Hedonic Pricing Models and the Evaluation of Attributes: The Case of Wines from Brazil, Argentina and Chile


Abstract
This study uses the analysis of hedonic prices to measure, on the perspective of the globalization, the impact on the prices of wines considering the following attributes: producing country, vintage, variety of grape used in the wine making and the specific growing region. The countries surveyed were Brazil, Argentina and Chile, which are the main competitors in the fine wine trade in Brazil.

The main objective of this work is to identify if attributes like vintage, producer, growing region, variety of grape and alcohol strength influence the price of the wines. The major difference between this work and previous ones that utilize the function of hedonic prices on wines is that, in this study, actual Brazilian retail prices are used instead of the prices recommended in foreign wine guides, such as Halliday in Australia and the Guia de Vinos Gourmets in Spain, that have been utilized by others. By a sample of 229 wines, the purpose of this study is to confirm if the characteristics printed on the labels of fine wines sold on the Brazilian market, specif-
ically those made in Argentina, Chile and Brazil, influence the price presented to the consumer. This kind of measure could lead to the creation of hedonic indexes of wine prices, which could support the making of price policies by private agents, as well as establish control plans and targets of the market prices by government agents, aiming to create sustainability in face of the globalization, competition and consumer protection against eventual abusive price increases.

It is hoped that, with the results of this work, it will be possible to analyze the power of adjustment of the semi-logarithmic model for this type of study, if the data make available sufficient information on the attributes of this market and if the analysis includes the differences among prices of wines in relation to the presence or absence of a given characteristic.

**Key words:** Wines; Attributes; Hedonic prices; Econometric regression models.

**JEL Code:** C5, D11, D40.
Introduction
Progress of the “New World” wines in the international trade has brought about significant changes in this market. In this wine market the designation of “Old World” wines was generally applied to European wine producing countries such as France, Italy, Spain and Portugal with a tradition of thousands of years and wines of the “New World” referred to countries in which viniculture is still incipient such as South Africa, Argentina, Australia, Brazil, Chile, the United States and New Zealand to mention a few.

Progress of “New World” wines in the market is tied to an effective communication, a reasonable quality price ratio, an attractive image of the producing country and the offer of new varieties. Today, Argentina, the fifth largest worldwide wine producer and Chile, another traditional wine producer in South America, are important players in this trade.

Demand for fine wines in Brazil has grown each year. Participation of imported wines exhibited a considerable increase in the Brazilian market over the last years, from 35% in 1966 to almost 54% in 2003 and over 50% of the imports are wines produced in Argentina and Chile (Uvibra, 2004).

Brazilian viticulture and viniculture has made major progress in the last two decades and now Brazil produces good quality wines. Since 1995, the country became a member of the OIV (Office Internacional de la Vigne et du Vin) a body that sets the international standards for wine production. Compliance with the OIV results in a higher quality standard for local wines.

Currently the sales of fine wines in the Brazilian market are mainly disputed between the Argentinean, Chilean and local wines. There is an aggressive competition for the fine wine consumer preferences. An interesting issue would be what explains the difference in prices among Brazilian, Argentinean, and Chilean wines in the Brazilian retail market. Another issue would be: which are the most relevant characteristics or what may be called the attributes that consumers consider important in the purchase of a wine?

Wines are rather distinctive products bought and sold at prices that vary widely. Although price is still one of the main determinants in the con-
sumer decision to purchase, there is a growing consumption of wines based upon attributes such as quality, producing region, taste or class among others. Furthermore, there seems to be a strong relation between market prices and attributes of the wines that influence the consumers’ choice for a specific wine. (Angulo et al., 2000).

Analysis of Hedonic prices has been used to measure the marginal value or the contribution to the price for a variety of different products. Wine is a product well suited for this type of analysis because of the differentiated forms of presentation and of the difficulty in objectively assessing the quality (Oczkowski, 2001).

This article uses the analysis of Hedonic prices to measure the impact on the prices of wines considering the following attributes: producing country, vintage, variety of grape used in the wine making and the specific growing region. In this study the countries surveyed are: Brazil, Argentina and Chile, that are the main competitors in the fine wine trade in Brazil.

These are objective attributes easily identified by consumers on the front labels of fine wines sold in Brazil. Earlier studies (Combris et al., 1997, 2000) along this line of research analyzed sensorial aspects such as aroma and taste but concluded that these factors are not significant for the price of the wines analyzed. To analyze the factors influencing prices, Angulo et al. (2000), Oczkowski (2001), and Schamel and Anderson (2003) used wine guides that publish the rating by experts regarding reputation and quality.

Unwin (1999) analyzed diverse articles and concluded that the models of Hedonic prices for wines are attempting to relate the price of the wines with objective information, easily available to most consumers. The only variables consistently available on the majority of bottles are the: vintage, producer, growing region, variety of grape and alcohol strength.

Thus the objective of this work was to identify if these attributes influence the price of the wines in question. The major difference between this work and previous ones that utilize the function of Hedonic prices on wines is that in this study actual Brazilian retail prices are used instead of the prices recommended in foreign wine guides, such as Halliday in Australia and the Guia de Vinos Gourmets in Spain, that have been utilized by others.
It is hoped that with the results of this work it will be possible to analyze the power of adjustment of the semi-logarithmic model for this type of study and if data make available sufficient information on the attributes of this market and if the analysis includes the difference in the prices of wines in relation to the presence or absence of a given characteristic.

To achieve this objective, the article is structured as follows. In the next section there is a survey of literature on utilization of the Hedonic function in wines and the theoretical bases for the method. The concept of Hedonic prices and their applicability to wines is focused in the third section. Next, the Hedonic function and its variables were estimated. The results achieved with regressions are then discussed. Finally the implications of Hedonic analysis, limitations of the study and the possibility for future studies are presented in the last section.

1. Theoretical foundation of the hedonic pricing model

In the traditional consumer theory, a good is treated as an indivisible unit. The complementarity and substitutability relationships with other goods are an intrinsic and subjective characteristic as it is independent from any criterion inherent to this theory. This type of approach has serious problems when facing the issues inherent to modern economy. This theory, especially presents inconveniences about including new goods. Thereupon, a problem arises for the comparison of the current situation with the previous one, because the mere inclusion of a good completely changes the situation from the point of view of the approach (Sartoris Neto, 1996).

As such, the classical consumer theory presents shortcomings in the definition of the ratio between goods since the character of the existence or not of substitution or complementarity of the goods in relation to others is considered an intrinsic propriety and in view of such limitations Lancaster (1966) proposed a new approach for the consumer theory (Lancaster (1966) apud Angelo and Fávero, 2003).

The analysis of the characteristics of goods in consumer behaviour was introduced by Kelvin Lancaster in 1966. This author proposed a new approach to the consumer theory in which the latter does not directly achieve utility through the goods acquired, but through the properties or
characteristics of these goods. Therefore, it is assumed that consumption is an activity in which the good or a combination of goods are obtained in order to acquire an array of characteristics present in that good or set of goods. Therefore, this new approach presented by Lancaster offers a more realistic view of consumer behaviour, where the utility results from the presence or not of certain characteristics.

According to the pioneer work of Waugh (1928) and Court (1939), it was the Zvi Griliches focus on product characteristics that revived the analysis of hedonic prices and from then on a great deal of works have been developed along this line of research (Griliches, 1961, 1971).

Analysis of hedonic prices is based upon the hypothesis that any product represents a set of characteristics that define quality and consequently price. Rosen (1974) was the first one to examine the theoretical framework of this type of research. The value perceived for a product is the sum of the implicit prices of the attributes contained in this product.

This analysis has been used in various surveys involving the price of wines. Among these works are Golan and Shalit (1993), Oczkowski (1994, 2001), Nerlove (1995), Combris et al. (1997, 2000), Angulo et al. (2000), Schamel and Anderson (2003) and Steiner (2004).

In the Golan and Shalit (1993) study, the authors intended to use hedonic analysis to identify and assess the quality of the grapes used in the Israeli wines, Results could be used by the Israeli producers as an indicator of the most suitable types of grapes for production.

Oczkowski (1994) identified the implicit assessment of the attributes of premium Australian wines for the recommended retail prices. As the first study of hedonic pricing of Australian wines it showed that the semi-logarithmic form was the best function of the model that utilized six wine attributes. Results indicate that the effects of reputation were significant, however the effects of quality were not.

Nerlove (1995) surveyed the Swedish wine market, a governmental monopoly, leading him to assume prices that were totally exogenous. He achieved similar results to those of the Oczkowski (1994) and Combris et al. (1997) and estimated an equation of hedonic prices for Bordeaux wines using intrinsic judgments of the quality of wines such as acidity and taste.
as well as extrinsic factors such as reputation and vintage; Results of the hedonic equation show that the market price is mainly governed by the extrinsic characteristics.

These authors published another paper using the same methodology for Burgundy wines (Combris et al., 2000). The same effects were noted, with the objective characteristics, in particular the ranking and the vintage as being more significant and having a greater effect on the price of this type of wine. Results of this study, together with the previous one, confirm that the objective characteristics, which are easier to identify than the sensorial characteristics, are the main determinants for the definition of price.

Angulo et al. (2000) utilizes a Spanish wine catalogue as a database for analyzing attributes that most influence pricing of red Spanish wines. The variables used relate to the categories of prices assigned in the catalogue to the producing region, vintage, variety of grape, alcohol strength and a classification based upon the ranking of wine experts. The growing region and the vintage were the main determinants of the market price of wines analyzed in this study.

In another study Oczkowski (2001) mentions four types of characteristics that have been used in the functions of hedonic prices of wines: sensorial, chemical, objective and climatic. Sensorial attributes are subjective measurements, for instance: the aroma of wines. Chemical attributes are technical measurements such as sugar level and acidity. The objective attributes are those easily recognized by consumers on the wine label and include vintage, growing region and variety of grapes. And finally, the climatic attributes are the effects of the climate where the grapes are grown.

In this work Oczkowski utilizes quality, reputation and objective characteristics as independent variables to establish the price of wines on the Australian market. Results disclose that objective attributes are easily recognized and judged by consumers. However, the reputation and classification evaluated by wine experts in guides have a weight in the consumers ranking, but there is little empiric evidence of this.

To analyze Australian and New Zealand wines, Schamel and Anderson (2003) used the James Halliday and Winestate wine classification guides. In the utilized method, all wines and regions were put into a sin-
single series of equations for each year (1992-2000). Results disclosed that the reputation of the wine producer, region, variety and the estimate of quality are significant in some equations using Barossa shiraz as point of comparison in the estimate of the dummy variable. Furthermore, some regions became more important during the 10-year time period covered by this study.

Steiner (2004) seeks in his work to use analysis of hedonic prices to identify the values that consumers assign to information on the labels of Australian wines in the British retail market. The independent variables utilized are those found on the labels of fine wines normally retailed in that country: colour (red/white), variety of grape, region of origin, vintage, volume, venue of bottling and wine producer. The important results of the study suggest that consumers consider the region together with the variety of grapes as proxies for the brands and quality of the wines.

2. Hedonic Pricing Models: The Case of Wines
Wines are well-differentiated products. Generally, four types of characteristics have been used in the functions of hedonic prices: sensorial, chemical, objective and climatic.

Oczkowski (1994) and Landon and Smith (1998) argue that the main supposition that must orient the choice of characteristics utilized is that of the comprehensive information of the Rosen (1974) work. The supposition where the consumers’ preference may contribute to establish the market prices depends upon knowledge of the wine characteristics. This implies that the individual sensorial, chemical and climatic characteristics are not good choices for inclusion in the functions of hedonic prices and, so the easily observed objective characteristics will be preferred (Oczkowski, 2001).

Previous studies of Australian wines indicate that there are three important wine guides, normally used by consumers to assess the quality and reputation of wines and used also by retailers, who place them on the sales displays together with the price of the wine and the rating in one of these guides. In this market these guides help the consumers’ decision to purchase and influence pricing of the wines.
Here in Brazil there are no wine guides, only some Internet sites or some specialized magazines where some vintages of a given type of wine or vintage from a specific country are sporadically analyzed.

In this section of the paper, it is noteworthy to state that wines in Brazil are sold in two levels of quality:

1. Table Wine: an inferior wine, made from the common varieties of grapes: (Concord, Herbemont, Isabel, Willard, Niagara, among others);
2. Fine Table Wine: a differentiated table wine, made from noble grape varieties Cabernet Sauvignon, Cabernet Franc, Malbec, Merlot, Chardonnay, Sauvignon Blanc, among others), from the European species (Vitis vinifera).

Therefore, when the authors mention fine wines, one is only dealing with superior quality wines. Thus, we shall in this first study analyze only the objective characteristics found on labels of fine wines in Brazil. These characteristics can be subdivided into the following categories:

- Producing Country: the most representative countries in the sales of fine wines on the Brazilian market are: Chile, Argentina and Brazil;
- Vintage: the year the wine was made and here are taken into account the 1999, 2000, 2001, 2002, 2003 and 2004 vintages;
- Variety of grape, there are varieties for red and white wines. The noble red vinicultures most produced in the regions analyzed are: Cabernet Sauvignon, Malbec, Merlot, Syrah, Carmenère, Tannat, Pinot Noir, Tempranillo, Cabernet Franc and Bonarda. The white vinicultures are: Chardonnay, Sauvignon Blanc, Riesling, Torrontés and Gewürztraminer;
- Producing regions and in this item an explanation on the region of each country is required:

1 – Brazil: Rio Grande do Sul concentrates approximately 93% of the country’s viniculture including the best Brazilian vineyards. Most are locat-
ed in the Gaucha mountain range where the cities of Bento Gonçalves, Garibaldi and Caxias do Sul are found. Other regions of the state also have vineyards, but of lesser importance. Another Brazilian region that has become prominent in the last years is the Valley of the São Francisco River in the state of Bahia, especially near the city of Santa Maria da Boa Vista, however this entire production is transported to the companies in Rio Grande do Sul for processing;

2 – Argentina: the most important producing region of Argentina is Mendoza (Centre), which produces 75% of the total of wines in the country and 85% of the quality wines. The North region, encompassing Jujuy, Salta, Rioja and San Juan, produces 18% of this country’s production and the Southern region, Neuquén and Rio Negro, has the smallest production;

3 – Chile: the leading Chilean winegrowing regions are in the river valleys and the most important area of the country is in the Central region: Valle del Maipo, Valle del Rapel, Valle del Curicó and Valle del Maule. The second ranking region in Chile is in the North, Valle del Coquimbo, Valle del Aconcagua and Valle de Casa Blanca. The less prestigious region is in the South, divided into Valle Itata and Valle Bío-Bío.

This classification of wine characteristics provides a structure for the subsequent analyses. These studies and the empirical evidences analyzed suggest the following hedonic function for wines:

Price of wines = f (objective characteristics)

Rosen (1974) formalized the structural interpretation of the hedonic method. He states that heterogeneous products are assessed according to the utility of their attributes or characteristics wherein the hedonic price is an implicit price of each attribute associated with the product. Each characteristic contributes to the value of the product but cannot be sold or traded individually.

In Rosen’s interpretation, the price paid for a given product is the sum of the implicit prices that the market assesses for the different characteristics associated to this product. Therefore, with the prices practiced for the products and their attributes it is possible, using econometric analysis, to
ascertain the relative importance that each attribute has in the make-up of this product’s total price.

The model has some limitations related to the suppositions that there is equilibrium in the whole market and that there is no inter-relation among the prices of each of the explicative variables corresponding to the attributes (Ekeland; Heckman; Nesheim, 2002). As such the implicit price of an additional attribute is treated as identical in all areas and all types of heterogeneous products. Notwithstanding these limitations the technique has been used in many analyses of the wine market.

3. Data and specifications of the hedonic function
Econometric problems faced in the estimate of a hedonic function are those common to econometric work. As stressed by Mason and Quiley *apud* Unwin (1999) the success of models of Hedonic prices depend essentially on the appropriated choice of the variables as well as the correct specification of the function’s form.

For many durable goods defining an appropriate set of variables is relatively easy, but for food and beverage this is not an objective task. For instance, with computers, velocity, memory and functions of the product and the peripherals are easily identified and a regression of the variables related to the price can easily be performed. However for products with limited consumer information or when the principal attributes are not physically displayed, definition of the attributes appropriate for the hedonic function is not easily obtained.

When a consumer purchases a wine for the first time, in general he does not have much of an idea of the sensorial characteristics of the wine and his choice is initially directed to the so-called objective criteria, instead of the sensorial variables assessed by a jury of specialists (Unwin, 1999). Combris et al. (1997) concluded, “This suggests that the price of wine is primarily set according to the objective characteristics on the bottle, for instance, those that are easily identified and perceived in the same way by all consumers.

Other evidence also cited by Unwin (1999) is that utilization of wine guides to generate independent variables used in the building of hedonic price models is rather difficult.
A model was formulated assuming that consumers, unsure about the true quality of a particular wine, change their intention to pay a given price for the product by using the information found on labels of fine wines sold in Brazil such as country of origin, vintage, variety of grape and producing region.

Characteristics related to alcohol strength were not considered in this study albeit included in other articles (Angulo et al., 2000; Steiner, 2004), as they have no statistical significance. Also not included is the bottle size because in the three countries analyzed, the standard size is 750 ml, which is the only size used in the sampling and the wine producers of which there are more than three hundred in South America. All this makes the division rather difficult.

The most diverse functional forms are reported in literature for this function: linear, quadratic, logarithmic, semi-logarithmic and many others. In this study the semi-logarithmic form was used because many of the variables are *dummies* making the definition of the natural logarithm of zero impossible.

In this article the logarithm of the price of wines is used as dependent variable and the independent variables are information on the product label. The latter were collected by researchers in three large hypermarkets and two supermarkets specialized in the sale of imported products offering a wide variety of wines on their shelves.

The total sample of 229 wines was subdivided as follows: 54 Brazilian, 98 Argentinean, and 78 Chilean. The highest price compiled was R$68,00 and the lowest was R$ 9,00 with an overall average of R$ 26,00 per bottle.

Since the semi-logarithmic form was adopted for the specification and the dependent variable is the logarithm of the price marked, coefficients resulting from regression may be interpreted as an estimated percentage change of the value to a unitary change in a particular attribute (Griliches, 1971). Therefore the partial derivative of these hedonic regressions, regarding a given attribute, describes a marginal change in the total assessment, associated to a change in one of the characteristics while maintaining the others constant (Linneman (1980) *apud* Fávero, 2003).
The model was specified based upon the method proposed by Rosen (1974) and expressed as:

$$\log P = \beta_0 + \beta_1 \cdot \text{COUNTRY}_1 + \beta_2 \cdot \text{COUNTRY}_2 + \beta_3 \cdot \text{VIN}_1 + \beta_4 \cdot \text{VIN}_2 + \beta_5 \cdot \text{VIN}_3 + \beta_6 \cdot \text{VIN}_4 + \beta_7 \cdot \text{VIN}_5 + \beta_8 \cdot \text{VARI}_1 + \beta_9 \cdot \text{VARI}_2 + \beta_{10} \cdot \text{VARI}_3 + \beta_{11} \cdot \text{VARI}_4 + \beta_{12} \cdot \text{VARI}_5 + \beta_{13} \cdot \text{VARI}_6 + \beta_{14} \cdot \text{VARI}_7 + \beta_{15} \cdot \text{VARI}_8 + \beta_{16} \cdot \text{REG}_1 + \beta_{17} \cdot \text{REG}_2 + \beta_{18} \cdot \text{REG}_3 + \beta_{19} \cdot \text{REG}_4 + e$$

Where:

- $P$: retail price of the wine
- $\text{COUNTRY}_1$ and $\text{COUNTRY}_2$: Producing Country
- $\text{VIN}_1$, $\text{VIN}_2$, $\text{VIN}_3$, $\text{VIN}_4$, $\text{VIN}_5$: Vintage
- $\text{VARI}_1$, $\text{VARI}_2$, $\text{VARI}_3$, $\text{VARI}_4$, $\text{VARI}_5$, $\text{VARI}_6$, $\text{VARI}_7$, $\text{VARI}_8$: Variety of Grapes
- $\text{REG}_1$, $\text{REG}_2$, $\text{REG}_3$, $\text{REG}_4$: Growing region
- $e$: variable related to error

The model utilized in this study is estimated using regression analysis of the prices of wines offered in retail sales. The independent variables will be treated as dummy variables in the binary code where the value 1 indicates the presence of a given attribute and the value 0 indicates its absence. In this article a total of 4 variables were used and the details are explained below.

The vintages used were those in the sample. Due to the large variety of white and red grapes, the authors made a survey with associations of sommeliers and specialized magazines to ascertain those most frequently grown in the countries in question.

The varieties were subdivided as follows:

**White Grapes:**
- Chardonnay
- Sauvignon Blanc
- Riesling
- Other White Grapes
Red Grapes
• Cabernet Sauvignon
• Malbec
• Merlot
• Syrah
• Other Red Grapes

The growing regions were subdivided according to their importance in each producing country. Therefore in Brazil there is only one region, in Argentina there are the Central and North/South regions and in Chile there are the Central and also the North/South regions.

Table 1. Definitions of hedonic variables

<table>
<thead>
<tr>
<th>VARIABLE COUNTRY₁ and COUNTRY₂</th>
<th>DEFINITION OF THE VARIABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producing Country:</td>
<td></td>
</tr>
<tr>
<td>- Chile:</td>
<td>COUNTRY₁ = 0 COUNTRY₂ = 0</td>
</tr>
<tr>
<td>- Argentina:</td>
<td>COUNTRY₁ = 1 COUNTRY₂ = 0</td>
</tr>
<tr>
<td>- Brazil:</td>
<td>COUNTRY₁ = 0 COUNTRY₂ = 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VIN₁, VIN₂, VIN₃, VIN₄, VIN₅</th>
<th>VINTAGE:</th>
</tr>
</thead>
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<tr>
<td>-1999:</td>
<td>VIN₁ = 0, VIN₂ = 0, VIN₃ = 0, VIN₄ = 0, VIN₅ = 0</td>
</tr>
<tr>
<td>-2000:</td>
<td>VIN₁ = 1, VIN₂ = 0, VIN₃ = 0, VIN₄ = 0, VIN₅ = 0</td>
</tr>
<tr>
<td>-2001:</td>
<td>VIN₁ = 0, VIN₂ = 1, VIN₃ = 0, VIN₄ = 0, VIN₅ = 0</td>
</tr>
<tr>
<td>-2002:</td>
<td>VIN₁ = 0, VIN₂ = 0, VIN₃ = 1, VIN₄ = 0, VIN₅ = 0</td>
</tr>
<tr>
<td>-2003:</td>
<td>VIN₁ = 0, VIN₂ = 0, VIN₃ = 0, VIN₄ = 1, VIN₅ = 0</td>
</tr>
<tr>
<td>-2004:</td>
<td>VIN₁ = 0, VIN₂ = 0, VIN₃ = 0, VIN₄ = 0, VIN₅ = 1</td>
</tr>
<tr>
<td>VARI$_1$, VARI$_2$, VARI$_3$, VARI$_4$,</td>
<td>VARIETY of grape</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| VARI$_5$, VARI$_6$, VARI$_7$, VARI$_8$, | -Chardonnay:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 0,  
| VARI$_5$ = 0, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Sauvignon Blanc:  
| VARI$_1$ = 1, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 0,  
| VARI$_5$ = 0, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Riesling:  
| VARI$_1$ = 0, VARI$_2$ = 1, VARI$_3$ = 0, VARI$_4$ = 0,  
| VARI$_5$ = 0, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Other White Grapes:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 1, VARI$_4$ = 0,  
| VARI$_5$ = 0, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Cabernet Sauvignon:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 1,  
| VARI$_5$ = 0, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Malbec:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 0,  
| VARI$_5$ = 1, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Merlot:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 0,  
| VARI$_5$ = 0, VARI$_6$ = 1, VARI$_7$ = 0, VARI$_8$ = 0 |  
| -Syrah:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 0,  
| VARI$_5$ = 0, VARI$_6$ = 1, VARI$_7$ = 1, VARI$_8$ = 0 |  
| -Other Red Grapes:  
| VARI$_1$ = 0, VARI$_2$ = 0, VARI$_3$ = 0, VARI$_4$ = 0,  
<p>| VARI$_5$ = 0, VARI$_6$ = 0, VARI$_7$ = 0, VARI$_8$ = 1 |</p>
<table>
<thead>
<tr>
<th>REG$_1$, REG$_2$, REG$_3$, REG$_4$,</th>
<th>Producing region</th>
</tr>
</thead>
</table>
| REG$_5$, REG$_6$, REG$_7$, REG$_8$, | -Central Region - Chile:  
| REG$_1$ = 0, REG$_2$ = 0, REG$_3$ = 0, REG$_4$ = 0 |  
| -North/South Region - Chile:  
| REG$_1$ = 1, REG$_2$ = 0, REG$_3$ = 0, REG$_4$ = 0 |  
| -Central Region - Argentina:  
| REG$_1$ = 0, REG$_2$ = 1, REG$_3$ = 0, REG$_4$ = 0 |  

Table 1. Continued
4. Presentation of the Empiric Results

The results of regressions for the semi-logarithm model proposed for this study are now presented. The analysis of hedonic estimates allows determining if the model is adequate and also, making sure that the data collected provides sufficient information for the necessary estimates. Finally, the coefficients obtained will be analyzed to establish the attributes that most influence the price of wines in the sample under study.

According to Vasconcellos and Alves (2000) verifications must be made regarding autocorrelations of residuals, of heterocedasticity and of multicollinearity in the regression analyses.

Initially the existence of problems related to the autocorrelation of residuals was verified to achieve a better specification of the model. The utilization of the Durbin-Watson test, however, did not disclose the existence of autocorrelation between residuals. Next, the Glejser test was applied to check for presence of heterocedasticity. Results disclose that the problem of heterocedasticity was not found indicating that in regression there is no significant relation between the random term and each one of the independent variables.

Finally, the coefficients of simple correlation between each pair of explanatory variables did not disclose multicollinearity problems.

Results of regressions were as follows:

### Table 1. Continued

<table>
<thead>
<tr>
<th>Region - Argentina:</th>
<th>REG1 = 0, REG2 = 0, REG3 = 1, REG4 = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region - Brazil:</td>
<td>REG1 = 0, REG2 = 0, REG3 = 0, REG4 = 1</td>
</tr>
</tbody>
</table>
Table 2. Results of regressions for the semi-logarithmic model:

<table>
<thead>
<tr>
<th>Attribute Variable</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUNTRY₁</td>
<td></td>
</tr>
<tr>
<td>COUNTRY₂</td>
<td>- 0.362**</td>
</tr>
<tr>
<td>VIN₁</td>
<td></td>
</tr>
<tr>
<td>VIN₂</td>
<td></td>
</tr>
<tr>
<td>VIN₃</td>
<td></td>
</tr>
<tr>
<td>VIN₄</td>
<td>- 0.174**</td>
</tr>
<tr>
<td>VIN₅</td>
<td></td>
</tr>
<tr>
<td>VARI₁</td>
<td>- 0.138**</td>
</tr>
<tr>
<td>VARI₂</td>
<td></td>
</tr>
<tr>
<td>VARI₃</td>
<td>- 0.124**</td>
</tr>
<tr>
<td>VARI₄</td>
<td></td>
</tr>
<tr>
<td>VARI₅</td>
<td></td>
</tr>
<tr>
<td>VARI₆</td>
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</tr>
<tr>
<td>VARI₇</td>
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</tr>
<tr>
<td>VARI₈</td>
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</tr>
<tr>
<td>REG₁</td>
<td></td>
</tr>
<tr>
<td>REG₂</td>
<td></td>
</tr>
<tr>
<td>REG₃</td>
<td>- 0.111*</td>
</tr>
<tr>
<td>REG₄</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.202</td>
</tr>
<tr>
<td>R² adjusted</td>
<td>0.184</td>
</tr>
<tr>
<td>F</td>
<td>11.267</td>
</tr>
<tr>
<td>Prob. (Stat.F)</td>
<td>0.000</td>
</tr>
<tr>
<td>N</td>
<td>229</td>
</tr>
</tbody>
</table>

OBS: The blank cells refer to the non-existence of statistical significance at a level of 10% for the hedonic variable.
* indicates a significance level of 0.10
** indicates a significance level of 0.05
N is the number of the sample
Analysis of the statistics of tests “t” and “F” shown in table 2 allows the assertion of the significance of the parameters and of the model utilized in this study. A survey of the coefficients of regressions stresses some characteristics that impact the prices of Brazilian, Argentinian and Chilean wines sold in Brazil. As expected, Brazilian wines are negatively assessed by consumers in relation to the wines produced in the other two countries. This points to the fact that consumers are willing to pay more for Chilean and Argentinian wines because they consider local wines to be of inferior quality.

In the sample analyzed, the 2003 vintage has a negative impact on the price of wines. The authors checked with a sommelier if there had been any problem regarding the wines produced in that year, but were unable to identify the reason for this negative assessment.

Negative coefficients for white wines apparently disclose that white wines are not so well evaluated as red ones and among the analyzed regions, the North of Argentina is not considered to be a region that produces good wines.

5. Conclusions

The purpose of this article is to confirm if the characteristics printed on the labels of fine wines sold on the Brazilian market, specifically those made in Argentina, Chile and Brazil influence the price presented to the consumer. A series of studies had been carried out in Australia, France and England, along this same line of research, which reached satisfactory results. To the authors’ knowledge, this is the first study of this nature in Brazil and therefore results must frequently be assessed and validated. Such a measure could also lead to the creation of hedonic indices of wine prices, which could support the making of price policies by private agents, as well as establish control plans and targets of the market prices by government agents aiming to create sustainability in face of the competition and consumer protection in view of eventual abusive price increases.

The study analyzed a sample of 229 wines and results pointed out that the characteristics that most influence prices of these wines were the producing country and the variety of grape. However, conclusions must take
into account factors already studied by other authors in various countries. According to Charters et al. (1999) design of the bottle and label are elements that influence the personal choice at the moment of purchasing the wine, above all when it is bought for the first time. After the initial purchase, the content of the bottle and the price-quality ratio are dominant factors for the next purchase. Thus, the factor that may be analyzed in future research refers to the evaluation made by consumers in the repeated purchases of the same product. Furthermore, future research may analyze, for instance, which is the influence of retail employees in the wine sections regarding the purchase process, as well as the relation with the price made available to consumers. The subject is really ample and important as already mentioned, for the assessment of the impact of given attributes in differentiated products as well as to establish strategies and trends of private organizations’ performance and for the formulation of public policies by government agents.

References


