

THE FUTURE OF THE FRENCH WINE INDUSTRY: GLOBALIZATION VS. QUALITY EFFECTS

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ABSTRACT

This paper surveys the current features and the current trends of the French wine industry, which, while still leading in terms of both quantity and quality, is facing increasing and global competition in international wine markets. In terms of long-term trends, the French wine supply is characterised by a strong shift towards increased quality. Roughly speaking, it can be concluded that the markets of the best quality wines, such as the best wines with *Appellation d'Origine Contrôlée* (AOC) in Bordeaux, Burgundy and other areas, are expanding. On the contrary, in the lower quality brackets (*Vins ordinaires* or ordinary table wines), the market is receding. Moreover, wines of intermediate but still quite good quality such as *Vins de Pays* (country wines) and *Vins de Cépage* (variety-denominated wines) are also expanding, thus adjusting to international competition, and to the trends of demand on international markets. An econometric application, focused on the demand for wines with Appellation d'Origine Contrôlée (AOC) and ordinary wines, is carried out, yielding statistically significant results. Our application illustrates the reality of the shift towards higher quality of French wines, as reflected in consumption patterns.

INTRODUCTION

At least since the end of the 19th century, France has been among the most important European wine producers, if not the most important, in terms of both quality and quantity. The markets for French wines have traditionally been segmented into quality or fine wines, and ordinary table wines. The best quality French wines belong to regulated categories such as *Appellation d'Origine Contrôlée* (AOC, or Controlled Denomination of Origin), or *Vin Délimité de Qualité Supérieure* (VDQS, or Higher Quality Wine from a given area). These certified quality labels guarantee that the wines in question have been produced in a traditional (and regulated) manner in one of the famous wine regions like Alsace, Bordeaux, Burgundy, Beaujolais, Champagne, Côtes du Rhône, Languedoc, Loire and Provence. In practice, there are few VDQS wines, so that most of the French quality wines are AOC wines. Moreover, the two qualities are often merged into a third category, *Vins de Qualité Provenant de Régions Déterminées* (Quality Wines from Specified Regions, or VDQRD). Similar denominations of origin schemes exist in most traditional European wine-growing countries, and also in comparatively more recent producers such as the USA, with its American Viticultural Areas scheme. This means that a new segmentation has developed, which includes, in addition to AOC wines and ordinary wines, *vins de pays* (country wines) and *vins de cépage* (variety-denominated wines). In practice, wines often belong to both of these categories. Thus, there is an intermediate category in terms of quality which, roughly speaking, can be defined as grape variety-denominated wines coming from a specific region (i.e. *pays*).

During the second half of the 20th century, the market for French wines has been characterized by a strong shift towards quality: we believe that this trend is going to continue and to be triggered by globalization during the 21st century.

It is therefore quite interesting to study the present trends of the French wine markets under the angle of quality on an international market which is global and is becoming more and more competitive, with complex quality attributes being a key factor. The present paper is devoted to that topical issue. It is organized as follows. Firstly, we describe the French wine industry and its importance within today's international wine markets. Secondly, we present a survey of the existing features and oncoming trends of French production, focusing on quality effects and on international trade. Thirdly, we present an econometric model that gives evidence of the qualitative evolution of French wine productions.

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THE FRENCH WINE INDUSTRY AND INTERNATIONAL WINE MARKETS

General considerations

Table 1 gives some general aggregated figures concerning France and the most important other wine-producing countries.

Country	Production (1999) ⁴	Share of world production	Trend	Area of vineyard ⁵	Growth of vineyard area
France	62.9	23.1%	-	910	-2.5%
Italy	58.4	21.5%	-	858	-11.4%
Spain	36.8	13.5%	+	1096	-12.8%
Germany	12.1	4.4%	-	101	-2.9%
United States	21.2	7.8%	+	362	15.3%
Argentina	15.9	5.8%	-	209	-2.4%
Australia	7.9	2.9%	+	99	47.8%
South Africa	5.9	2.2%	+	104	10.6%
Rumania	5.0	1.8%	=	?	?
Chile	4.3	1.6%	+	163	43.0%

Table 1 - France and other wine-producing countries: comparative data
(Sources : European Commission; Villard (2001))

A number of conclusions can be drawn from these figures. We can first notice that there is a group of dominant producers, which are three European countries (France, Italy and Spain, which are EU member countries), all of which have a long historical tradition in viticulture. These three countries together accounted in 1999 for 58.1%, and the European Union member countries accounted, also in 1999, for 67% of the world wine supply in volume. At equal rank with Italy, the French wine industry is leading in terms of quantity, with a share of 23.1 % of the total world production in volume. Our figures are aggregated figures: they include the best qualities as well as current and intermediate qualities. Many of the French wines can be ranked within the best quality brackets, including some of the best Bordeaux and Burgundy wines. These wines are also considered as among the best wines world-wide according to some prevalent quality attributes. A second feature is that, together with other traditional European wine suppliers, the French vineyard is decreasing in terms of area. This hints at a possible oversupply, at least for the lowest qualities. But, again, this is an aggregate effect which is overshadowed by quality effects. We believe that, if we take into account the best qualities, there are favourable prospects for the French vineyard. The situation is of course more difficult for ordinary table wines, and even for some wines that are in the middle quality categories, which are in oversupply. The figures presented in Table 1 are aggregate figures which do not take into account the diversity of France's wine products, in terms of both regional origin and in terms of quality. A more precise analysis has to discuss the various French wine-producing regions, as well as the various qualities of French wine products.

The various French wine regions

As far as regional origins are concerned, the French vineyard can be classified into 14 main wine-producing regions, which are, as ranked in terms of quantitative and qualitative importance : the Bordeaux region, Burgundy, Beaujolais, Champagne, Alsace, Jura, Savoie, Côtes du Rhône, Provence, Corsica, Languedoc, Roussillon, the South-West of France, and the Loire valley. All these regions can be characterized by a long historical tradition that, for many of them, dates back to Roman times. However, wine-making, grape varieties, and wine-drinking habits have been

⁴ In millions of hl (10⁸ litre).

⁵ In thousands of hectares.

submitted to constant change throughout history. As shown by Tchernia and Brun (1999), wine-making and the very quality of wine were altogether different in Roman times from what they are today. The reputation of many of the important wine regions of France probably dates back to the Middle Ages. This is true, for instance, of the Bordeaux area, which developed and established a long-standing tradition of wine trade with England during the Hundred Years' war (1328-1453). Other important wine-producing regions developed later (during the 18th century in the case of Champagne sparkling wines). In the Middle Ages, and until the middle of the 19th century, European vineyards extended far beyond their present extent, due to the demand for sacramental wines.

Closer to us, the second half of the 19th century (1850-1900) corresponds to a marked break in the history of French vineyards. Firstly, during that period, the development of railways (especially between the vine-growing regions of southern France and Paris) allowed for competition between cheap and attractive wines from the Mediterranean provinces of France, and some hitherto existing wines from Northern regions of France. Secondly, the phylloxera crisis, which almost entirely destroyed the French vineyards around 1880, also ruined wine production in some Northern regions of France. As is well known, grape varieties that prevail in French vineyards are comparatively recent. This is because since the phylloxera crisis of the 1880's, native American grape varieties have been used: unlike most former European varieties, these American varieties can resist phylloxera. While regions that are still active in wine production were able to maintain viticulture through shifting to American grape varieties, in other regions, vineyards almost completely disappeared. This is true of the Paris region (*Ile de France*). This region produced reputable wines in places that used to be rural areas. These wines included *vins de Paris* (Paris wines), and wines produced in other places that are now suburbs of Paris. But these Parisian vineyards were ruined by the mass supply of cheap Mediterranean wines that developed after the building of the Paris-Lyon-Méditerranée (PLM) railway between Paris and the Mediterranean, and the phylloxera crisis. The same is true of Lorraine, which also maintained an important wine production.

Some regulations concerning quality date to the second half of the 19th century, with a decree of 1855 regulating the quality of the best Bordeaux wines (*grands crus classés*, or great classified vintages). The regulation establishing the AOC scheme came later, as it originates in a law of July 1935. A much more recent regulation, which is a European regulation (EEC regulation N° 822/87 of March 1987) applies to *vins de pays*. The present situation of the various regional wine productions in France is summarized for a number of significant examples in Tables 2 and 3.

Region	Denominations	Area of vineyard ⁶	Share of vineyard	Grape varieties	Quality	Wholesale prices ⁷
Bordeaux	Bordeaux, Bordeaux Supérieur	58500	6.6%	Cabernet-	AOC	1.20
	Médoc	4800	0.5%	Sauvignon,	AOC	2.34
	Saint-Emilion	5400	0.6%	Merlot, Cabernet Franc...	AOC	2.62
Burgundy	Beaujolais	10500	11.8%	Gamay	AOC	1.75
	Bourgogne Passetoutgrain	3000	0.3%	Pinot noir, gamay	AOC	1.53
	Bourgogne			Pinot noir	AOC	2.57
Côtes du Rhône and Provence	Côtes du Rhône	45000	5.1%	Grenache,	AOC	1.30
	Côtes du Rhône Villages	7000	0.8%	Mourvèdre,	AOC	1.56
	Côtes de Provence Rouge and Rosé	19500 ⁸	2.2%	Shiraz...	AOC	0.93
Languedoc	Corbières rouge	13000	1.5%	Mainly carignan	AOC	0.90
	Coteaux du Languedoc	10000	1.1%	Grenache,	AOC	0.88
	Minervois	5300	0.6%	mourvèdre, shiraz...	AOC	0.89
	Vin de pays d'oc rouge	-	-	-	Vin de pays	0.68
	Vin de pays d'oc rosé	-	-	-	Vin de pays	0.58

⁶ In hectares.

⁷ Average prices in €/litre, observed in September, 2000 for 1999 vintage wines.

⁸ Rosé + red + white

Loire Valley	Bourgueil rouge	1300	0.1%	Cabernet franc, cabernet-sauvignon (small proportion)	AOC	1.41
	Chinon rouge	2100	0.2%		AOC	1.77
	Saumur Champigny	1350	0.1%		AOC	2.07
	Rosé d'Anjou	All Loire valley	-	Cabernet franc, cabernet-sauvignon...	AOC	0.87
	Cabernet d'Anjou (Rosé)	2800	0.3%	Cabernet	AOC	0.96
Table wines	Red, rosé (11 -12% alcohol in volume)	-	-	-	Table wines	0.41

Table 2 - French regional wine productions: Significant examples (red and rosé)
(Source: ONIVINS)

Region	Denominations	Area of vineyard ⁹	Share of French vineyard	Grape varieties	Quality	Wholesale prices ¹⁰
White wines						
Alsace	Alsace Gewürtztraminer	12000	1.4%	Gewürtztraminer	AOC + variety	2.70
	Alsace Riesling			Riesling	AOC + variety	1.44
Bordeaux	Bordeaux blanc	21000	2.4%	Sauvignon	AOC	0.56
	Entre-deux-mers	2000	0.2%	Sauvignon, sémillon, muscadelle	AOC	0.77
	Vin de pays des côtes de Gascogne	-	-	Various	Vin de pays	0.57
Burgundy	Bourgogne blanc	3000	0.3%	Chardonnay	AOC	1.93
	Bourgogne aligoté	1600	0.1%	Aligoté	AOC	1.79
	Chablis	2800	0.3%	Chardonnay	AOC	3.38
Loire valley	Muscadet de Sèvre et Maine	10600	1.2%	Melon de Bourgogne	VDQS	0.93
	Vin de pays jardin de la France	-	-	Miscellaneous	Vin de pays	0.63
Vins de pays / Vins de cépage	Vin de pays Chardonnay	-	-	Chardonnay	Vin de pays + variety	0.93
	Vin de pays Sauvignon	-	-	Sauvignon		0.76
	Vin de pays blanc 11-12°	-	-	Miscellaneous	Vin de pays	0.55
Sparkling wines (white, rosé)						
Champagne	All denominated as Champagne	31000	3.5%	Pinot noir, chardonnay, pinot meunier	AOC	13.96

Table 3 - French regional wine productions: Significant examples (white and sparkling)
(Source: ONIVINS)

Clearly, quantities cannot be compared together without taking into account quality effects, which are indeed very important. Excluding vintage effects, which are also very significant, we can see that, for a given vintage year, the dispersion of prices can be enormous. Due to averaging of data, this dispersion has been understated rather than overstated. Even allowing for this under-

⁹ In hectares.

¹⁰ Average prices in €/litre.

estimation of price dispersion, we can see that prices, at least in our examples, rank between 0.41 €/litre for ordinary table wines, and 13.96 €/litre for Champagne sparkling wines, all prices being wholesale and tax-free prices observed in September, 2000 for 1999 vintage wines. But, within most of the wine regions of France, the quality effect, largely reflecting price dispersion, is very important.

This, for instance, is true of one of the most important wine-producing regions in France, which is the region of Bordeaux (the *Bordelais*). Bordeaux wines are strongly present in international markets, and their markets can be considered as efficient. It may be estimated that the prices of Red Bordeaux wines, as observed in 2001 for 2000 vintage year, rank, only for the vins classés (excluding Bordeaux and Bordeaux Supérieur) between 9 and 36 €/litre for the top brands and denominations (Château Haut-Brion, Château Lafite-Rothschild, Château Latour, Château Margaux, Château Mouton-Rothschild). This means a dispersion factor of 4, but this dispersion factor goes up to 30 between the best Châteaux of the Bordelais and plain Bordeaux wines.

However, the Bordeaux region is not the region from which the average prices of AOC wines are highest, because it supplies comparatively larger quantities on domestic French and international markets. Wines from several other regions, such as Burgundy, and Champagne for sparkling wines, undergo scarcity effects due to comparatively small vineyard surfaces, which results in comparatively higher prices.

Quality effects, and globalization

As already mentioned, the quality attributes of fine French wines have traditionally been identified with the traditional wine making processes, under a public certification scheme which is implemented by the French authorities, and which is known as "Appellation d'Origine Contrôlée". The AOC scheme is strongly related to the concept of *terroir*, a French word which is used worldwide in the wine industry. A *terroir* is an original, and sometimes unique, combination of natural factors such as the quality and nature of the soils, climate, and location and orientation factors such as the slope and sunshine exposition of vineyards. To these *terroir* quality attributes, others that pertain to traditional wine making processes are added under the French AOC scheme. Grape variety as a quality attribute is comparatively less important than it is in other vineyard growing countries. Many of the French wines are in practice made from a traditional blend (*assemblage*) of grape varieties. This is, for instance, true of the *Bordelais*, because Bordeaux red wines are a blend of a number of varieties (Cabernet-Sauvignon, Merlot, Cabernet Franc...). Red wines of Burgundy are comparatively simpler blends, that include mainly Pinot Noir and Gamay. Gamay is the traditional grape of Beaujolais, and it is also widely used in the neighbouring vineyards of the French-speaking regions of Switzerland. An exception is Alsace, a region in which under the existing AOC scheme wines are single grape variety-denominated, using grapes that are in wide use in German-speaking countries, in central European countries such as Hungary, and also in countries such as Australia (Gewürtztraminer, Sylvaner, Riesling, Tokay, and Pinot Noir).

Finally, the quality of the best categories of French wines (which are mostly AOC wines) is defined by a rather complex bundle of quality attributes, including (1) *terroir*, (2) a *traditional wine-making process* usually involving a traditional blend of grapes, or exceptionally (mainly in Alsace) a single grape variety, and (3) for some famous denominations, a *brand effect*. This brand effect is, for instance, observed for some famous châteaux of the Bordeaux region, such as Château Mouton-Rothschild, which is owned by the French branch of the Rothschild family. This complex array of quality attributes is not specific to France. It is also observed in other traditional wine producing countries such as Italy, Spain and Portugal. Moreover, it is a feature of some other traditional drinks. For instance, Scotch whiskies are characterized by (1) being distilled exclusively in Scotland, (2) in a traditional manner, including the use of a single Scotch malt for their upper quality, as well as (3) by a brand effect. They are distilled under the supervision of the British government just as the French AOC wines are produced under the supervision of French official agencies.

In France, the wine industry is a regulated industry, and the quality attributes of the best wines are regulated under the existing AOC scheme. This is a strong constraint in a global market which is

increasingly competitive and there are concerns that the French wine industry is losing some of its competitiveness because of such regulations. *Vins de pays*, which, while regulated, are defined by simpler quality attributes, are growing on international markets in terms of market share. For instance, *vins de pays* and *vins de cépage* now represent about 30% of all French wine exports in the UK. This means that in the UK, one imported bottle of wine out of ten is a French *vin de pays*.

Concerns regarding the loss of competitiveness of the French wine industry (Villard, 2001) are therefore perhaps exaggerated and they are worth discussing. Clearly, France is still a major wine producer in terms of volume, with a share of world grape vine area above 11 % of world grape vine area. In terms of its market share within world wine export value, it can be argued, however, that it has consistently declined since 1990 (Table 1), but this has also been the case of other major European wine producers, including Italy, Portugal and Spain. The evolution unit value of French wine per litre seems to indicate, however, an increase in quality over the 1990-1999 period. This quality indicator has, according to figures given by Anderson and Norman (2001), increased by 2.12% p.a. over the 1988-1999 period, more than the figures for other major European producers such as Spain (0.84%), Portugal (0.88%), but less than in the case of Italy (3.26%).

Year	1990	1995	1999
% of world grape vine area	11.2	11.7	11.6
% of world wine exports in value	46.9	35.6	34.4
Exports as % of wine production volume	20.0	23.1	28.7
Unit value of wine exports (US \$/litre)	3.27	3.66	3.54

Table 4 - Some pertinent ratios concerning French wine production and exports
(Source : Anderson and Norman (2001))

Furthermore, the share of French wine exports within French wine production in volume has been increasing over the 1990-1999 period, as is also shown in Table 1. This means that France is exporting a larger share of its production in volume, and wines of greater quality as measured in terms of US \$ prices. However, the productions of some emerging wine producing countries have been growing rapidly, so that the share of world wine exports in value represented by French exports has been declining.

Some other emerging and topical issues show that quality is playing an important rôle in the supply of French wine products, and that, interestingly enough, quality attributes are departing from the traditional *terroir* attributes and from the traditional AOC system. Firstly, some new intermediate quality classes are emerging in between ordinary wines and AOC wines, such as *vins de pays*, a quality class which indicates an origin, but under less stringent regulations than in the AOC system. Variety-oriented qualities (*vins de cépage*), which traditionally were less prevalent on the French wine production than elsewhere, are developing and their markets are growing steadily. It is clear that these comparatively new medium quality categories are in line with the trends of both domestic and international demand. This is because a number of segments of the market, such as English-speaking countries, Asian countries such as Japan, Korea, and China, as well as several Northern European countries, the mass consumption of wine requires simpler, and comparatively cheaper, quality patterns. Clearly, emerging producers such as the United States and Australia do keep up with this increasing demand, and also supply more expensive high quality wines which compete with many of the French AOC wines.

Finally, due to the environmental concerns of an increasing segment of the market, what might be called the environmental quality of goods, including wines, has become part of the product quality mix (Lesourd and Schilizzi, 2001). Therefore, in line with this emerging trend, the market for French organic wines (*vins biologiques*), including both *vins de pays/vins de cépage* and AOC wines, is also growing at a fast pace.

All these emerging trends have implications for the structure and the actors of the market, that we can discuss now.

The actors of international markets for French wines

As far as *production* is concerned, while many of the French wine producers are still comparatively small, family-owned estates, often associated in wine-making cooperatives, there is clearly a trend towards more involvement of private and public joint-stock companies that are often large or very large companies. This trend is especially true of the best quality brackets, in which international public companies are paying an increasing rôle. Many of the *châteaux* of the Bordeaux region, which have become very expensive, are owned by either large private companies, or large international corporations. A number of take-overs have occurred in the French wine-making business. This reflects the fact that, due to the rather restrictive regulations that apply to the best French wines, external growth is often the only possibility of investment for growth in the French wine business. Many French wine-makers, including family-owned estates (*propriétaires*, or proprietors), and large private or publicly quoted companies also grow by investing in emerging wine-making countries, such as Australia, the United States, South Africa and Argentina, Chile or Uruguay. For instance, the Rothschild family (Château Mouton-Rothschild) is present in California, the Marnier family (famous for its Grand Marnier sweet liquor brand) has invested in Chile, and the Cointreau family owns an estate in South Africa. French publicly quoted companies such as LVMH and Pernod-Ricard are also heavily involved in Australia, in California and in South America.

Other actors of the French wine markets are *négociants* (literally: traders, usually termed in English as wine merchants or shippers). These are market intermediaries which are also traditionally involved in wine-making. While family-owned private capital is still present, public companies (like LVMH or Pernod-Ricard, already mentioned) are more and more present in both wine production and marketing. As shown by Table 5, two French companies (LVMH and Castel Brothers) are among the world leaders as wine merchants, but other international and especially American companies are also present among these leaders. British merchants and shippers have anyway traditionally played an important rôle in the international markets for Bordeaux wines.

The next stage of the wine market is distribution, and here the purchasing divisions or branches of large distribution companies such as Carrefour in France, Metro in Germany, Sainsbury in the UK and others, play an important role in wine markets and are increasingly aware of the competition between various wine producers world-wide.

Company	Turnover (2000-2001, millions of €)
LVMH (France)	1783
E & J. Gallo (USA)	1710
Foster's Group-Beringer (Australia, USA)	915
Seagram (Canada)	899
Constellation Brands (USA)	793
Southcorp-Rosemount (Australia)	747
Castel Brothers (France)	701
Diageo (UK)	656
Henkell and Söhnlein (Germany)	595
Mondavi (USA)	564

Table 5 - Examples of international companies involved in the international wine trade
(Source: Centre Français du Commerce Extérieur)

Innovations in the organisation of markets are worth mentioning, for at least a brief discussion. For instance, WINEFEX, a futures market for first-quality Bordeaux wines (*grands crus classés*) has been established by EURONEXT (the continental European stock exchange, which is a merger of the Paris Bourse, the Amsterdam and the Brussels Stock Exchanges). However, WINEFEX has so far disappointed in attracting only very little liquidity. Other experiments in electronic spot markets, such as SpiritXchange, an online wine and spirit exchange operated by the Crédit Agricole, a leading French bank, have apparently been more successful.

We can conclude that both international and domestic French wine markets are undergoing a significant shift towards quality. The following model and its application aims at analysing this trend in the case of French domestic wine consumption.

QUALITY EFFECTS AND THE FRENCH WINE INDUSTRY: AN ECONOMETRIC APPLICATION

In a previous paper (Auriol, Lesourd and Schilizzi, 1998) we developed a model of credence goods and their certification which leads to the cost function of quality-certified credence goods, taking into account fixed certification costs.

Nelson (1970, 1974) and Darbi and Karni (1973) developed a useful categorisation of the quality of goods. These authors thus distinguish *search goods*, *experience goods* and *credence goods*. *Search goods* are those for which consumers can assess their quality or qualities before purchasing them. Typical examples are external physical attributes such as colour, smell, size, polish and style. *Experience goods* are those for which consumers cannot assess the qualities until they have used or consumed them. Typical examples are attributes such as taste, system functionality or performance, or productivity. It is only by testing these goods, with experience, that their quality attributes can be assessed. Finally, *credence goods* are those for which consumers can assess the quality attributes neither before nor after purchase and use. Typical cases refer to environmental impact at the production but also at the consumption stage. In this case, quality signalling to consumers has become an important problem. One practical solution to this problem is *certification*. Wines are typically credence goods, and, in France, their quality is certified by a public body on the basis of regulated classification schemes. The AOC scheme discussed above is one of the key elements of this public classification scheme.

We have transposed our model to an analysis of the consumption of wines including the quality effect. At an aggregate level, we assume that q , the quantity supplied by the representative producer, is the sum of the quantities of quality wines q_v and of ordinary table wines q_0 :

$$q = q_v + q_0 \tag{1}$$

We now interpret the quality index v as simply being the ratio of q_v over q , so that :

$$v = q_v / q \tag{2}$$

Also assuming, as a simple and reasonable approximation, that the marginal cost is simply a linear combination of the marginal cost of quality wines c_1 and of the marginal cost of ordinary wines c_0 , with $c_1 > c_0, > 0$, the cost function of the representative producer becomes :

$$C(q, v) = q [c_1 v + c_0 (1 - v)] = q [(c_1 - c_0) v + c_0] \tag{3}$$

Whence :
$$c(v) = (c_1 - c_0) v + c_0 \tag{4}$$

which is a strictly increasing function of v . Since it appears from our model (Auriol, Lesourd and Schilizzi, 1998) that the representative consumer's income index r is a strictly increasing function of v , consequently, v is also a strictly increasing function of r . Assuming that the income index r is simply proportional to an aggregate income variable R (such as the GNP), so that $r = k R$, we deduce from (4) the following linear dependence between v and the ratio R/q :

$$v = \frac{k}{3(c_1 - c_0)} \frac{R}{q} - \frac{c_0}{3(c_1 - c_0)} = a \frac{R}{q} + a_0 \tag{5}$$

with $a = \frac{k}{3(c_1 - c_0)}$, and $a_0 = - \frac{c_0}{3(c_1 - c_0)}$. The 3 coefficient stems from the specification of the

functional forms that appear in the model. With time series data, (5) leads us to assume a long-term cointegration relationship between our variables v and R/q , which are probably non-stationary, with a constant term and perhaps a time trend. We first verify that the variables are indeed nonstationary ; the Dickey-Fuller test statistics are, respectively, 1.17 and 0.928 for v and R/q , which clearly leads us to reject stationarity in both cases. We may therefore test the model by estimating through an OLS regression the dependence of the quality index v against variable R/q with a linear time trend added. This dependence has been carried out in the case of Appellation d'Origine Contrôlée (AOC) wines.

In agreement with the above definitions, we take the ratio of the French domestic consumption of AOC wines over total consumption of wine as the v variable, and the ratio of the French GNP over the total consumption of wine as the $?$ variable. For this purpose, we use a time series of annual observations between 1960 and 1995. The results of the regression are given in Table 6.

VARIABLE	COEFFICIENT	STANDARD ERROR	T-STATISTIC	SIGNIFICANCE
$?$	0.007363	0.000859954	8.56218	0.00000000
TIME TREND	-0.0068800	0.002107859	-3.26400	0.00256003
CONSTANT	- 0.1169295	0.01693681	-6.90387	0.00000007

Table 6 - Results of the OLS regression of v against $?$ following the linear dependence of equation (11). ($R^2 = 0.971$). Data available from the French Office National Interprofessionnel des Vins - ONIVINS (1994, 1997)

Our regression gives satisfactory results in terms of both the significance of the coefficients, which are well defined and have the expected signs, and in terms of the high determination coefficient. Applying the cointegration test, which is a Dickey Fuller test (Davidson and MacKinnon, 1993) to the residuals, we obtain a statistic s of -12.604, which, with the asymptotic values given by Davidson and MacKinnon, leads us to conclude that these residuals are stationary within the 0.01 confidence level. Thus, our variables are cointegrated, and the model leading to equation 11 [equation 5?] (with a linear time trend) cannot be rejected. Econometric evidence is thus compatible with a long-term relationship between our variables.

Furthermore, for the model to be consistent, we may check that parameter q is greater than parameter q_0 , because we have assumed that $q > q_0, > 0$, and $c_1 - c_0, > 0$ for the consistency of Equations (3) to (5). The constant term of Equation (5) should also approximately be related to the ratio $c_1/c_0 > 1$. Parameters c_1 and c_0 reflect the actual marginal production costs of, respectively, ordinary and AOC wines.

Our data (Office National Interprofessionnel des Vins, 1994, 1997) give estimates of the bulk wholesale prices at the winery for various wine producing regions (ordinary wines) and AOC denominations (AOC wines) at various dates. We may assume that these reflect marginal production costs, and that certification costs for AOC wines occur at the wholesale trading and are reflected in retail prices. Taking the data for the 1995-1996 vintage year, we are able to calculate a production-weighted mean of the price for both ordinary and AOC wines; this gives us estimates of 0.49 €/litre and 1.29 €/litre, respectively. We thus calculate a c_1/c_0 ratio of 2.63 from these data. The value of this ratio deduced from a_0 is clearly :

$$\frac{c_1}{c_0} = -\frac{1}{3a_0} + 1 \tag{6}$$

With our estimate of $a_0 = - 0.117$, we calculate an estimate of $c_1/c_0 = 3.85$, a satisfactory order of magnitude and a crude but reasonable estimate if we allow for the fact that our model is only an approximate and aggregate model.

As it stands, and although it rests on a simplified model, our econometric application hints at the reality of the quality effect on the market for French wines, with a long-term trend towards higher quality.

CONCLUSION

In this paper, we discussed background issues concerning the French wine industry. It is clear that the market is increasingly global and competitive and that international competition on world markets is quality-driven. This has led to an evolution in the quality patterns of French wine production. In particular, the French wine market used to be divided into two quality segments, that were (1) the complex traditional AOC and VDQS *terroir*-oriented first quality wines, and (2) ordinary table wines. However, a comparatively recent medium quality category, which is composed of *vins de pays* (country wines) and of *vins de cépage* (grape variety denominated wines),

or both, is emerging. It can be said that the emergence of this comparatively new category is driven by the trends of demand on the international wine markets. At the same time, ordinary table wines are less and less important on both the French domestic market and on international markets.

We also applied a model by Auriol, Lesourd and Schilizzi (1998) to this quality effect on the domestic French market for wines, with an econometric application on data available from Office National Interprofessionnel des Vins (1994, 1997). Allowing for the fact that our application was carried out at an aggregate level, and on the basis of a rather simple case deduced from our general model, the results obtained are consistent with that simple case. This modelling exercise rests on a simplified model with two groups of wines in terms of quality, AOC and VDQS wines and other wines (table wines and vins de pays). It gives some evidence for a quality effect on the market for French wines which consists in a trend towards higher quality. It would be interesting, in the future, to carry out a more sophisticated econometric application on the basis of a more detailed model. Such a model could involve a more realistic segmentation of the market, with, for instance, three broad quality categories (AOC and VDQS wines, *vins de pays*, and other table wines).

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