The Role of Individual Risk Attitudes on Old Wine Valuations

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Abstract

In this article, we report the results of an experiment designed to address the effect of risk attitudes on valuations of aged wines. We find that higher risk taking in the economic domain is associated with a significantly higher willingness to pay for an old wine. Given the increasing interest of consumers and investors in old wines, our results are applicable to the pricing of old wines and to the use of auctions as an efficient willingness to pay elicitation mechanism. (JEL Classifications: C91, D44, L66)

Keywords: auctions, risk attitudes, wine economics.

I. Introduction

Properly stored wine ages to a superior product up to a moment at which it rapidly deteriorates. In specific cases where the aging process has not been controlled by the seller, the effect of time on wine quality becomes even more uncertain. A trendy cava-wine bar in Dijon, France,[1] recently decided to sell old wine that had been purchased from private sellers. Recognizing the uncertainty entailed of the lack of control over the product's life until it reached the shop's shelves, the owner fixed a unique price (25€) for all the wines, informing their customers that the quality of aging process could not be guaranteed. In the concrete case of that specific bar, after all bottles were sold, the ex post share of "bad" wine was 10%. Wine expert estimations

[1] Details available at http://www.pharmacy.vin/en/.

vary, but most of them expect that less than 10% of wines improve after one year and no more than 1% of wines continue to improve after 10 years. While aging cheap wines will most likely result in a deterioration of the wine's quality, some types of wines could improve their quality over decades if properly stored. Wines made to be aged are nevertheless the exception rather than the rule and most wines quickly reach their optimal age of consumption. Of course, several tips can be used to identify a wine that has not aged well. For example, if the space between the cork and the wine is too long, it could be a sign that the wine has oxidized or evaporated through the cork. Even when a bottle of aged wine shows no sign of poor quality, the taste of the wine inside the bottle is not guaranteed, except maybe for highly skilled connoisseurs who have a very good knowledge of the product. That said, even if knowledge of the product helps to minimize the risk, there is no such thing as zero risk in the case of aged wines and there is still a higher or lower probability that the content of the bottle has turned sour.

The aforementioned value formation process and the decisions involved in the resale of old wine resemble those of a risky financial asset whose value gradually increases to maturity and the process can be stopped or even reversed (Noparumpa, Kazaz, and Webster, 2015).[2] Since financial assets are not as tangible as wine, there are few guarantees about the optimal moment when the owner should sell. The link between old wine valuations and individual buyers' risk attitudes then becomes very likely to exist. Riskier buyers should be willing to pay more than risk-averse ones for old wines and the effect should be stronger for older wines. The relevance of addressing this hypothesis is twofold: (1) the optimal prices for old wine may depend on buyers' risk attitudes; and (2) we can assess the external validity of in-lab risk elicitation instruments using a tangible asset, whose value uncertainty originates from an uncontrolled process, naturally occurring outside of the lab.

Risk is subjective in nature and its perception involves many factors including psychological, social, and cultural. The study of risk perception mainly implies examining the opinions expressed by individuals when they have to evaluate more or less risky activities in various ways. A large number of studies have focused on the perception of risk (mainly monetary) across different categories of individuals. Different individuals will react in various ways to comparable uncertain circumstances.

Psychologists and economists have conducted numerous experiments to identify risk-taking and risk-averse people's profiles (see, e.g., Holt and Laury, 2002 and reviews by Andersen et al. 2006; Charness, Gneezy, and Imas, 2013; Attanasi et al. 2018). These experiments allowed us to learn more about the perception of risk by different types of individuals. For example, we know that women on average, have a significantly higher risk perception than men (García-Gallego, Georgantzís, and Jaramillo-Gutiérrez, 2012). With regard to education/training,

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[2] This is especially likely to happen when the consumption of the wine peters out (Jovanovic, 2008).

the majority of studies agree that more educated people are also the least risk-averse. On the other hand, age, which is also one of the variables that have attracted particular interest, does not seem to be correlated with a certain type of risk preference.

The use of experimental methods in wine research is not new. Several studies have used laboratory methods to account for each preference in the wine and spirits sector.[3] With respect to wine-related uncertainty, recent articles focus on the risks faced by fine wine investors (Le Fur, Ameur, and Faye, 2016; Bouri and Roubaud, 2016) or on the risk aversion of winegrowers to pesticides (Aka, Ugaglia, and Lescot, 2018), but the literature remains silent on the link between individual risk attitudes and old wine valuation. Exceptionally, Georgantzís and Navarro-Martínez (2010) report a negative effect of risk aversion on a consumer's valuation of a wine whose quality is unknown at the moment of valuation. According to this result, risk preferences elicited in the laboratory are externally valid and useful to predict how wine quality uncertainty will affect the valuation of a wine, depending on risk attitudes elicited in the monetary domain. This positive result concerning the external validity of risk elicitation measures is confirmed and extended here in a domain in which uncertainty is particularly present and relevant for consumer choice, namely, in the market for aged wines. Therefore, our study contributes to a long-standing debate (see, e.g., Weber, Blais, and Betz, 2002; Vieider et al. 2015; Attanasi et al. 2018; Lévy-Garboua et al. 2012) concerning the validity of risk preferences elicited through one instrument in one particular domain for preferences revealed in other, more or less distant domains.

In this article, we are interested in the risk attitude of different types of consumers when buying aged wines. The link between a person's willingness to pay (WTP) for a vintage wine and her attitude towards uncertainty is rather straightforward. Consider a mean-variance model of risk taking. The person does not want to pay more than the market value of the wine. We hypothesize that wine age is associated with increasing price variance. The value of a wine can increase when it is well matured or fall to zero when spoiled. In this case, a risk-averse person will be more affected by this variance and will be willing to pay less, while a risk-loving person will be more attracted to the possibility of an excellent aged wine.

This laboratory experiment was run with 65 participants of different profiles. During this experiment, participants had the opportunity to declare their WTP for 20 bottles of aged wine by spending the money they had been allocated at the beginning of the experiment. In another phase of the experiment, the subjects also completed a paid risk aversion test and finally completed a questionnaire designed to collect personal information that we considered relevant to refine our statistical analysis. In particular, the results of our study show that greater appetite for

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[3] See, for example, recent work by Goldstein (2019) employing experimental methods and using behavioral economic theories to address the deception issue in placebo experimental treatments. Also, see Malone and Lusk (2019), Hart (2018), Gabrielyan et al. (2018), and Drichoutis, Klonaris, and Papoutsi (2017).

monetary risk is correlated with a significantly higher WTP for wines that are too old compared to their optimal consumption date. Also, self-assessed wine knowledge as well the WSET level of the subject are associated with a significant increase in WTP.

The remainder of the article is organized as follows. In Section 2 we present the experiment procedure as well as the experimental material we used to record the data. Section 3 provides a description of the data and variable. The results are presented and discussed in Section 4. Section 5 concludes.

II. Experimental Procedures

The experimental sessions took place at the School of Wine and Spirits Business in Dijon between September 2017 and December 2018. In total, four experimental sessions were organized with 65 subjects with different profiles: students in Wine Business from the School of Wine and Spirits Business, management students from the Burgundy School of Business, and professionals from various fields visiting the school. Table 1 gives an overview of the number of sessions and subjects of each type.

The subjects received an invitation to the experiment by email. The four experimental sessions each included up to 20 subjects and lasted approximately one hour. All subjects received a cash payment at the end of the experiment and/or a bottle of wine based on the decisions made during the experiment.

The experiment was divided into three distinct and independent stages. In the first stage, subjects were asked to make four consecutive monetary decisions by choosing their favorite lottery from ten lotteries in each of the four tables shown in Figure 1. The objective of this first step is to measure the participants' monetary risk appetite in different situations, with varying amounts of money at stake. When a subject is risk neutral, he or she should choose the lottery with the highest expected gain, that is, the most right-hand lottery in the tables. The higher the risk aversion of a subject, the more the subject's lottery choice will move to the left to have a greater chance of securing a gain. At the end of the experiment, one of the four panels is drawn at random with a dice in front of the participants. For this panel, we roll a ten-sided dice to determine the winning choices (ten wins it all). This method of risk elicitation was introduced by Sabater-Grande and Georgantzís (2002), allowing a more systematic identification of the effect of the stakes than the one originally used by Holt and Laury (2002).

In the second phase of the experiment, all the subjects start with an endowment of 18 euros allowing them to buy the different real bottles of wine presented during the experiment. If the subjects do not spend the 18 euros during the experiment, then the 18 euros are given to them in cash at the end of the experiment. The subjects are aware of this information before starting the experiment. In this step, we present 20 bottles of aged wine to each participant. Participants have the opportunity to inspect the bottles one by one and are asked to show on a table like the one presented

Table 1
Session Information

Type of Subjects	Total Number of Subjects	Number of Sessions
Wine students	30	2
Management students	20	1
Professionals	15	1

Figure 1
Risk Aversion Test

PANEL 1

Prob. of Winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Euros	1	1.12	1.27	1.47	1.73	2.10	2.65	3.56	5.40	10.90
I prefer										

PANEL 2

Prob. of Winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Euros	1	1.20	1.50	1.90	2.30	3	4	5.70	9	19
I prefer										

PANEL 3

Prob. of Winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Euros	1	1.66	2.50	3.57	5	7	10	15	25	55
I prefer										

PANEL 4

Prob. of Winning	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
Euros	1	2.20	3.80	5.70	8.30	12	17.50	26.70	45	100
I prefer										

in Figure 2 the price they are willing to pay for each of these bottles, between 0 and 18 euros, by increments of 2 euros. Before declaring their WTP for any of the wines, the subjects are told that "the wines had aged under uncontrolled conditions and could therefore have turned sour, or still be as good as they were." At each session, the participants are assigned to a group of three or four participants, which is known only once all the bidding has been completed and the bids submitted to the experimenters. This guarantees no wealth accumulation effects and incentive compatible valuations for all the wines involved. Once each subject has announced how much they are willing to pay for all the bottles, the groups are revealed and each group of three or four participants is assigned a randomly selected bottle. The highest bid in the group for the bottle that has been randomly drawn for them wins the bottle and pays the announced price with his or her endowment. The

Figure 2

Decision Table

	Would you buy the bottle?	
2€	Yes	No
4€	Yes	No
6€	Yes	No
8€	Yes	No
10€	Yes	No
12€	Yes	No
14€	Yes	No
16€	Yes	No
18€	Yes	No

remaining participants in the group keep their 18 euros in cash. This elicitation method allows participants to reveal their actual WTP for each bottle. Figure 1 shows the type of table subjects had to fill for each bottle.

Finally, in a third step, we asked the subjects to complete a questionnaire containing personal questions about their age, sex, nationality, knowledge of wine (WSET level and nine self-assessment questions). The next section presents more information about the questionnaire itself, as well as a summary of descriptive statistics for these variables.

III. Variables and Data Analysis

During the four sessions, we collected observations on subjects' risk aversion, WTP for bottles of older wines aged in sub-optimal conditions, self-assessed knowledge about wine, WSET level, age, gender, and subject's knowledge of the wine he or she is currently rating.[4] Table 2 provides an overview of the descriptive statistics. More information about the self-reported knowledge in wines variable is available in an appendix.

Given the high number of censored observations (WTP = 0) and the sequential nature of the declaration of WTP for each bottle, estimates are made with a tobit panel model. The results are shown in Table 3.

The results we obtained highlight several interesting relationships. Subjects report a significantly higher WTP when their appetite for monetary risk is higher. This result is valid for any of the four risk aversion variables, as well as for average risk aversion. The coefficient associated with risk aversion estimation of Panel 4, which is the panel with the highest stakes, shows a weaker significance. This result is not

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[4] For each wine, the subject had to answer if he or she knew this wine. We control for the fact that the subject knows the wine with a dummy variable in the statistical analysis.

Table 2
Descriptive Statistics

Variable	Description of the Variable	Average Value	Standard Deviation	Min.	Max.
Bid	Bid of a subject for a wine expressed in euros	5.30	3.90	0	18
Risk aversion 1	Risk aversion measured from Panel 1 from 1 to 10	3.94	3.01	1	10
Risk aversion 2	Risk aversion measured from Panel 2 from 1 to 10	3.71	2.47	1	10
Risk aversion 3	Risk aversion measured from Panel 3 from 1 to 10	3.81	1.96	1	8
Risk aversion 4	Risk aversion measured from Panel 3 from 1 to 10	3.24	1.92	1	7
Average risk average	Average of four risk aversion measures	3.68	1.71	1	7.25
WSET	WSET level of the subject from 0 to 4	0.61	1.11	0	3
Knowledge	Self-reported knowledge of wines from 1 to 7	3.95	1.33	2.40	6.80
Know this wine	Dummy variable equal to 1 if the subject knows the wine he/she is evaluating	0.42	0.52	0	1
Gender	Dummy variable equal to 1 if the subject is female	0.62	0.47	0	1
Age	Age of the subject	25.7	6.27	18	46
Color	Dummy variable equal to 1 if the wine is red	0.60	0.49	0	1
Year	Year of production of the wine	2009	2.11	2004	2012
Alcohol content	Alcohol content of the wine	13.18	0.46	12.5	14

so surprising since the highest reward (100 euros) of this panel is so appealing that a non-trivial number of subjects chose this option even though they had chosen much safer choices in previous panels. Interestingly, while old wine-related uncertainty and monetary risk are certainly two different domains involving risky choices, we confirm the external validity of in-lab risk elicitation tools such as the lottery panel test adopted here.

Subjects' knowledge about wine is also an important variable of their WTP for aged wines. Subjects with higher self-reported knowledge and a higher WSET level have, on average, a significantly lower WTP for aged wines. This result might highlight the fact that people with lower knowledge overestimate the probability that an old wine that aged under uncontrolled conditions could still be worth consuming. It is very likely that more informed subjects about wines are more likely to know this information.

Finally, the results show that the characteristics of the wine we control for (year, color, degree of alcohol, and French wine) do not significantly interfere with subjects' WTP. This result, as surprising as it might be, does not mean that the wine's characteristics were totally irrelevant for determining the subjects' WTP in this

Table 3
Estimates of a Tobit Panel Model

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Average risk	−0.536***				
	(−6.40)				
Risk Panel 1		−0.226***			
		(−4.48)			
Risk Panel 2			−0.384***		
			(−6.65)		
Risk Panel 3				−0.374***	
				(−5.01)	
Risk Panel 4					−0.200**
					(−2.45)
Wine student	1.463***	1.138***	1.720***	1.562***	1.643***
	(3.65)	(2.75)	(4.27)	(3.86)	(3.99)
Know this wine	1.478***	1.458***	1.393***	1.425***	1.377***
	(4.82)	(4.71)	(4.55)	(4.62)	(4.42)
Female	−0.623**	−0.637**	−0.742**	−0.642**	−0.764
	(−2.07)	(−2.09)	(−2.47)	(−2.11)	(−2.50)
Age of subject	−0.109***	−0.090***	−0.114***	−0.106***	−0.096***
	(−4.33)	(−3.59)	(−4.53)	(−4.17)	(−3.76)
Knowledge	−0.621***	−0.620***	−0.451***	−0.658***	−0.546***
	(−3.90)	(−3.84)	(−2.84)	(−4.05)	(−3.38)
WSET	−0.882***	−0.683***	−0.958***	−0.871***	−1.062***
	(−4.34)	(−3.24)	(−4.70)	(−4.25)	(−4.91)
Red wine	0.085	0.102	0.102	0.083	0.131
	(0.29)	(0.34)	(0.34)	(0.28)	(0.43)
Year of production	−0.011	−0.012	−0.007	−0.0075	−0.0088
	(−0.16)	(−0.16)	(−0.10)	(−0.10)	(−0.12)
Alcohol content	−0.046	−0.045	−0.040	−0.042	−0.034
	(−0.92)	(−0.89)	(−0.80)	(−0.84)	(−0.67)
French wine	0.200	0.206	0.208	0.204	0.222
	(0.46)	(0.47)	(0.48)	(0.47)	(0.50)
Constant	34.52	34.32	25.59	26.78	27.99
	(0.24)	(0.24)	(0.18)	(0.19)	(0.19)
Pseudo R^2	0.29	0.27	0.29	0.28	0.26
Number of observations	1,016	1,016	1,016	1,016	1,016

Note: t-statistics in parentheses, $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

experiment. There are a lot of other wine characteristics such as grape variety, the wine producer, the region of origin, the style of the label that we were not able to control for in the econometric analysis due to the lack of replicates of each of these characteristics in our sample.

IV. Conclusion

While the regulatory environment for food and beverage production tends to get tougher over time, we still know very little about people's risk preferences for this

type of product. In this study, we have attempted to establish a statistical relationship between subjects' monetary risk aversion and risk preferences for aged wines. For this purpose, we ran laboratory experiments on 65 subjects with different profiles and real monetary rewards. Our results show in particular that a lower risk aversion for monetary choices is associated with a higher WTP for wines at risk. Also, we show that subjects' knowledge about wines in general leads to a significantly lower WTP for aged wines. These results shed new light on wine consumers' behavior, especially on aged wines that are attracting an increasing number of consumers in auctions.

Despite interesting results, one important shortcoming should be mentioned. Due to the small size of our sample and the resulting identification problem (e.g., perfect collinearities), we could not include all potentially relevant wine characteristics. Even though we were aware of this before running the experiment, the pool of bottles that we had access to for the experiment was not large enough to have a sufficient number of replicates of some characteristics (e.g., different wines by one winemaker in order to identify winemakers fixed effects). Also, the sample we used did not have a wine with a special reputation for aging. Although these discrepancies do not affect the robustness of our results regarding our main focus, which is the relationship between subjects' risk aversion and their WTP for aged wines, we believe the research question can be further addressed with a larger sample of bottles, or by accounting for more wine characteristics. We hope, however, that our results will inspire future studies and pave the way for further research on this topic.

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