

## How do consumers use signals to assess wine quality ?

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### Abstract

In this article, we analyse the way some 6,000 European wine consumers use, according to their type (connoisseurs versus non-connoisseurs), a set of available signals (price, regional umbrella, goodwill, past consumption) to assess the quality of Bordeaux wines.

From the empirical analysis, we learn that (i) Price -not the umbrella “Bordeaux”- is the main signal used by both types of consumers, (ii) Price is a substitute for umbrella for non-connoisseurs who seem to use it all the more that their knowledge of the umbrella Bordeaux is quite limited.

Our results suggest that : (i) connoisseurs are aware that Bordeaux as an umbrella is not a relevant quality signal or that it fails to reveal a too heterogenous level of quality, (ii) non connoisseurs have a limited knowledge of the umbrella Bordeaux to be able to use it more frequently to infer quality.

This paper, by pointing out the weakness of the Umbrella Bordeaux helps to understand why Bordeaux wines tend nowadays to lose market shares in favour of more easily recognizable wines produced by new-world winegrowers whose strategy is based on a more efficient and simpler communication (brand plus type of grape).

**Key Words :** Signals of quality, perceived quality, Bordeaux wines.

**JEL Codes :** D12, L15, L66

## 1. Introduction

In this article, we analyse the way some 6,000 European wine consumers use, according to their type (connoisseurs versus non-connoisseurs), a set of available signals (price, umbrella, goodwill, past consumption) to assess the quality of Bordeaux wines, a good particularly difficult to assess.

How do consumers assess quality when information is costly to acquire, when a good is mostly made of what economists call experience and credence characteristics, that is to say characteristics that are respectively discovered or not after the product has been consumed ? The question is relevant from the marketing point of view, but also from an economic one. In a seminal article, Akerlof (1970) has shown that the consumer refuses the exchange if he is not able to assess the quality of the good supplied ; in such a situation, the market collapses. Thus the assessment of quality is central to ensure the smooth running of the market.

To induce consumers to try their product, producers of complex goods use quality signals, such as price, advertising, warranty, brand, etc. (for a detailed review of this literature, see Kirmani and Rao, 2000). According to the economic theory of signal, the cost of signalling for the producer assures consumers that the good supplied is of high quality (see Spence, 1973, and Nelson, 1974, among others). Then repeat purchases offset the initial expenditure of signalling. The commitment to quality is proportional to the cost of signalling (Ippolito, 1990). An important empirical literature has examined the correlation between quality signals and objective measures of quality such as those assessed by experts or released by Consumer Reports (see for instance Gerstner, 1985 in the case of price ; Caves and Greene, 1996 and Thomas et al., 1998 in the case of advertising). The relationship between signals and objective quality is not systematically proved.

Quality signals are supposed to contribute to the quality perceived by the consumer, defined by Zeithaml (1988, p. 3) as “the consumer’s judgment about a product’s overall excellence or superiority”. But quality signals are they systematically used by consumers to infer quality ? Empirical research on this issue is prolific. Nevertheless, available studies point in different directions (see Rao and Monroe, 1988 for a review). Moreover, theoretical prescriptions concerning the way signals influence perceived quality are not always matched : Kirmani (1990, 1997) shows that in the case of advertising, excessive expenditure suggest to the consumer that the firm is desperate. In that case the relationship between advertising expenditure and perceived quality exhibits an inverted U-shape. Jones and Hudson (1996) also show that price does not systematically act as a signal, but has a dual role. In particular, there is a critical price above (below) which price is used (not used) as a quality signal.

Regarding wines, consumers mainly rely on the label to infer quality (Gluckman, 1990). Price (Lockshin and Rhodus, 1993) and awards (Orth and Krška, 2002) also act as quality signals in the consumers’ mind. Nevertheless, the way these information sources are used is not clear. Moreover, empirical research on consumer responses to multiple signals is sparse. Indeed, the way these signals are combined by the consumer to infer quality remains unclear.

The determination of factors that affect the use of signals to infer quality is addressed here in a multi-signal setting : price, umbrella impact, goodwill and past consumption. Price is quite a classical signal (see for instance Bagwell and Riordan, 1991). Umbrella impact refers to umbrella branding, defined by Montgomery and Wernerfelt (1992) as the use of the same

brand name on several products. Umbrella branding as a quality signal has been analyzed by Wernerfelt (1988) among others. The umbrella can also refer to collective reputation phenomenon (Cabral, 2000). Hence, regional products, such as Bordeaux wines, often share a collective reputation (Winfrey and McCluskey, 2005). Past consumption may not be seen as being a signal sent by the producer given that it is not costly to produce. Nevertheless, it refers to experience with the product and is considered here as a potential source of information for the consumer.

To contribute to better understand the way consumers combine these signals (as substitutes or complements), we analyse in what follows the intensity with which they use the price (the main signal here) in function of several factors : consumer's knowledge in wine (connoisseur versus non-connoisseur), country of origin (a proxy for cultural differences) and the intensity with which they use the other available signals such as the umbrella or collective brand name, the goodwill, and their past experience through past consumption. The intensities used in this application have been estimated as in a previous paper by Gergaud and Livat (2005) concerning the interactions between the collective and individual reputations of Bordeaux wines.

The article is organised as follows :

Section 2 presents the theoretical and empirical background as far as signal use by the consumer is concerned ; section 3 provides details on the empirical strategy used ; section 4 presents the econometric analysis ; section 5 concludes.

## **2. Signal use : theoretical and empirical background**

In this section we do not consider how producers use in a strategic way the price and the umbrella as quality signals, widely analysed by the empirical economic literature, but how these signals are used and combined by consumers to imagine a quality for a complex product. Economic, marketing/consumer and psychological literature are useful on this topic.

Are quality signals used in the same way by every consumer ? In other terms, what can influence the way consumers use available information on quality ? Two main factors emerge : culture and the level of knowledge of the product.

Psychologists show that cultural norms and beliefs are powerful forces shaping consumer's perceptions, dispositions and behavior (Triandis, 1989 ; Markus and Kitayama, 1991). For Hofstede (2001), the four dimensions of culture are the individualism/collectivism dimension, uncertainty avoidance, the masculinity dimension and power distance. Members of individualist cultures give importance to their own well being and are favorable towards differentiation and uniqueness. On the opposite, members of collectivistic cultures are inserted in a social network and more favorable towards building relationships. The individualism/collectivism dimension is widely employed in cross-cultural consumer behavior research (see Kim et al., 1994, for instance). Uncertainty avoidance refers to the extent to which people feel uncomfortable in the presence of vagueness and ambiguity. The masculinity dimension indicates the degree to which a culture value assertiveness, achievement, and the acquisition of wealth. Power distance is the extent to which people accept that power is distributed inequally and is related to conservatism and maintaining the status quo. Hence, culture must be viewed as an important factor in international marketing (Usunier, 2000 ; Hofstede, 2001).

The universality of the signal theory is discussed at the empirical level. Dawar and Parker (1994) have shown that variations in signal use are independent from cultural factors and more probably explained by personal differences, such as preference for information search or attitude towards risk. On the opposite, for Erevelles et al. (2001), signal use, in the case of services, is determined by cultural factors.

Knowledge can be viewed as a personal factor acting upon the assessment of quality. For Alba and Hutchinson (1987), consumer knowledge has two components : familiarity, which is defined as the number of product-related experiences accumulated by a consumer, and expertise, which is the ability to perform product-related tasks successfully. On the first hand, knowledge modifies the types of information used as well as information processing (Bettman and Park, 1980 ; Johnson and Russo, 1984 ; Brucks, 1985). As a consequence, connoisseurs are able to use relevant information only. On the second hand, knowledge influences signal use. Distinguishing extrinsic cues (not physically related to the product, such as brand or price) from intrinsic ones (physically related to the product, such as size or color)<sup>1</sup>, Rao and Monroe (1988) provide a theoretical analysis of the influence of knowledge on the use of signals to infer quality : A low-connoisseur consumer uses extrinsic signals such as price to assess quality ; when the consumer achieves a moderate level of knowledge, he is more able to examine intrinsic information and reliance on extrinsic cues decreases ; then a connoisseur has acquired the ability to diagnose if the extrinsic cue is truly correlated to quality. In such a way, for a product exhibiting an actual price-quality association in the marketplace, the tendency to use price as an indicator of quality decreases and then increases with knowledge (U-shaped curve). In other terms, « low-familiar consumers are more likely to use extrinsic information based on their *belief* that a quality-extrinsic cue relationship exists in the marketplace. [...] [H]ighly familiar consumers use extrinsic information based on their *knowledge* that a quality-extrinsic cue association exists in the marketplace » (Rao and Monroe, 1988, p. 262). Reciprocally, we can expect that when an extrinsic cue is not correlated with quality in the marketplace, the use of such a signal decreases with knowledge in favour of intrinsic signals ; thus, with consumer knowledge improvement, intrinsic cues become a substitute for extrinsic ones. This analysis is consistent with the idea developed earlier by Scitovszky (1945), for whom the use of price as a quality signal corresponds to a rational behavior and reflects learning about price-quality correlations established in the marketplace.

Empirical evidence tend to support the idea of signal use as a function of the consumer's degree of knowledge. Jacoby et al. (1971) suggest that consumer knowledge may mediate the effect of price on perceived quality. While novices rely on product characteristics (i.e. intrinsic cues), experts use signals such as the brand (Bettman and Park, 1980). In the case of wine, the price is used by novices to infer quality (Lockshin and Rhodus, 1993), while brands are perceived differently according to the individual level of wine knowledge (Lockshin et al., 2000).

Given these different elements, two hypothesis can be formulated :

H<sub>1</sub> : all the quality signals are not systematically used by all the consumers

H<sub>2</sub> : signals can interact in the assessment of quality

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<sup>1</sup> More generally, intrinsic cues can be viewed as physical attributes of the products. In this sense, they are not precisely quality signals as suggested by the economic theory.

### 3. Empirical strategy

#### 3.1. The data

The data are generated in the same way as in a previous study by Gergaud and Livat (2005) who assess the interactions existing between individual and collective reputations in the case of Bordeaux wines.

The data used for this previous study are private survey data, collected in 2001 by *Sociovision* for the *Conseil Interprofessionnel du Vin de Bordeaux* in seven European countries : Belgium (1028 wine consumers), Denmark (613 wine consumers), Germany (1133 wine consumers), France (819 wine consumers), The Netherlands (1258 wine consumers), Switzerland (584 wine consumers), United-Kingdom (959 wine consumers). As a whole, 6394 wine consumers<sup>2</sup> have been surveyed about the perceived quality of Bordeaux wines in general (the umbrella here), and a set of nine individual appellations under this umbrella : Saint-Emilion, Bordeaux Supérieur, Sauternes, Médoc, Graves, Margaux, Premières Côtes de Bordeaux, Entre-Deux-Mers and Côtes de Bourg. The perceived quality for a given wine (either Bordeaux wines in general or an individual appellation) is a dummy variable which takes the value 1 if the consumer declares that the wine is a high quality one, 0 otherwise (henceforth perceived quality).

The survey also contains some socio-economic characteristics such as gender, age, socio-economic category. It gives the level of knowledge regarding wine in general (connoisseur -1- vs. non-connoisseur -0) as declared by the consumers themselves, indicates whether or not they know the wine (goodwill), whether or not they perceive it as “expensive” (henceforth perceived price), and whether or not the wine has been tasted during the 12 months preceding the survey (henceforth past consumption). For goodwill, perceived price and past consumption, the variable is 1 in the affirmative, 0 otherwise. Table 1 presents some sample characteristics, table 2 the opinion of consumers and their past consumption regarding Bordeaux wines and each appellation.

**Table 1: Sample characteristics**

	Mean Proportion (in %)
Age	46.2
Women	51.21
<i>Socio-professional category:</i>	
Upper-class	21.63
Middle-class	60.65
Lower-class	17.18
No answer	0.54
<i>Knowledge in wine:*</i>	
Connoisseurs	32.14
Non-connoisseur	67.03
No opinion	0.82

\* As perceived by consumers themselves.

<sup>2</sup> In this survey, wine consumers drink wine at least once a quarter.

**Table 2 : Consumers opinion and past consumption (%)**

<b>Appellation</b>	<b>Goodwill</b>	<b>Perceived quality</b>	<b>Perceived price</b>	<b>Past consumption</b>
<i>Regional (Umbrella) :</i>				
Bordeaux	33.95	50.08	38.24	23.55
<i>Generic :</i>				
Bordeaux Supérieur	2.74	25.21	29.29	10.15
<i>Sub-regional :</i>				
Entre-deux-mers	2.6	7.65	11.2	7.77
Médoc	3.63	21.14	20.3	18.63
Graves	3.52	19.32	19.87	7.6
<i>Local/village :</i>				
Saint-Emilion	10.12	25.6	29.62	20.55
Margaux	3.14	19.21	26.1	5.86
Côtes de Bourg	2.08	7.57	6.96	4.72
Premières Côtes de Bordeaux	1.58	13.85	17.45	4.69
Sauternes	4.1	23.02	32.36	11.23

Gergaud and Livat (2005) estimate a series of 43 models for the perceived quality of each Bordeaux sub-appellation ( $q_{appell.i}^c$ ) using a bivariate probit procedure<sup>3</sup>, and treating the perceived quality of the umbrella “Bordeaux” ( $q_{umbrella}^c$ ) as a right-hand side endogenous variable. The model is made of two equations. A structural one explicitly refers to the perceived quality of appellation  $i$  (equation 1). A second one allows to take into account the endogeneity of the umbrella perceived quality thanks to some instrumental variables (equation 2). Gergaud and Livat (2005) use the perceived quality of some other famous French viticultural area such as Burgundy, Languedoc-Roussillon, Alsace, Loire as instruments for Bordeaux’ perceived quality. These variables have –given their status of regional appellation– a potential and natural link with the umbrella Bordeaux while they are expected to have no link with some Bordeaux’ sub-appellations, namely Saint-Emilion, Margaux, etc.

Each structural equation allows to assess, among others, the impact of the following variables on the perceived quality of each appellation under this umbrella (see Equations 1 and 2 below for an example) :

1. Umbrella Bordeaux’ perceived quality (collective reputation impact),
2. Perceived price (item “expensive”),
3. Goodwill,
4. Past consumption.

Perceived price, goodwill and past consumption are assumed to be exogenous variables (vector X).

<sup>3</sup> See Gergaud and Livat (2005) for a more detailed description of the procedure.

$$\begin{cases} q_{\text{appell. } i}^e = \alpha_1 + X \beta_1 + \chi_1 q_{\text{umbrella}}^e + u_{i1} & (1) \\ q_{\text{umbrella}}^e = \delta_2 + X \phi_2 + \text{Instruments } \varphi_2 + u_{i2} & (2) \end{cases}$$

Equations (1) and (2) are estimated simultaneously. This empirical analysis is reproduced here on two distinct sub-samples : connoisseurs and non-connoisseurs<sup>4</sup>. The calculations were run country by country and appellation by appellation as well. A total of 67 systems of the above type are estimated. By doing so, we get per calculation a series of impacts on perceived quality from three different signals contained in vector X (perceived price, goodwill and past consumption, measured by  $\chi_1$ ) and from the umbrella perceived quality (measured by  $\beta_1$ ). Together, these estimated coefficients form a new database of 67 observations used thereafter to model the intensity with which consumers use the different available signals. We run the following econometric analysis on the z-stats instead of the estimated coefficients to take into account both the coefficient and its magnitude. A plot of the estimated coefficients on the first hand and of their associated z-stat on the second hand has the same appearance in both cases.

### 3.2. The information used to infer quality : some descriptive statistics

The previous calculations give information on the intensity with which the umbrella “Bordeaux” and some other signals (perceived price, goodwill and past consumption) are used by the consumer to infer a quality for a set of wines produced in the Bordeaux region (individual appellations). Table 3 summarizes the way each type of information-signal is used on average :

**Table 3 : The information used to infer quality (%)**

Source of information	Non-significant impact	Significant* impact	Significant* and positive impact	Significant* and negative impact
Price	2.33	97.67	97.67	0
Umbrella	59.51	40.49	27.38	13.1
Past consumption	61.97	38.03	38.03	0
Goodwill	75.71	24.29	22.86	1.43

\* % of significant  $\beta_1$  and  $\chi_1$  coefficients (at 10%) in the perceived quality equations (1).

Price is the main source of information, followed by the umbrella, past consumption and goodwill. Consumers use almost systematically (nearly at 100%) what they think about the price to infer the quality in the case of Bordeaux wines. Except in the case of the umbrella, most of the coefficients that we get are positive. Table 4 highlights some differences between connoisseurs and non-connoisseurs regarding signal use.

<sup>4</sup> The detailed results are not reported here but are available from the authors upon request.

**Table 4 : The information used  
 by connoisseurs and non-connoisseurs**

Source of information	% of significant $\beta_1$ and $\chi_1$ coefficients (at 10%) in the perceived quality equations (1)	
	Connoisseurs	Non-connoisseurs
Average	49.6	50.5
1. Price	95.35	100
2. Umbrella	48.78	32.56
3. Past consumption	31.43	44.44
4. Goodwill	23.53	25

Connoisseurs use, on average, as many signals as non-connoisseurs (at around 50%). The price is intensively used by both types, contrary to the other signals which are used differently. Connoisseurs rely more on the umbrella “Bordeaux” than non-connoisseurs do, which is not surprising given that the former have a better knowledge of Bordeaux wines than the latter. On the opposite, non-connoisseurs base more intensively their quality opinions on their past experiences (past consumption). The difference concerning the use of goodwill is rather negligible between both types. Let’s also remark that the umbrella use rate is only about 50% for connoisseurs and nearly one-third for non-connoisseurs. This suggests that : (i) connoisseurs are aware that Bordeaux as an umbrella is not a relevant quality signal or that it fails to reveal a too heterogenous level of quality, (ii) non connoisseurs have a limited knowledge of the umbrella Bordeaux to be able to use it more frequently to infer quality.

Tables 5 and 6 present -for both types of consumers respectively- probabilities for two given signals to be used jointly.

**Table 5 : Joint probabilities for connoisseurs**

	Umbrella	Price	Goodwill	Past Consumption
Umbrella	-	48.78	9.38	15.15
Price	-	-	23.53	31.43
Goodwill	-	-	-	6.06
Past consumption	-	-	-	-

% of significant  $\beta_1$  and  $\chi_1$  coefficients (at 10%) in the perceived quality equations (1)



**Table 6 : Joint probabilities for non-connoisseurs**

	Umbrella	Price	Goodwill	Past Consumption
Umbrella	-	32.56	5.56	13.89
Price	-	-	25	44.44
Goodwill	-	-	-	5.56
Past consumption	-	-	-	-

% of significant  $\beta_1$  and  $\chi_1$  coefficients (at 10%) in the perceived quality equations (1)

Price, the main signal, is quite frequently combined with umbrella and past consumption (resp. 48.78% and 31.43%) by connoisseurs and with past consumption and umbrella (resp. 44.44% and 32.56%) by non-connoisseurs. Price and goodwill are also associated in almost a quarter of the cases : 23.53% for connoisseurs and 25% for non-connoisseurs.

To learn more about the way these signals are combined by consumers, to know whether these signals are used either independently of one another or as substitutes or complements, we regress in the next section the intensity with which price as a quality signal is used by consumers as a function of the other intensities concerning umbrella, past consumption and goodwill.

#### 4. Econometric analysis

In this section, we regress the fact of using more or less intensively the price (dependant variable) as a quality signal to imagine a quality for Bordeaux wines on the fact of using more or less intensively some other available signals.

The econometric analysis employs variables which have been themselves estimated previously with equation (1), thanks to the model presented above, what can causes heteroskedasticity problems. If solely the dependant variable is an estimated one, the problem seems not very serious (Wooldridge, 2002, p. 71). It is more problematic when the regressors are also estimated variables : the standard errors must be corrected to make valid statistical inference. Gawande (1997), for instance, proposes to model generated regressors as variables measured with error. For Im and Lee (2003), the problem diminishes as the first-stage sample size increases. The sample used here to estimate equations (1) and (2) is quite large.

We control here for potential differences that could arise due to international and cultural differences by introducing in the regressions a set of country dummies. A binary variable is also introduced to differentiate connoisseurs and non-connoisseurs.

In this framework, a coefficient with a positive (negative) sign suggests that price and the considered signal are complements (substitutes). Non-significant coefficients indicate that the signals are used independently of one another. Table 7 presents the results for three equations estimated from : (1) the full sample, (2) the connoisseurs sub-sample and (3) the non-connoisseurs sub-sample.

**Table 7 : Intensity with which consumers use price to infer quality**

	Full sample	Connoisseurs sub-sample	Non-connoisseurs sub-sample
Connoisseur	-1.064 (2.58)*	dropped -	dropped -
Signals <sup>5</sup> :			
Umbrella	0.011 (0.25)	0.034 (0.70)	-0.225 (2.50)*
Past Consumption	0.059 (0.37)	0.103 (0.39)	-0.076 (0.38)
Goodwill	0.197 (1.02)	0.315 (1.13)	0.156 (0.63)
Country of Origin :			
France	dropped -	dropped -	dropped -
Belgium	1.550 (2.22)*	0.579 (0.59)	1.816 (2.09)*
United Kingdom	-1.828 (2.42)*	-1.083 (1.01)	-3.243 (3.39)**
Switzerland	-1.636 (2.35)*	-1.056 (1.07)	-2.825 (3.24)**
Germany	0.076 (0.10)	-1.483 (1.29)	0.463 (0.49)
Denmark	-0.453 (0.59)	-0.209 (0.19)	-2.259 (2.17)*
The Netherlands	1.510 (2.07)*	1.699 (1.63)	0.912 (1.03)
Intercept	5.102 (9.11)**	3.918 (5.38)**	6.046 (8.72)**
Observations	67	31	36
R-squared	0.47	0.44	0.69

Absolute value of t statistics in brackets.

\* significant at 5% ; \*\* significant at 1%.

From the full sample, we learn that connoisseurs use less intensively the price than non-connoisseurs. Several cultural differences also appear. All other things being equal French, Danish and German consumers make a greater use of the price than Swiss and British consumers and a lesser use than Belgian and Dutch consumers.

When estimated on the connoisseurs sub-sample, the model shows that this type of consumers use the price independently of the other signals. None cultural-international differences are detected in this equation. On the contrary, non-connoisseurs seem to use the price in substitution for the umbrella (negative sign for umbrella), i.e. price is used all the more intensively that the use of umbrella is low. The other signals are not significant

<sup>5</sup> Intensity with which consumers use the signal.

substitutes or complements for price. We also get that cultural differences mainly come from non-connoisseurs.

## 5. Concluding remarks

This article analyzes econometrically the way more than 6000 European wine consumers combine a series of available signals to infer a quality for a series of Bordeaux wines in function of their knowledge in wine and their geographical-cultural origin.

The main signal used, whatever the type of the consumer, is the price. Umbrella Bordeaux and price are substitutes for non-connoisseurs who ignore for most of them the various and numerous appellations lying under the umbrella. Given that price is almost systematically used by the consumers to infer Bordeaux wines quality, our results reveal that the umbrella “Bordeaux” has a limited impact. Moreover, the connoisseurs’ attitude suggests that this umbrella is not a good indicator of the level of quality for all the wines in the group. Given that they are able to diagnose the correlation between a signal and the true quality of a good, “Bordeaux” can not be seen as an efficient quality signal. This result is all the less surprising that Bordeaux is a very complex umbrella. It is in line with the results obtained by Rasmussen and Lockshin (1999) in the case of Australian wines : a small number of consumers use regional branding as a cue in their choice process. Hence, individual signals (not collective ones) seem preferred by consumers.

We can consider that perceived price is used as a source of information on quality “by default”. In other terms, despite the existence of several quality signals, the assessment of quality remains difficult for the consumer. This paper, by pointing out the weakness of the umbrella Bordeaux, helps to understand why Bordeaux wines tend nowadays to lose market shares in favour of more easily recognizable wines produced by new world winemakers. Indeed, these winegrowers have adopted a more accessible brand-based strategy which reveals to be more efficient than the confusing terroir-based strategy of old-world producers. Because consumers are not able to discover Bordeaux wines quality, their demand for such goods decreases and Bordeaux wines lose market shares. The market evolution can be seen as an *à la* Akerlof one.

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