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## **More risks or/and more benefits? Prospect theory application to the analysis of the bio wines evolution in France**

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### ***Abstract***

**Purpose:** *In the last five years the conversion of vineyards to organic or bio vineyards accelerates all over France, the annual rate of conversion varies between 20-25% per year since 2006. It becomes even more striking as the total surface of vineyards in France reduces. Our work focuses first on understanding the main reasons and difficulties of the conversion process into organic vineyards (which takes three years), in particular in Bordeaux region.*

**Methodology:** *We examine the risky choices of winemakers using the prospect theory to explain the various outcomes. We put forward a simple model describing how winemakers make choices in situations where they have to decide between alternatives "bio or not bio" ; "bio certified or not certified", "reasonable use of chemicals" ( agriculture raisonnable) that involve several risks and will impact their financial situation. We introduce and compute a value function, based on the potential outcomes and their respective probabilities, and then choose the alternative having a higher utility.*

**Findings:** *Our results point to reference-dependent choice theories such as prospect theory, and suggest that path-dependence is relevant; the concavity of the value function in gains can lead to a low preference for converting into organic farming even when the choice problems*

*are simple and well-defined, as large real monetary amounts are at stake. Despite evident difficulties of converting, more attention in the public eye towards environmental concerns affect the utility function of winemakers and favour their choice for converting into organic farming over the last two years.*

**Key words:** Decision making under risks, Bio wines, Prospect theory

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## 1. INTRODUCTION

Over the last few years, the interest towards organic or bio wines has been increasing on the world wine market. As with many organic products, organic wine is becoming more widely available and offering more choice to consumers. Organic wines are produced by specific management practices that take care of the environment and soil. Synthetic chemicals and artificial fertilizer including pesticides are not permitted other than those specifically listed by the specific EU regulation of 2002. The term ‘organic wine’ is used to describe wines made from organically grown grapes (AB certificate in France), although other ingredients are not certified. Organic wine not only uses organic grapes but is usually processed using the minimum of chemical intervention during the production process. There is, however, no agreed standard for this. It is also not compulsory for wine producers to name chemicals used within the ingredients list, with the exception of sulphite, or whether animal products have been used.

An EU-wide certification, internationally recognized, could clarify numerous uncertainties the winemakers are going through these days. In the light of the recent failure of EU-wide certification negotiations, our study reassesses an area where the academia could provide invaluable help

### 1.1. The natural wines sector in France

The French National Agency BIO for the Development and Promotion of Biological Agriculture report (2008) indicates that in twelve years, from 1995 to 2007, the surface under bio vineyards in France has grown more than four and a half times, from 4 854 hectares to 22 510 ha. In the last five years the conversion of vineyards to organic or bio vineyards accelerates all over France, the annual rate of conversion varies between 20-25% per year since 2006 (the conversion period takes three years); it attains almost 39% on average in 2009 compared to 2008. It becomes even more striking as the total surface of national vineyards in France reduces during the last years.

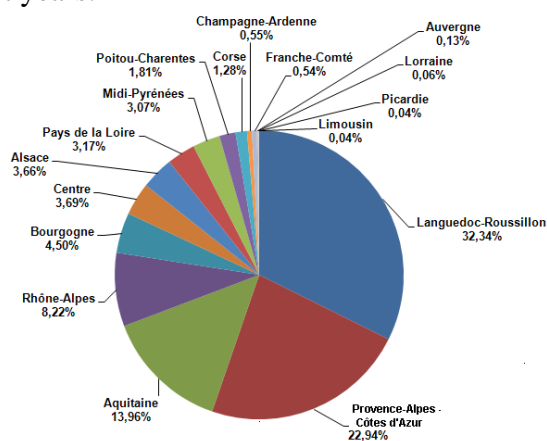


Figure 1. Percentage of organic wine farming in France in 2009 (per region )

The number of winemakers engaged into the conversion process grows steadily; yet the steady quick growth of SMEs producing natural wines is not always accompanied by a steady growth of quality though a heavy certification process is already put in place.

	Nombre d'exploitations pratiquant la bio	Surfaces en viticulture						
		Certifiées bio	1 <sup>re</sup> année de conversion	2 <sup>e</sup> année de conversion	3 <sup>e</sup> année de conversion	Total conversion	Total Bio + Conversion	2009/2008
Alsace	148	809	263	173	187	622	1 431	13,5%
Aquitaine	439	2 549	1 778	770	368	2 915	5 464	45,2%
Auvergne	15	32	12	1	7	19	51	18,5%
Basse-Normandie	0	0	0	0	0	0	0	///
Bourgogne	195	778	525	358	102	986	1 763	43,2%
Bretagne	0	0	0	0	0	0	0	///
Centre	113	724	336	244	139	719	1 443	14,9%
Champagne-Ardenne	49	118	36	31	32	99	217	13,7%
Corse	27	212	68	136	84	289	501	12,5%
Franche-Comté	35	144	17	25	24	65	210	4,4%
Haute-Normandie	0	0	0	0	0	0	0	///
Ile-de-France	2	c	c	c	c	c	c	///
Languedoc-Roussillon	798	4 740	4 624	2 343	955	7 921	12 661	51,9%
Limousin	6	9	1	6	0	7	16	9,1%
Lorraine	4	5	0	17	0	17	22	-7,6%
Midi-Pyrénées	151	398	471	231	103	805	1 203	63,6%
Nord-Pas-de-Calais	0	0	0	0	0	0	0	///
Pays de la Loire	110	948	106	67	121	293	1 241	7,1%
Picardie	4	12	4	0	0	4	16	32,8%
Poitou-Charentes	70	630	25	41	12	78	709	-0,4%
Provence-Alpes-Côte d'Azur	536	4 113	2 509	1 427	933	4 868	8 981	34,6%
Rhône-Alpes	322	1 271	1 115	481	350	1 946	3 217	50,8%
Outre-Mer	0	0	0	0	0	0	0	///
<b>TOTAL</b>	<b>3 024</b>	<b>17 492</b>	<b>11 889</b>	<b>6 349</b>	<b>3 416</b>	<b>21 654</b>	<b>39 146</b>	<b>38,9%</b>

Source : Agence BIO / OC

Table 1: The surfaces under bio wine production in France in 2009 (Agence BIO, 2011)

Regardless of the recent growth, organic grapes still represent only about 4% of all French vineyards. Three major regions in France which are particularly involved in this process are the Mediterranean regions - Languedoc-Roussillon and Provence-Alpes-Côte d'Azur - followed by Aquitaine region with respectively 12 661, 8981 and 5465 bio wine producers and those under the conversion process. As an example, Pays de la Loire region shows one of lowest results.

Many small vineyards in France, are managed with methods similar to organic techniques following local traditions and minimising the use of chemicals. Since 1990 the term " viticulture raisonnée " or reasonable vine growing, has been used more and more widely to stress vine cultivation with minimum chemical input, and only in extreme situations. The major importers of French natural wines are the USA, the Scandinavian countries and Japan.

Being on the third place is pleasing though the reality of the process remains quite puzzling and confusing: the number of natural wine producers in Bordeaux is around than 500 (compared to almost 10000 winemakers in total in the region); the surface under organic wine farming is around 2000 ha (compared to the total of 118900 ha) and bio certified wines are only 980 ha. Why the process is so complicated?

## 1.2. Bordeaux and Loire wine regions – comparison of conversion processes

First, we have focused on understanding the main reasons and difficulties of the conversion into organic vineyards and compare Aquitaine and Pays de la Loire regions in France. A series of interviews in several wine properties (SMEs) in the France (Bordeaux and Loire regions), with wine merchants, and wine broker's agency has been performed ( Bouzdine – Chameeva et Ninomiya, 2009; Bouzdine-Chameeva, 2010).

The application of the model suggested by T. Durand (2000) “The dynamics of competences’ accumulation” permits to analyze company's positioning in terms of the three major axes : interactions/ know-how/ knowledge ( see Figure 2.)

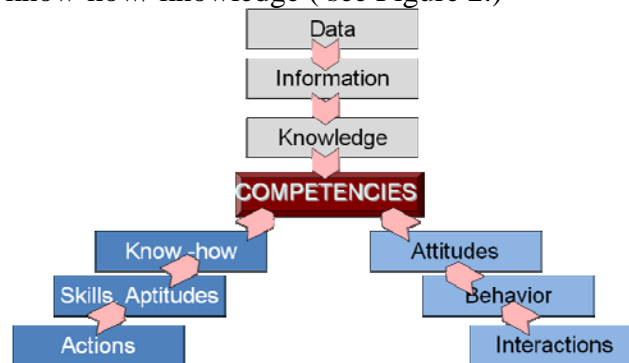


Figure 2. The three axes of competences’ accumulation dynamics for a company ( adapted from T. Durand, 2000)

Our findings has shown the strong heterogeneity of the natural wines' production sector and considerable differences in solutions found by wine producers dependent on the core competencies. Such competencies as organic vine growing know-how, knowledge based on the analysis of risks related to production volume and wine quality; thorough financial expertise (as there are considerable investments and high costs of certification process), attitudes and active social behavior focused on learning more internal (French) and external (world) market requirements, understanding the competition rules and clients preferences – wine tasting/wine experts advice/direct sales) strongly affect in devising a strategy.

Organic winemakers face multiple risks while considering converting into organic wine-making: Environmental risks; Quality risks; Supply chain risks and Market risks related to the region image.

1. Environmental risks - Bordeaux oceanic climate is not stable and lacks consistency compared to Mediterranean regions of France, for example. Risks involved into the interdiction of chemical treatment of grape diseases in organic wine farming are quite high.
2. Quality risks – difficult to maintain stable quality as the dependence on the weather is quite strong
3. Supply chain risks related to multifaceted supply chain system on Bordeaux wine scene (wine producers, wine merchants, wine brokers, wine syndicates) compared to the Loire region mainly direct sales.
4. Market risks related to image - the image of Bordeaux wines on the international market is directly associated more with luxury, complex and sumptuous, traditional and chic wines than with simple and natural, organic or bio wines. Loire region seems to get benefits of the image of being simple and natural.

## 2. RESEARCH METHODOLOGY

As the second stage of the study we examine these risky choices of winemakers using the prospect theory to explain the various outcomes. Prospect theory was developed by Daniel Kahneman, professor at Princeton University's Department of Psychology, and Amos Tversky in 1979 as a psychologically realistic alternative to expected utility theory. It allows one to describe how people make choices in situations where they have to decide between alternatives that involve risk, e.g. in financial decisions. Starting from empirical evidence, the theory describes how individuals evaluate potential losses and gains. In the original formulation the term prospect referred to a lottery.

The theory describes such decision processes as consisting of two stages, editing and evaluation. In the first, possible outcomes of the decision are ordered following some heuristic. (Kahneman, Tversky, 1979) In particular, people decide which outcomes they see as basically identical and they set a reference point and consider lower outcomes as losses and larger as gains. In the following evaluation phase, people behave as if they would compute a value (utility), based on the potential outcomes and their respective probabilities, and then choose the alternative having a higher utility.

We put forward a simple model describing how winemakers make choices in situations where they have to decide between the alternatives:

- Bio versus Not Bio; (additional costs up to 25 % to add);
- Bio certified (AB) versus Not certified AB; (additional costs up to 15 % to add);
- Reasonable Use of Chemicals versus Not Bio (additional costs up to 5 % to add).

All three alternatives studies suggest that there are several risks involved to be considered that will impact the financial situation. Analysis includes the influence diagram based on decision tree alternatives ( see figure 3)

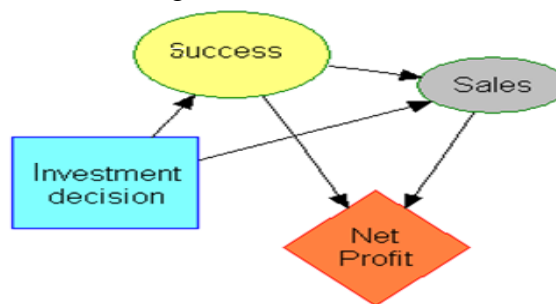


Figure 3: The influence diagram used for the prospect theory application.

### 3. MODEL AND RESULTS

We introduce and compute a value function, based on the potential outcomes and their respective probabilities, and then choose the alternative having a higher utility. If  $x_i$  describes the possible outcomes and  $p_i$  – respective probabilities then we obtain the following equations for the three studies alternatives:

Bio ( $x_1$ ) versus Not Bio ( $x_2$ ) :  $V_1 = w(p_1) v(x_1) + w(p_2)v(x_2)$  ;

Bio certified (AB) ( $x_1$ ) versus Not certified AB ( $x_3$ ):  $V_2 = w(p_1) v(x_1) + w(p_3)v(x_3)$

Reasonable Use of Chemicals ( $x_4$ ) versus Not Bio ( $x_2$ ):  $V_3 = w(p_4) v(x_4) + w(p_2)v(x_2)$

The value function of s-shape passes through the reference point (see figure 3) and, as its asymmetry implies, given the same variation in absolute value, there is a bigger impact of losses than of gains ( see figure 4)

Our results point to reference-dependent choice theories such as prospect theory, and suggest that path-dependence is relevant; the concavity of the value function in gains can then lead to a low preference for converting into organic farming even when the choice problems are simple and well-defined, as large real monetary amounts are at stake. Risk aversion of winemakers is quite strong. In the evaluation phase:

- 80% of winemakers interviewed behave as if they would compute a value (utility), based on the potential outcomes and their respective probabilities, and then choose the alternative having a higher utility.
- 50% are ready to lose as they prefer a larger gain in future; strong impact of personal convictions and beliefs is emphasized in the post-test discussions.

- We observe heterogeneity of approaches applied by organic or bio wine makers. The absence of a unique European certification "organic wines" creates confusions; current heavy AB certification process involves multiple risks.

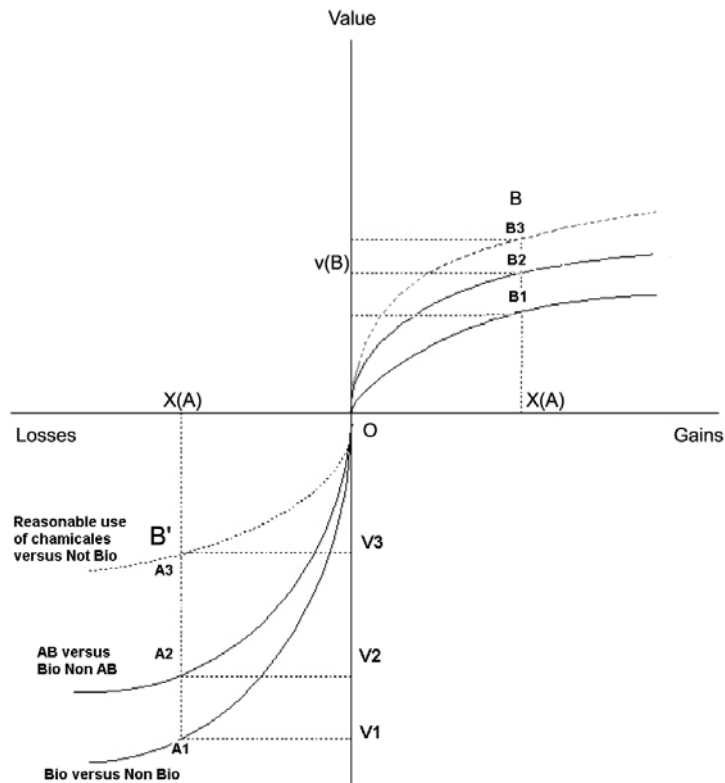


Figure 4. The shape of the value function for the three studies cases.

#### 4. CONCLUSIONS

A DM process of the conversion to organic wine making in France involves multiple risks. The prospect theory applications bring forward two major points:

- a low preference for converting into organic farming even when the choice problems are simple and well-defined, as large real monetary amounts are at stake;
- despite evident difficulties of converting, more attention in the public eye towards environmental concerns affect the utility function of winemakers and favor their choice for converting into organic farming;
- convictions and beliefs of winemakers impact the DM process more than a rational financial approach.

Basing on the results of our study we could state that bio wines will lack visibility on the European market if the common certification of "organic wines" will not be put in place. Converting into organic wine making will continue to increase for a certain number of population, in the range of medium - low prices wines;

Fines wines (Bordeaux grand cru wines in particular) are mainly organically grown, consumers consider them natural by definition and are confused if the organic certificate is indicated on the bottle ; therefore fine wines producing chateaux do not go into certification process. The ambivalent approach to organic certification is therefore observed.

This would suggest that the risks associated with organic viticulture methods are not off-set by the positive market response to organic wines. The consumer distrust towards organic wines on the one hand, and the lack of an internationally recognisable and universal

quality certification for organic wines on the other, makes full organic conversion and certification problematic for some producers. 'Organic' thus becomes associated with value loss rather than value adding on the wine market.

A thorough, clear understanding of the client on the end of the distribution chain could become a core strength for small wineries; a conceptualisation of decision-making based on learning about the importer's side would facilitate and improve the distribution channels. This would require a closer collaboration along the distribution chain.

Several recommendations can be suggested:

- to increase market knowledge as a result of closer collaboration with distributors. A further step could be the development of market research and marketing strategies, which would require either consolidation or state intervention to raise necessary time and capital;
- to increase the support the conversion process on the side of wine producers unions, Intra-professional organisations, on the European level. While their actions are a step in the right direction, a more rapid and thoughtful solution is certainly required to stimulate the process.

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