model is based on the assumption that all characteristics of the product can be observed. Both in the industrial organization and marketing theoretical frameworks, unobserved characteristics are very important to explain data (Bajari and Benkard, 2005). In order to capture unobserved characteristics such as trust, style, or prestige, the most suitable proxy is brand (Diewert, 2003b; Deltas and Eleftherios, 2006). Wine brands is a diffuse construct (Mitchell and Greatorex, 1989; Gluckman, 1990), but if the market under study is specific, it is expected that there should be a greater brand impact, because consumers have a detailed knowledge of their market (Schamel, 2006) and the Chilean wine consumer does relate brand with quality (Schnettler and Rivera, 2003). The statistical approach to brands must be at a greater level of dissagregation because they represent the relationship between characteristics and price in a better way (Requena-Silvente and Walker, 2007). Thus, a brand is considered as the distinctive and unique element of each bottle, and in order to control for the amount of available brands in the market (over 570 different brands), 15 brands with the largest amount of transactions in the market have been considered. All other brands are grouped into one category called «*other brands*».

Color is considered an explanatory variable due to its relevance for consumers when making decisions (Schnettler and Rivera, 2003). This variable is represented by *«color»*.

Varieties of grapes have been widely studied by hedonic wine research (Oczkowski, 1994; Landon and Smith, 1998; Schamel and Anderson, 2003; Geve, 2005; Troncoso and Aguirre, 2006; Cardebat and Figuet, 2009). Only five types of grapes represent 70% of the land area planted in Chile (Cabernet Sauvignon, Merlot, Carmenere, Chardonnay, and Sauvignon Blanc) which were considered individually. All others of grapes were considered under «*other grapes*». Wines for which no grape variety is mentioned are included into a level called «*no variety*». These varieties are used in the current study to determine their impact over price, and will be treated as dummies and it is represented by the variable «*varieties*» with seven levels.

In the Chilean market, prices for wine in glass bottles are higher than for wines in other types of packaging (Buzeta, 2005). In this study, glass, box and plastic have been considered as packaging materials, and glass is specified as a dummy variable. The database shows that glass bottles have an average price of $3,456 whereas other packages are on average $1,581. This shows that there is a high price difference. Wine guides only consider glass bottled wine for their evaluations, because glass bottles can ensure a minimum degree of quality (Sánchez *et al*., 2007). Then, the type of package has

an association with the quality of wine. It is expected that bottle package will impact on valuation of the market more than others packages. The type of packaging is represented by variable «*packages*», which considers two levels: glass and other packages.

Size of packaging has an impact on the consumer's satisfaction (Gerstner and Hess, 1987), in the case of the Chilean wine market; size has a 66% impact on value, although this percentage decreases as size of packaging increases its value (Buzeta, 2005). The sign of this variable is expected to be positive. This attribute is represented by the variable «*size*».

There is an important increase in wine consumption during special celebrations, which are December 24-25 (Christmas), January 1st (New Year), and September 18-19 (Independence Day). Because the period between one purchase of wine and the other is 36 days (Nielsen, 2006), it can be expected that the whole month will be affected by activities related to these special days. Therefore, the weeks that are expected to have an increase in marketing activities are December 5, 12, 19, 26, 2004; January 2, 2005; September 19, 26, 2004; and September 4, 11, 2005. For the second year the weeks are December 4, 11, 18, 25, 2005; January 1st, 2006, September 18, 25, 2005, and September 3, 10, 2006. These weeks are considered under the name of the «*holidays*» variable.

Several studies have investigated the influence of vintage on wine quality (Combris *et al*., 1997; Landon and Smith, 1998; Angulo *et al*., 2000; Troncoso and Aguirre, 2006; Cardebat and Figuet, 2009; among others). This has been relevant for wine valuing on the part of the market. Because available information does not refer to vintage, and following Buzeta (2005) and Geve (2005) who determine that a new vintage enters the supermarket chain in September, it is possible to infer that all wines that are sold after September 15, 2006 are assumed to be new vintage wines. The variable that considers the new vintage is «*last harvest*».

In the literature about wine, the impact of distribution in wine value has been analyzed with hedonic methods. Oczkowski (1994) studied the Australian market using wine guides and the manufacturer size to proxy the effects of exclusiveness. In his paper, Ozckwoski established that consumers are more willing to pay more for wines produced by smaller wineries than massive wineries, because they have a limited availability, and this denotes exclusiveness. Nevertheless, wines that are sold in supermarkets are usually massive products (Ritchie, 2007) and if the massive products cannot be found in a store, they cannot be sold, which entails sales and utility consequences for both producers and retailers (Grant and Fernie, 2008). If consumers are not able to find a given product, this leads to consumer's dissatisfaction due to the difficulty in decision-making, and this probably affects the possibilities that the client will return to the store (Fitzsimons, 2000). So, if mass-consumer products increase their availability in the market, they are most likely to succeed. Therefore, one would expect that an increase in distribution will have a positive impact. Product availability is represented by the variable «*weighted distribution*».

Table 2 shows that almost 50,000 observations were eliminated to determine regular prices. Regular prices can be considered to be promotional prices or prices affected by aggregation of data. The fact that promotional prices observation are 30% less than regular prices is consistent with recent literature, such as Hosken and Reiffen (2004). Moreover, the standard deviations are smaller for regular price than currency

Table 2. Descriptive statistics of quantitative variables

Types of price	Variables	No. obsevations	No. of SKU[1]	Minimum	Maximum	Mean	SD[2]	Skewness	Kurtosis
Current price	Price per unit (ChC)[3]	154,943	2,182	149.7	59,214.1	3,232.6	3,622.3	5.8	50.9
	Weighted distribution (%)	154,943	2,182	0.0	100.0	19.3	25.5	1.6	1.5
	Package size (mL)	154,943	2,182	300.0	5,100.0	951.7	738.9	4.5	21.0
Regular price	Price per unit (ChC)[3]	105,569	2,182	274.4	57,383.7	3,317.2	3,591.5	5.6	46.9
	Weighted distribution (%)	105,569	2,182	0.0	100.0	18.7	24.6	1.6	1.8
	Package size (mL)	105,569	2,182	300.0	5,100.0	947.0	736.8	4.5	21.3

[1] SKU: stock keeping unit. [2] SD: standard deviation. [3] ChC: pesos chilenos (Chilean currency).

price. Determinations of regular prices produce that media and standard deviations are smaller for weighted distribution and package side.

It can be seen that the minimum and maximum current price values are higher than regular prices. This can be explained by the information treatment, where minimum prices are considered as a special offer, and the maximum price is the result of a higher weight of some stores, in which prices are higher than the mean.

The two types of prices show a positive skewness, which may be due to the fact that most of the wines sold in the supermarket channel are massive wines. But the kurtosis is leptokuitic, which shows that some of the wines sold in this channel have a high price.

Both in current prices and in regular prices, skewness shows a positive distribution, where most of the prices fall within $1,000 and $10,000.

Hedonic methodology

Definitions and variables that are found in the reports by Nielsen or IRI (Information Resources Inc.) are well accepted by manufacturers, because many aspects of the strategies of participating companies are based on the information they receive from these reports (Nevo, 1998). Considering the assumption that manufacturers are the ones who know best their product to determine which are the most important characteristics (Triplett, 2004), it can be said that these reports contain the relevant attributes in order to conduct a hedonic study.

According to Pakes (2003) and Triplett (2004), choosing a functional form is not clearly established in hedonic theory, which should be basically an empirical problem. Feenstra (1995) and Diewert (2003a) suggest a linear function based on economic theory. Therefore, there is no function that could be seen as a better option «*a priori*». Because it is hard to determine hedonic curves for characteristics, it could be very useful to make different approximations according to what has been suggested in the literature, and assess them with the database.

Griliches (1971) states that the use of panel data does not make much sense if product characteristics are permanent over time. Therefore, the database will be pooled by time periods. This allows for the direct comparison of hedonic regressions with the dependent variable as regular price and as ordinary price, instead of using another temporarily disaggregated method (*i.e.* weekly basis), which makes it difficult to compare information due to the elimination of observations which can affect results for some SKUs.

Martinez and Morilla (2002) state that, in order to control for joint effects over price, it is advisable to use interactive terms. Based on this, an interaction between color and package type will be used. This is relevant, because it allows one to observe red wines (a primary choice for consumers) and bottles (an aspect which is associated with quality wine) at the same time.

Because hedonic theory is not presented as a specific functional form, and traditions and empirical tests have a crucial role, the researchers assessed two widely used alternatives for wine from hedonic literature, the linear and the natural logarithmic (Ln) dependent variable. This choice was based on the functional form that had the best performance on the classic test as RESET test (specification), Durbin-Watson test (autocorrelation), and Breusch-Pagan test (heteroscedasticity) used in the literature on wine hedonic models (Oczkowski, 1994; Steiner, 2004; Rodríguez and Castillo, 2009) and some tests used in the literature on panel data (Ioannidis and Silver, 1999; Silver and Heravi, 2001; Heravi *et al*., 2003). Table 3 shows this for regular price and current price the different alternatives for hedonic function. In addition, this table shows the tests (Breush-Pagan, Durbin Watson and Reset) used for the selection of the hedonic function with their respective levels of significance.

The functional form that is best adjusted to the database for both price types is log-linear, because it is well-specified, based on the Reset test has a $p > 0.5$. However, heteroscedasticity and autocorrelation problems can be found. So, in order to determine the significance level of the estimates, the estimator of Newey and West (1987, 1994) was applied, because this type of function is now usually used in econometric analyses when regressions have autocorrelations and heteroscadasticity (Zeileis, 2004).

Coefficient interpretation is easier in log-linear models than in linear-linear models, since they can be understood as the percentage change of variable prices to a unit change in the independent variable involved (Rodriguez and Castillo, 2009).

The functional forms for current price and regular price are as follows:

Table 3. Evaluation of different functional forms[8]

Type of price	Functional forms	Test for evaluating functional forms					
		Breusch-Pagan[1]		Durbin-Watson[2]		Reset test[3]	
		χ^2	*p*-value	DW[2]	*p*-value	Reset	*p*-value
Current	Ln-Ln[4]	7,563.163	0.000	1.1843	0.000	0.7332	0.480
	Lin-Ln[5]	2,833.484	0.000	1.6692	0.000	3,938.545	0.000
	Lin-Lin[6]	2,974.81	0.000	1.6853	0.000	5,100.679	0.000
	Ln-Lin[7]	6,547.1	0.000	1.2075	0.000	1,122.933	0.000
Regular	Ln-Ln[4]	10,045.13	0.000	1.2675	0.000	2.271	0.103
	Lin-Ln[5]	211.004	0.000	1.7188	0.000	2,811.788	0.000
	Lin-Lin[6]	2,266.366	0.000	1.7335	0.000	3,504.835	0.000
	Ln-Lin[7]	4,487.632	0.000	1.2925	0.000	901.9658	0.000

[1] Breusch-Pagan test with Koenker's studentized version. [2] DW, Durbin-Watson test, two-tailed. [3] Remsey's test. [4] Transformation with natural logarithm on independent variable and continuous independent variables. [5] No transformation on dependent variable, with logarithm transformation on continuous independent variables. [6] Lin-Lin refers to a form in which no variables have been transformed. [7] Ln-Lin form refers to natural logarithm of the dependent variable, with no transformation on the independent variables. *Data source:* Nielsen Scantrack (with authors' calculations). The statistical packet used is R 2.8.1 from R Development Core Team (2008).

1. Current price:

$$\text{Ln } P_T = $$

$$= B0 + \sum_{i=1}^{2} B_i Color_i + \sum_{j=1}^{7} B_j Varieties_j + \sum_{k=1}^{2} B_k Package_k +$$

$$+ \sum_{l=1}^{16} B_l Brand_l + \text{Ln (Size)} + \text{Ln (W. Distribution)} +$$

$$+ \text{Holidays} + \text{Last Harvest}$$

2. Regular price:

$$\text{Ln } P_R = $$

$$= \sum_{i=1}^{2} B_i Color_i + \sum_{j=1}^{7} B_j Varieties_j + \sum_{k=1}^{2} B_k Package_k +$$

$$+ \sum_{l=1}^{16} B_l Brand_l + \text{Ln (Size)} + \text{Ln (W. Distribution)} +$$

$$+ \text{Holidays} + \text{Last Harvest}$$

The models were estimated using ordinary least square (OLS). This methodology is consistent, and the sample is large, ensuring the reliability of the result. The only difference between models is the dependent variable, where P_T is current price, P_R is regular price and the subscripts represent the different kinds of attributes. The subscripts represent the different levels of color wine, grape varieties, types of packages and brands. The bottle size variable (size) and weight distribution were transformed by natural logarithm. Finally, *«last harvest»* and *«holidays»* were specified as dichotomous variables.

Following some very important literature for comparing hedonic models (such as Ohta and Griliches, 1975, 1986; Steiner, 2004) the difference in the adjustment of regressions should be considered. That is, the residual standard error, the F, z or t-values, and both R-squared, and then determine whether there are relevant global differences. The Akaike Information Criteria (AIC) is also calculated in order to improve regression choice criteria. Finally, in order to compensate for the large sample size, the F-test should present significant levels when it is being equal or below to 0.01 (Berndt and Griliches, 1993).

Results and discussion

Econometric results of the two hedonic regressions indicate that models present high adjusted R^2 and significant F-values (Table 4). That is, both models are well-specified (Table 4). When adjusted R^2 are compared, along with errors, residuals, and AIC, the results are better for the model using the regular price, and therefore it can be expected that the estimates for the attributes are more accurate.

There are no differences in the signs of the different coefficients in both models. The signs obtained for the different variables are in line with the expected based on theoretical assumptions or with existing literature. The only difference in significance levels between the two regressions is for the «*holidays*» variable. This

Table 4. Estimates for hedonic functions – Ordinary least squares

Variable	Level	Current prices					Regular prices				
		Estimate	Std. error	z value	Pr(>|z|)	Sig.[2]	Estimate	Std. error	z value	Pr(>|z|)	Sig.[2]
Intercept	(Intercept)	3.060	0.045	68.75	0.000	***	3.129	0.051	60.994	0.000	***
Color	White	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]
	Red	–0.017	0.008	–2.16	0.031	*	–0.023	0.009	–2.618	0.009	**
Varieties	Carmenere	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]1
	Cabernet Sauvignon	–0.073	0.006	–12.61	0.000	***	–0.081	0.007	–11.493	0.000	***
	Chardonnay	0.037	0.008	4.60	0.000	***	0.029	0.010	3.001	0.003	**
	Merlot	–0.142	0.005	–28.00	0.000	***	–0.146	0.007	–22.375	0.000	***
	No variety	–1.074	0.010	–107.81	0.000	***	–1.098	0.011	–101.622	0.000	***
	Other varieties	0.071	0.007	10.02	0.000	***	0.073	0.008	8.798	0.000	***
	Suavignon Blanc	–0.215	0.009	–24.71	0.000	***	–0.205	0.010	–19.946	0.000	***
Packages	Other packages (plastic&box)	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]
	Glass	0.200	0.010	20.18	0.000	***	0.194	0.011	18.213	0.000	***
Brands	120	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]	+[1]
	Bodega Uno	0.188	0.011	16.56	0.000	***	0.176	0.016	10.851	0.000	***
	Caperana	–0.210	0.017	–12.17	0.000	***	–0.304	0.025	–11.976	0.000	***
	C.del Diablo	0.405	0.013	30.18	0.000	***	0.406	0.019	21.579	0.000	***
	Clos de Pirque	–0.419	0.014	–29.09	0.000	***	–0.466	0.020	–23.187	0.000	***
	Fressco	–0.039	0.013	–3.08	0.002	**	–0.045	0.018	–2.478	0.013	*
	Gran Tarapaca	0.299	0.016	18.30	0.000	***	0.277	0.022	12.566	0.000	***
	L. Cauquenes	0.110	0.015	7.58	0.000	***	0.131	0.019	6.960	0.000	***
	Leon de Tarapaca	–0.366	0.013	–28.11	0.000	***	–0.389	0.018	–21.395	0.000	***
	Other Brands	0.182	0.011	16.60	0.000	***	0.174	0.016	10.849	0.000	***
	Panul	–0.313	0.019	–16.64	0.000	***	–0.373	0.024	–15.677	0.000	***
	Planella	0.085	0.013	6.60	0.000	***	0.070	0.018	3.945	0.000	***
	S. Emiliana	–0.475	0.013	–37.82	0.000	***	–0.495	0.017	–28.550	0.000	***
	Tierruca	–0.378	0.017	–21.73	0.000	***	–0.364	0.020	–18.297	0.000	***
	Undurraga	–0.167	0.013	–12.56	0.000	***	–0.198	0.019	–10.630	0.000	***
	Viña Mar	0.087	0.016	5.28	0.000	***	0.661	0.006	102.376	0.000	***
Package sizes	ln (package size)	0.663	0.006	116.95	0.000	***	0.803	0.018	44.089	0.000	***
Weighted dist	ln (w. distribution)	0.006	0.001	4.47	0.000	***	0.006	0.001	3.921	0.000	***
Holydays	Holidays	–0.021	0.007	–2.89	0.004	**	–0.005	0.008	–0.663	0.507	
Harvest	Last harvest	0.027	0.006	4.93	0.000	***	0.020	0.006	3.422	0.001	***
Interaction term	Red*Glass	0.253	0.009	27.49	0.000	***	0.251	0.010	24.107	0.000	***
Residual standard error:		0.6052 on 154,914 degrees of freedom					0.5954 on 105,540 degrees of freedom				
Multiple R^2:		0.327					0.335				
Adjusted R^2:		0.327					0.335				
F-statistic:		2,690 on 28 and 154914 DF, p-value: < 0.000					1,901 on 28 and 105540 DF, p-value: < 0.000				
AIC		284,128.7					190,142.4				

[1]+: Base level. [2] Signif. codes of p-values: *** = 0.001, ** = 0.01, * = 0.05. *Data source*: Nielsen Scantrack (with authors' calculations) evaluations.

difference may be explained because the variable is not permanent over time; holidays are specific moments in time, and as it has been mentioned before, regular price only represents stable attributes over time (Melser, 2006). Besides, it is expected that when consumers increase demand, manufacturers tend to develop special offers (MacDonald, 2000).

The estimators will be analyzed individually. To do this, it will be determined whether the regression coefficient estimates for one regression falls within the confidence interval (at 95%) of the other regression, and viceversa. When one estimate is not within the confidence interval of the two regressions, it will be considered as a different estimate. Table 5 shows confidence intervals and variables in which both regressors are outside the confidence intervals.

When confidence intervals for each estimator are determined in transaction and regular price regressions, it is possible to see that some brands present statistical differences in their estimations. These brands have coefficient estimates whose impact is smaller than when regular price is used. One possible explanation is that

Table 5. Confidence interval for differences between estimates of regular and current prices regressions

Variable	Level	Current prices CI[1] (95%)		Out of CI[1]	Regular prices CI (95%)		Out of CI[1]	Out of both CIs
Intercept	(Intercept)	2.97	3.15	0	3.03	3.23	0	0
Color	White	+	+	+	+	+	+	+
	Red	–0.03	0.00	0	–0.04	–0.01	0	0
Varieties	Carmenere	+	+	+	+	+	+	+
	Cabernet Sauvignon	–0.08	–0.06	0	–0.10	–0.07	0	0
	Chardonnay	0.02	0.05	0	0.01	0.05	0	0
	Merlot	–0.15	–0.13	0	–0.16	–0.13	0	0
	No variety	–1.09	–1.05	1	–1.12	–1.08	1	2
	Other varieties	0.06	0.08	0	0.06	0.09	0	0
	Sauvignon Blanc	–0.23	–0.20	0	–0.23	–0.18	0	0
Packages	Other packages (plastic&box)	+	+	+	+	+	+	+
	Glass	0.18	0.22	0	0.17	0.22	0	0
Brands	120	+	+	+	+	+	+	+
	Bodega Uno	0.17	0.21	0	0.14	0.21	0	0
	Caperana	–0.24	–0.18	1	–0.35	–0.25	1	2
	C.del Diablo	0.38	0.43	0	0.37	0.44	0	0
	Clos de Pirque	–0.45	–0.39	1	–0.51	–0.43	1	2
	Fressco	–0.06	–0.01	0	–0.08	–0.01	0	0
	Gran Tarapaca	0.27	0.33	0	0.23	0.32	0	0
	L.Cauquenes	0.08	0.14	0	0.09	0.17	0	0
	Leon de Tarapaca	–0.39	–0.34	0	–0.43	–0.35	0	0
	Other Brands	0.16	0.20	0	0.14	0.21	0	0
	Panul	–0.35	–0.28	1	–0.42	–0.33	1	2
	Planella	0.06	0.11	0	0.03	0.10	0	0
	S.Emiliana	–0.50	–0.45	0	–0.53	–0.46	0	0
	Tierruca	–0.41	–0.34	0	–0.40	–0.32	0	0
	Undurraga	–0.19	–0.14	1	–0.24	–0.16	0	1
	Viña Mar	0.05	0.12	1	0.65	0.67	1	2
Package sizes	ln (package size)	0.65	0.67	1	0.77	0.84	1	2
Weighted distribution	ln (w. distribution)	0.00	0.01	0	0.00	0.01	0	0
Holidays	Holidays	–0.04	–0.01	1	–0.02	0.01	0	1
Harvest	Last harvest	0.02	0.04	0	0.01	0.03	0	0
Interaction term	Red*Glass	0.23	0.27	0	0.23	0.27	0	0

CI: confidence interval. [1] Estimate out of range in confidence interval of one regression. [2] Estimate out of range in confidence interval of both regressions. *Data source:* Nielsen Scantrack (with authors' calculations) evaluations.

when one brand has a high frequency and big discounts in its prices, its value may be eroded in the market (Schultz, 2004). The results show other brands whose value is not affected by the use of transaction or regular prices. This can be explained because their margin has remained stable over time; therefore, estimators would not be biased (Feenstra, 1995).

Regarding the different varieties of grapes, the only difference between transaction price and regular price regressions is the significance level of «*no variety*», because the number of attributes is smaller, these products present less attributes and they are more prone to discounts (Myers, 2003).

The greatest difference among the coefficient estimate can be found for bottle size. One explanation for this conclusion can be found in wine production costs. The cost for the amount of grape represents over 60% of the total cost of wine (González *et al.*, 2004). The difference of the impact of size is higher when it is calculated on the basis of regular price rather than transaction price. The reason for this may be the fact that regular price is mostly associated with the cost structure for manufacturers rather than with transaction prices (Bronnenberg *et al*., 2006). Thus any other effects (*e.g.,* special offers or competitive discount) are excluded from the analysis of regular price.

In both regressions, red wine is less appreciated than white wine, although its impact is not very high, and in the case of the regression where transaction price is used it is not significant and is almost non significant when regular price is used. Even if these results were not conclusive, they cannot be compared with other results in previous studies (Buzeta, 2005; Geve, 2005; Troncoso and Aguirre, 2006) because in those studies the focus of attention were several different red versus white varieties of grapes. Thus, the current research study is the first hedonic study about the Chilean market in which color is considered as an independent variable.

Therefore, the hypothesis that grape variety effect is low cannot be rejected. However, the greatest negative impact is for wines with «*no varieties*» level of grape. This is consistent with findings in other studies such as Buzeta (2005) and Geve (2005). An explanation for this can be found in the fact that 17.1% of observations did not provide information on this attribute. This circumstance does not allow these types of products to reach some specific market segments (Myers, 2003) where the grape is an important attribute. One can observe that Carmenere grape is the attribute with the highest value. This can be explained by the fact the Chilean market is very region-oriented (Vergara, 2001) and Carmenere is an important local variety mainly grown in Chile (Lukacs, 2007). Regarding white varieties, Chardonnay is preferred to Sauvignon Blanc, which is also consistent with findings in Troncoso and Aguirre (2009). As for the type of packaging, glass has a higher valuation as expected, and aligned to the result of the study by Buzeta (2004).

It was also possible to establish that wine brands have an impact, some of them above other attributes such as color, varieties of grapes or types of packaging. The difference in impact among brands may be explained by the fact that local consumers, who have been exposed to several local marketing activities on the part of manufactures, can yield a deeper knowledge of brands, something an external consumer would not be able to distinguish (Schamel, 2006).

As for distribution, results are within the expected ranges. However, its impact is quite small compared with other attributes. In supermarket channels, where massive consumption products are sold, an increase in distribution has a positive impact due to the increase of the product's availability.

The last harvesting has a considerable impact on the value of wine. This result is consistent with the previous literature on the subject (Combris *et al*., 1997; Landon and Smith, 1998; Angulo *et al*., 2000; Steiner, 2004; Troncoso and Aguirre, 2006; Cardebat and Figuet, 2009).

Stable attributes could be part of the features that the product maintains during the studied period, or will be those affecting the cost structure of the product or its valuation by consumers. For example, attributes that remain stable during the time period will include: color, varieties of grapes, size of packaging, type of packaging, etc. Within the structure that may affect cost or quality of wine, one should mention vintage (harvest), which has a major impact on wine quality (Jones and Strorchmann, 2000), and can be viewed as a technological change. The latter is aligned with the points made by Hulten (2003) that prices can only be altered by technological changes. Therefore, then for this type of property it is advisable to use regular prices. However, this research study has considered a seasonal variable: holidays, reflecting characteristics of temporary market conditions, such as increased competitive conditions, which is not part of a product's attributes, and therefore the regular price may not reflect conditions beyond the product.

The main conclusion of this paper is that, in a hedonic study permanent attributes for regular price exhibit a better performance than current price attributes. Working with regular prices has a stronger theoretical support for determining the value of those attributes, because it avoids potential bias as a result of manufactures' margin or mark-up, and it represents more faithfully the cost structures of manufacturers. Hence, this is more accurately associated with the hedonic theory proposed by Rosen (1974).

There are several criteria to define regular prices (Abraham and Lodish, 1993; Narasimhan *et al*., 1996; Van Heerde *et al*., 2000; Pauwels *et al*., 2002; Hosken and Reiffen, 2004, among others), and clearly the use of these criteria may lead to different results. Theoretically, with attribute valuing, any of these criteria ought to be better than a current price. The use of regular price must consider the behavior of the category. This means that, in categories where there are several special offer prices with a different depth, the criterion of one standard deviation would not be adequate; it could be more weeks and more depth. This brings the concept that application of the regular price should consider the characteristics of each category, *i.e.* frequency of discounts and rebate levels.

This research opens possibilities to keep on working on the development of hedonic models, since it will allow for a more accurate attribute valuing than habitual hedonic research studies. There is still a long way to go in order to improve this method based on regular price, since it needs to be validated across other product categories, other functional forms, and the possibility of working with a disaggregated database.

As Tripplet (2004) states, one must always consider the purpose of the study, for example if the objective of the study is to determine the inflation caused by technology changes in some products, it would be advisable to use the transaction price, because the price should reflect value changes in the market. However, in studies related to the area of industrial organization, where the attributes of products are the cause of competitive advantages, the use of regular price has the benefit that will perform better in hedonic functions.

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References

ABRAHAM M., LODISH L., 1993. An implemented system for improving promotion productivity using store scanner data. Marketing Sci 12(3), 248-270.

AILAWADI K.L., HARLAM B.A., CESAR J., TROUNCE D., 2006. Promotion profitability for a retailer: the role of promotion, brand, category, and store characteristics. J Marketing Res 43(4), 518-535.

AILAWADI K.L., GEDENK K., LUTZKY C., NESLIN S., 2007. Decomposition of the sales impact of promotion-induced stockpiling. J Marketing Res 44(3), 450-467.

ANGULO A.M., GIL J.M., GRACIA A., SÁNCHEZ M., 2000. Hedonic prices for Spanish red quality wine. British Food J 2(7), 481-493.

AYALA M., DURÁN M.J., 2004. Determinantes de la calidad del vino en la industria chilena. Thesis, Universidad de Chile, Facultad de Economía y Administración, Santiago, Chile. [In Spanish].

BAJARI P., BENKARD L., 2005. Demand estimation with heterogeneous consumers and unobserved product characteristics: a hedonic approach. J Political Econ 113(6), 1239-1276.

BENFRATELLO L., PIACENZA M., SACCHETTO S., 2009. Taste or reputation: hat drives market prices in the wine industry? Estimation of a hedonic model for Italian premium wines. Appl Econ 41(1), 2197-2209.

BERNDT E., GRILICHES Z., 1993. Price measurements and their uses. In: Price indexes for microcomputers: an exploratory study (M.F. Foss, Manser M., Young A., eds). Volume 57, Studies in income and wealth. National Bureau of Economic Research, University of Chicago Press. Chicago, USA. pp. 63-93.

BIJMOLT T., VAN HEERDE H.J., PIETERS R.G.M., 2005. New empirical generalizations on the determinants of price elasticity, J Marketing Res 42(2), 141-156.

BRONNENBERG B.J., MELA C.F., BOULDING W., 2006. The periodicity of pricing. J Marketing Res 43(3), 477-493.

BUZETA J.E., 2005. Determinantes del precio del vino en el mercado chileno: un estudio de precios hedónicos. Master's thesis. Facultad de Economía Agraria e Ingeniería Forestal, Pontificia Universidad Católica de Chile, Chile. [In Spanish].

CARDEBAT J.M., FIGUET J.M, 2009. Estimation of a hedonic price equation for Alsace, Beaujolais and Provence wines. Appl Econ Letters 16(9), 921-927.

CARROLL M., 2001. Pricing U.S. North Atlantic Bluefin Tuna and implications for management. Agribusiness 17(2), 243-254.

COMBRIS P., LECOCQ S., VISSER M., 1997. Estimation for a hedonic price equation for Bordeaux wine: does quality matter? Econ J 107(441), 390-402.

DELTAS G., ELEFTHERIOS Z., 2006. Entry order and pricing over the product cycle: the transition from the 486 to the Pentium processor. Int J Indust Org 24(5), 1041-1069.
DIEKMANN F., 2008. Tractors on ebay: differences between internet and in-person auctions. Am J Agr Econ 90(2), 306-320.
DIEWERT W.E., 2003a. Hedonic regressions: a consumer theory approach. In: scanner data and price indexes (Feenstraand R.C., Shapiro M.D., eds). National Bureau of Economic Research Studies in Income and Wealth, Vol. 64. University of Chicago Press, Chicago, IL, USA. pp. 317-348.
DIEWERT W.E., 2003b. Hedonic regressions: a review of some unresolved issues. Proc 7th Meeting of the Ottawa Group, Paris. p. 43.
FEENSTRA R.C., 1995. Exact hedonic price indexes. Rev Econ Stat 57(4), 634-654.
FITZSIMONS G.J., 2000. Consumer response to stockouts. J Consum Res 27(2), 249-266.
FOEKENS E.W., LEETIANG P., WITTINK D.R., 1994. A comparison and an exploration of the forecasting accuracy of a nonlinear model at different levels of aggregation. Int J Forecast 10(2), 245-261.
FOK H., PAAP F., 2006. A hierarchical bayes error correction model to explain dynamic effects of price. J Marketing Res 43(3), 443-461.
GERSTNER E., HESS J., 1987. Why do hot dogs come in packs of 10 and buns in 8s or 12? A demand-side investigation. J Business 60(4), 491-517.
GEVE P.A., 2005. Análisis y valoración hedónica de atributos del vino en Santiago. Master's thesis. Facultad de Economía Agraria e Ingeniería Forestal, Pontificia Universidad Católica de Chile, Chile. [In Spanish].
GLUCKMAN R., 1990. A consumer approach to branded wines. Eur J Marketing 24(4), 27-47.
GONZÁLEZ J.I., MORINI S., GUIRAO G., CANO V.J., RODRÍGUEZ M.C., 2004. Análisis comparativo de costes y precios en las DO Tacoronte-Acentejo e Ycoden. V Jornadas Técnicas Vitivinícolas Canarias, Tenerife, España, Noviembre 1-19. [In Spanish].
GRANT D.B., FERNIE J., 2008. Exploring out-of-stock and on-shelf availability in non-grocery, high street retailing. Int J Retail Distrib Manage 36(8), 661-672.
GRILICHES Z., 1971. Hedonic price indexes for automobiles: an econometric analysis of quality change. In: Price indexes and quality change (Griliches Z., ed.). Harvard Univ Press, Cambridge, MA, USA.
GUADAGNI P.M., LITTLE J.D., 1983. A logit model of brand choice calibrated on scanner data. Marketing Sci 2(3), 203-239.
GUPTA S., 1988. Impact of sales promotion on when, what and how much to buy. J Market Res 25(4), 342-355.
HAEGER J.W., STORCHMANN K., 2006. Prices of American pinot noir wines: climate, craftsmanship, critics. Agr Econ 35, 67-78.
HERAVI S., HESTON A., SILVER M., 2003. Using scanner data to estimate country price parities: a hedonic approach. Rev Income Wealth 49(1), 1-21.
HOSKEN D., REIFFEN D., 2004. Patterns of retail price variation. RAND J Econ 35(1), 128-146.
HULTEN C.R., 2003. Price hedonics: a critical review. FRBNY Econ Policy Rev 9(3), 5-15.
INE, 2009. Índice de precios al consumidor (IPC) desde enero 1998 hasta diciembre 2008, divisiones, serie historia empalmada (índices y variaciones). Available in: http://www.ine.cl/canales/chile_estadistico/estadisticas_precios/ipc/ [October 12, 2008]. [In Spanish].
IOANNIDIS C., SILVER M., 1999. Estimating hedonic price indices: an application to UK television sets. J Econ 69(1), 71-94.
JEDIDI K., MELA C.F., GUPTA S., 1999. Managing advertising and promotion for long-run profitability. Market Sci 18(1), 1-22.
JONES G.V., STORCHMANN K.H., 2000. Wine market prices and investment under uncertainty: an econometric model for Bordeaux Crus Classés. Agr Econ 76(1), 1-18.
LANDON S., SMITH C., 1998. Quality expectations, reputation, and price. South Econ J 64(3), 628-647.
LUKACS P., 2007. Chile rediscovers Carmenere. Washington Times, The DC. Apr 4. Section: Food, Wine, p. E03.
MacDONALD J.M., 2000. Demand, information, and competition: why do food prices fall at seasonal demand peaks? J Indust Econ 48(1), 27-45.
MARTÍNEZ A., MORILLA J., 2002. Una función de precios hedónicos para el vino español de calidad en el año 2000. Rev Esp Estud Agrosoc Pesqu 196, 173-196. [In Spanish].
McGUCKIN R.H., STIROH K.J., 2002. Computers and productivity: are aggregation effects important? Econ Inquiry 40(1), 42-59.
MELSER D., 2006. Accounting for the effects of new and disappearing goods using scanner data. Rev Income Wealth 52(4), 547-567.
MITCHELL V.W., GREATOREX M., 1989. Risk reducing strategies used in the purchase of wine in the UK. Eur J Marketing 23(9), 31-46.
MYERS C.R., 2003. Managing brand equity, a look at the impact of attributes. J Product Brand Manage 12(1), 35-51.
NARASIMHAN C., NESLIN S.A., SEN S.K., 1996. Promotional elasticities and category characteristics. J Market 60(2), 17-31.
NERLOVE M., 1995. Hedonic price functions and the measurement of preferences: the case of Swedish wine consumers. Eur Econ Rev 39(9), 1697-1716.
NESLIN S.A., POWELL S.G., STONE S.L., 1995. The effects of retailer and consumer response on optimal manufacturer advertising and trade promotion strategies. Manage Sci 41(5), 749-766.
NEVO A., 1998. Measuring market power in the ready to eat cereal industry. National Bureau of Economic Research, Work document 6337.
NEWEY W.K., WEST K.D., 1987. A simple, positive-definite, heteroskedasticity and autocorrelation consistent covariance matrix. Econometrica 55, 703-708.
NEWEY W.K., WEST K.D., 1994. Automatic lag selection in covariance matrix estimation. Rev Econ Stud 61, 631-653.

NIELSEN, 2006. ACNielsen/Tendencias, Nielsen Chile, Santiago. [In Spanish].

OCZKOWSKI E., 1994. A price function for Australian premium table wine. Aust J Agr Econ 3 (1), 93-110.

OHTA M., GRILICHES Z., 1975. Household production and consumption. In: Automobile prices revisited: Extensions of the hedonic hypothesis (Terleckyj N., ed). National Bureau of Economic Research, Studies in Income and Wealth. National Bureau of Economic Research, NY, University of Chicago Press. pp. 325-390.

OHTA M., GRILICHES Z., 1975. Automobile prices and quality: did the gasoline price increases change consumer tastes in the U.S? J Bus Econ Sta 4(2), 187-198.

OIV, 2006. El 15 de septiembre de 2005, la Comisión de la Unión Europea y los Estados Unidos de América han llegado a un acuerdo «de fase uno» sobre el comercio del vino. Organización Internacional de la Viña y el Vino. Available in: http://www.oiv.int. [November 27, 2006]. [In Spanish].

PAKES A., 2003. A reconsideration of hedonic price indexes with an application to PCs. Am Econ Rev 93(5), 1578-1596.

PALMA D., 2004. De apetitos y de cañas. El consumo de alimentos y bebidas en Santiago a fines del siglo XIX. Instituto de Historia, Pontificia Universidad Católica de Chile, 2(37), 391-417. [In Spanish].

PAUWELS K., HANSSENS D.M., SIDDARTH S., 2002. The long-term effects of price promotions on category incidence, brand choice, and purchase quantity. J Market Res 39(4), 421-439.

REQUENA-SILVENTE F., WALKER J., 2007. Investigating sales and advertising rivalry in the UK multipurpose vehicle market (1995-2002). J Econ Business 59(2), 163-180.

RITCHIE C., 2007. Beyond drinking: the role of wine in the life of the UK consumer. Int J Consum Stud 31, 534-540.

RODRÍGUEZ M., CASTILLO J.S., 2009. El vino tinto de denominación de origen en Castilla-La Mancha: un análisis de precios hedónicos. Rev Esp Estuds Agrosoc Pesqu 222, 103-123. [In Spanish].

ROSEN S., 1974. Hedonic prices and implicit markets: product differentiation in pure competition. J Politic Econ 82(1), 35-55.

SAG, 2006. Panorama de la vitivinicultura chilena en 2006. Servicio Agrícola y Ganadero, Ministerio de Agricultura, Gobierno de Chile. [In Spanish].

SÁNCHEZ F., SÁNCHEZ M.S., PRIETO P., PRIETO R., 2007. Guía de vinos de Chile. Turismo y Comunicaciones SA, Santiago, Chile. [In Spanish].

SCHAMEL G., 2006. Geography versus brands in a global wine market. Agribusiness 22(3), 363-374.

SCHAMEL G., ANDERSON K., 2003. Wine quality and varietal, regional winery reputations: hedonic prices for Australia and New Zealand. Econ Record 79(246), 357-369.

SCHNETTLER B., RIVERA A., 2003. Características del proceso de compra de vino en la IX Región de la Araucanía. Ciencia Invest Agrar 30(1), 1-14. [In Spanish].

SCHULTZ D.E., 2004. A clean brand slate. Market Manage 13(5), 10-11.

SILVER M., HERAVI S., 2001. Scanner data and the measurement of inflation. Econ J 111(472), 383-405.

STEINER B., 2004. Australian wines in the British wine market: a hedonic price analysis. Agribusiness 20(3), 287-307.

TRIPLETT J., 2004. Handbook on hedonic indexes and quality adjustments in price index: special application to information technology products. OECD Science, Technology and Industry Working Papers, 2004/9. OECD Publishing, Paris.

TRONCOSO J.L., AGUIRRE M., 2006. Price determinants of Chilean wines in the US market: a hedonic approach. Spanish J Agric Res 4(2), 124-129.

VAN HEERDE H.J., 1999. Models for sales promotion effects based on store-level scanner data. Doctoral thesis. Groningen University, Holland.

VAN HEERDE H.J., LEEFLANG P., WITTINK D.R., 2000. The estimation of pre- and postpromotion dips with store-level scanner data. J Market Res 37(3), 383-395.

VERGARA S., 2001. El mercado vitivinícola mundial y el flujo de inversión extranjera a Chile. CEPAL, United Nations. [In Spanish].

ZEILEIS A., 2004. Econometric computing with HC and HAC covariance matrix estimators. J Stat Software 11(10), 1-17.