Do good things come in small packages? Willingness to pay for pomegranate wine and bottle size effects

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Do good things come in small packages? Willingness to pay for pomegranate wine and bottle size effects *

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Abstract: We evaluate the claim that bottle size formats signal quality changes, using a controlled laboratory experiment where we simultaneously auctioned two different sweet wines: a pomegranate wine and a grape wine. We varied on a between subjects basis the size of the bottle, from 500ml to 750ml, but kept the wine content of the bottle constant across bottle size formats. We also explored in a within subjects design the effect of expectations for the wines, blind tasting and information on willingness to pay. For the grape wine we find evidence consistent with diminishing marginal utility while for the pomegranate wine we find a premium for the smaller bottle size which is consistent with changes in perceived quality of the wine. We also find that information is adequate in offsetting the negative effect from the tasting treatment.

Keywords: second price auction, laboratory experiment, wine, sensory analysis, willingness to pay, bottle size effect.

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1 Introduction

Although it is widely known that wine has been produced for thousands of years, it is less well known among ordinary consumers that wine is not always made of grape. Mead, for example, although not classified as wine, is created with a similar process to wine from fermenting honey with water (sometimes with various fruits and spices) and has been produced in Europe, Africa and Asia as far back in time as wine (Toussaint-Samat, 2009). Wherever grapes were scarce, fruit wine making blossomed (Schneider, 2007) and in modern times fruit wine has come to mean any fermented alcoholic beverage made from any plant matter that can be fermented. This definition usually excludes beer, mead, cider and perry which historically constitute separate categories.

The market size for fruit wines is not easy to determine, however, since most fruit wines are sweet, the size of the dessert wine category is often used as a proxy. Although the sweet wine market has been estimated to be just 2% of the global wine market (Rivard, 2009, pp. 13), non-grape wines represented the fastest growing sector of the US wine industry since demand for fruit wines grew by more than 89% in 2014 (Anonymous, 2015).[1]

Given the small but growing nature of the fruit wine industry, knowledge of consumer preferences can be very important for proper targeting consumers segments that are more likely to purchase fruit wines at a given price. When it comes to (fruit) wines, it is often not enough to increase consumer awareness by providing information for those salient characteristics that may affect choices. Sensory characteristics of wines can be very important elements of repeat purchases, therefore, studying the combined effect of information and sensory evaluations may provide unique insights of the importance of both sensory and information cues in marketing research (Combris et al., 2009).

For wines in particular, sensory evaluation is an important element guiding the consumer-driven winemaking process (Lesschaeve, 2007) and has often been explored in relation to wine market prices (see Goldstein et al., 2008; Granato et al., 2011; Lecocq and Visser, 2006, among others). Marketers pay special attention to the determination of pricing strategies by using a plethora of methods to uncover consumers' willingness to pay (WTP). Experimental economics methods, like auctions (Lusk and Shogren, 2007), have often been used in order to elicit consumers' valuation for wines or wine specific attributes. For example, Lecocq et al. (2005) used a Vickrey auction in order to investigate the impact of information on bids for four red wines (two Bordeaux and two Burgundy wines) and found a higher WTP when subjects were provided with information about the wines' characteristics and opinions

[1] A similar statement about fruit wines being the fastest growing sector in Europe, can be found in the website of the European Cider and Fruit wine Association but without specific numbers backing up the claim.

from experts after first blind tasting the wines. However, when information was provided before tasting, tasting did not exert a significant effect on WTP. More recently, Vecchio (2013) used a 5th price Vickrey auction to determine price premiums for sustainable wines (Protected Geographical Indication wines from Sicily) and Bazoche et al. (2008) used the Becker-DeGroot-Marshak mechanism to study the impact of information about pesticide use in farming on WTP for four Bordeaux wines.

A variety of marketing tools like packaging, bottle shapes, designer labels and advertising (Boudreaux and Palmer, 2007; de Mello and Pires, 2009) are used by wineries to convince consumers that their wines are of higher quality and therefore worth a higher price. However, little work has been done on the signaling effect of bottle size formats on implied quality of wines. The bottle size format is one of the most accessible and easy-to-process products cues to which consumers are exposed and has rightly be given prompt attention, albeit for many other goods but wine. For example, Mathur and Qiu (2012) and Yan et al. (2014) provide evidence that consumers associate package size with quality of consumer packaged goods (the products used in these studies were potato chips, shampoo, laundry detergent, orange juice, vitamin pills and pharmaceutical drugs). Their results suggest that marketers can manipulate consumers' perception of product quality as smaller package sizes signal superior quality, even in the absence of unit price information. In addition, Shreay et al. (2016) conclude that different package sizes of the same product may reflect product differentiation, which can explain quantity surcharges.

From the perspective of economics, as long as the quality of the good is unchanged, when examining marginal increases in the quantity of a good, the price a consumer is WTP for the marginal increase should be progressively lower due to diminishing marginal utility. If, on the other hand, (perceived) quality differs because of changes in the quantity of the good, then diminishing marginal utility is not relevant to explain price premium differences. Perception of quality with respect to quantity is summarized in the popular proverb "Good things come in small packages" which is to say that the size of goods doesn't always indicate their quality; smaller things often have better quality than larger ones.

The notion that prices may convey quality signals is well known in the behavioral marketing literature (Bagwell and Riordan, 1991; Rao and Monroe, 1989; Shiv et al., 2005), however, the relation of bottle size formats and prices is not well established. In a related paper, Outreville (2011) studied posted prices found on company's websites of several Champagne producers (e.g., Dom Perignon, Moet-Chandon, Deutz etc.) for a variety of bottle formats (from Demi (375ml) and Jennie (500ml) bottle formats to Nabuchodonosor (15L) bottles). He found that smaller Champagne bottles are sold for a higher normalized price relative to the 750ml format. Similar results were obtained for Bordeaux and Burgundy

wines. On the other hand, Brunke et al. (2009) found no effect of smaller than 750ml bottle formats on prices of wines offered for sale at auction markets in Germany. A recent contribution to this broad literature of consumer-packaged goods comes from Yan et al. (2014) who introduce the importance of the effect of package size on product's unit price rather than on total price of the good. They investigate how variations in package size of food and non-food items (but not wines) can affect both the unit price and the total price and found that smaller packages are judged to be better as they are associated with higher unit price (but lower overall price).

Thomas (2000) notes how important packaging is because it embodies aesthetics and emotions and represents the last chance to communicate with and influence consumers. Wine makers and marketers are aware of the power of packaging on consumers' purchasing behavior and this is why they give great importance to which product information appear on the label. It is a well established finding in the behavioral marketing literature that product information may shape hedonic and sensory judgments. For example, Allison and Uhl (1964) in a very influential work, concluded that consumers showed a preference for their favorite beer in a labeled condition but not in blind tests. Johansson et al. (1999) reached a similar conclusion by performing a blind and a non-blind preference test for tomatoes in a selected trained panel. Finally, in a wine tasting experiment, positive and negative information about the wine, affected not only the overall assessment of the wine after the tasting but also the experience itself (Siegrist and Cousin, 2009).

To test whether the bottle size format signals quality changes, we used a controlled laboratory experiment where we simultaneously auctioned two different sweet wines: a pomegranate wine and a grape wine. We varied on a between subjects basis the size of the bottle, from 500ml to 750ml but kept the wine content of the bottle constant across bottle size formats. For the grape wine we find that subjects are willing to pay more for the increased quantity but that the premium increase is consistent with diminishing marginal utility. For the pomegranate wine, our estimates imply a premium for the smaller bottle size which is consistent with changes in perceived quality of the wine due to changes in perceived scarcity.

Besides bottle size effects, we also explore in a within subjects design the effect of prior expectations (Visual treatment), blind tasting (Sensory treatment) and information (Information treatment) on WTP for the two wines. We find that tasting has a negative effect on WTP with respect to expectations from the visual first stage but that information about wines offsets the negative effect of the taste (Sensory) treatment. In the next section we present our experimental design, and proceed with the statistical and econometric analysis in Section 3. We conclude in the final section.

2 Experimental design

Our experiment combined characteristics of a within- and a between-subjects design (Charness et al., 2012). In June/July 2015, a marketing research company recruited for us adult subjects (≥18 years old) from the general population in Athens, Greece, with the understanding that they will participate in a marketing research of approximately one hour at the university campus. Consumers were screened over their various consumption habits and only consumers with no allergies associated with food/drink consumption that stated to drink at least one glass of wine twice per week and buy a bottle of wine at least once a month were invited to participate. In all, 160 subjects participated in our experiment over 17 sessions (all but two sessions were conducted with 10 subjects/session). In addition subjects were asked not to smoke, eat or drink anything except water at least 1.5 hours before their session in order to avoid any influence of their taste perception from prior cigarette/food/beverage consumption. Sessions were spread over all weekdays (except Sunday) and throughout the morning and afternoon hours, in order to accommodate respondents with various time schedules. The experiment was fully computerized using zTree (Fischbacher, 2007).

Upon arrival, subjects were given a consent form to sign and when all subjects necessary to form an auction group had arrived (subjects participated in auction groups of 5 subjects), they were randomly seated to one of the PC private booths. Printed instructions were given to all subjects and the experimenter read aloud instructions. Subjects were specifically instructed to raise their hand and ask any questions in private and that the experimenter would then share her answer with the group. Subjects received a show-up fee of €10 and another €10 upon successful completion of the experiment. Subjects could earn or lose money during the experiment (described momentarily), so that average total payouts were €25.7 (S.D.=3.90, min=8, max=40). After instructions were read aloud, subjects filled a series of computerized control questions to enhance comprehension of instructions. They were free to advise their printed instructions or ask questions to the experimenter and generally showed a good understanding with an average of 10.5 correct answers out of 12 questions.

The experiment consisted of three stages (experimental instructions are reproduced in English in Appendix C). Stage 3 involved two risk preference elicitation tasks. These data will be analyzed elsewhere and are not further discussed here. In Stage 1 subjects went through a typical real effort task where they had to count and report the number of zeros shown in a 4×4 matrix. This task was repeated 10 times (the elements of the matrix where random and changed with each repetition but was the same for all subjects at a given repetition) and subjects could earn €0.5 every time they correctly solved the task within

30 seconds. The task aimed at mitigating house money effects by making subjects earn part of their endowment (e..g., Corgnet et al., 2014; Jacquemet et al., 2009). The task was purposefully made easy (as evident by the fact that earned real effort money averaged €4.83 with a standard deviation of 0.31 and that 73.8% and 20.6% of subjects earned exactly €5 and €4.5, respectively), so that subjects would start off in Stage 2 of the experiment with approximately equal endowments.

In Stage 2 subjects participated in a series of 2nd price Vickrey auctions (Vickrey, 1961) in groups of 5 subjects. Matching in groups was random and remained the same throughout the session. Subjects were unaware of which other subjects in the session composed their group. The group size was decided with three things in mind: a) avoid disengaging off-margin bidders from the auction procedure (Shogren et al., 2001) by having 'too large' groups b) given that price feedback in repeated 2nd price auctions is discouraged (Corrigan et al., 2012), avoid 'too small' groups that would, by design, easily reveal bidding behavior of other subjects and c) increase the number of independent observations (if we count the auction group as the unit of an independent observation). In addition, recent theoretical (Banerji and Gupta, 2014) and empirical studies (Rosato and Tymula, 2016) have shown that if subjects have reference dependent preferences then the equilibrium bid is lower when the number of bidders is larger. Thus, by keeping the number of bidders constant we eliminate a possible confound.

The mechanics of the auction were explained in the instructions. In order to ensure that the procedure was fully understood, three hypothetical training rounds for two non-focal food products were conducted: a pack of biscuits and a chocolate bar (pictures of the products as shown to the subjects can be found in Appendix B; pictures B.2a and B.2b). Bids were entered simultaneously for the two goods. The purpose of the training rounds was to closely mimic the real auctions rounds that followed.

Right after the training rounds, subjects were served with 40 ml of each of the two wines in ISO wine tasting glasses (see picture B.1). Wines were only identified by a three digit number at this stage. Subjects were reminded that wines should be tasted only when they are instructed to do so. Research assistants in the lab made sure that everyone followed this rule and, as a consequence, we didn't observe anyone breaking it. The real auction rounds that followed, consisted of three within-subjects treatments: the Visual, the Sensory and the Information treatment (see Figure 1). Subjects went progressively from the Visual, to the Sensory and to the Information treatment. Each of the within-subjects treatments involved three repetitions of a 2nd price auction for the two wines for a total of nine rounds. Subjects were told that only one round and one product would be randomly selected for each auction group at the end of the session using a bingo cage. Just before each three-round auction

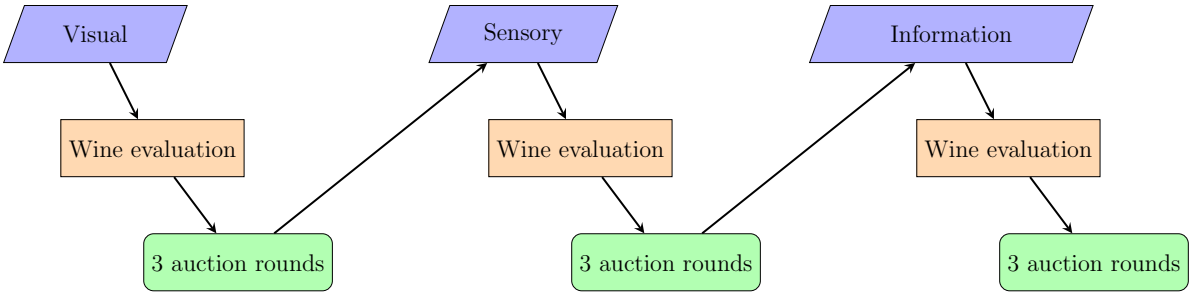

Figure 1: Within-subjects treatments

repetition, subjects completed hedonic evaluations for both wines (on a scale from 1 to 9) as well as paired comparisons.[2]

In the first within-subjects treatment (Visual treatment), subjects were asked to observe the two wines and evaluate them based on their expectation of liking each wine (presentation order of wines was randomized between-subjects). Subjects then bid in three repeated auction rounds their WTP to buy a bottle of each wine. In the second within-subjects treatment (Sensory treatment), subjects were asked to first taste and then evaluate each wine. The order of tasting of the wines was randomized for each subject by receiving private instructions on their screen and subjects were instructed to rinse their mouths using water before tasting the second wine. Subjects then bid again in three repeated auction rounds. In the third within-subjects treatment (Information treatment), subjects were given information about each wine, they saw pictures of the wines in their computer screens (shown in Appendix B: pictures B.3a, B.3b, B.3c and B.3d) and real bottles of wines were circulated in the lab for subjects to observe closely if they wished to do so. The information given in this treatment was the actual information written on the labels of the bottles which included information about the grape and pomegranate variety, growth location of the fruits, bottling location and serving advise[3].

Furthermore, in order to examine bottle size effects, we varied on a between-subjects

[2]In sensory evaluation analysis, any given sensory attribute is seen as having two basic underlying scales: a scale of magnitude and a scale of dissimilarity. Because discrimination changes with the magnitude of the stimulus difference, category scale data are expected to be non-linearly related to magnitude scale. The magnitude of attributes is often measured by means of nine-point ordinal scales which have been repeatedly assessed for their reliability and validity (Stone and Sidel, 2004, pp. 88). Discrimination testing seeks to answer the question of whether two products are perceived as different. This is often measured through a paired comparison test asking subjects to indicate which product they prefer (or whether they are indifferent between products). These tests are viewed as particularly informative when there are changes in choices patterns after a change in the task (Stone and Sidel, 2004, pp. 150), similar to what is accomplished with our within-subjects treatments.

[3]For the pomegranate wine the information indicated that the pomegranate juice comes from the local Ermioni variety, grown in the island of Evia where the wine is also fermented and bottled. For the grape wine the information indicated that the wine comes from juice from the variety 'Muscat of Alexandria', fermented and bottled in the island of Limnos.

basis the bottle size of the wines at two levels: a standard 750 ml bottle and a 500 ml bottle. Table 1 shows the number of subjects participating in each cell of this 2×2 experimental design. Subjects knew from the very beginning of the auction the size of the bottles for each wine they were bidding on. This information was also discretely reminded during the bidding stage with appropriate descriptive text in their computer screens. Both wines were bottled and labeled on demand by their producers for the purpose of this experiment.

Table 1: Between-subjects treatments

		Pomegranate wine	
		500 ml	750 ml
Grape wine	500 ml	40 subjects	40 subjects
	750 ml	40 subjects	40 subjects

3 Results

The essence of experimentation is the ability to establish exogeneity of the treatment by comparing groups of subjects that have the same expectation in the distribution of all covariates which are potentially relevant for the treatment outcome. Typically, before presenting any results, experimenters perform balance tests as a scrutiny test for randomization success. With our data we fail to reject the null of no difference for the between-subjects treatments at $\alpha = 5\%$ significance level for age (Kruskal-Wallis $\chi^2 = 0.071$, p-value $= 0.995$), body mass index constructed from self-reported weight and height (Kruskal-Wallis $\chi^2 = 0.096$, p-value $= 0.992$), gender (Pearson's $\chi^2 = 1.117$, p-value $= 0.773$), education level (Fisher's exact p-value $= 0.614$), household size (Pearson's $\chi^2 = 10.810$, p-value $= 0.545$), smoking status (Fisher's exact p-value $= 0.718$), consumption frequency of alcoholic drinks in general (Pearson's $\chi^2 = 2.438$, p-value $= 0.883$) and wine in particular (Pearson's $\chi^2 = 3.174$, p-value $= 0.366$), number of alcoholic drinks consumed in a typical day (Fisher's exact p-value0.883) and income levels (Fisher's exact p-value $= 0.069$). [4]

[4] Although such balance tests are popular and almost mandated by reviewers, we should note that it is debatable whether they are really meaningful. For example, Ho et al. (2007) categorize such tests under the term 'the Balance Test Fallacy'. Their main point is that '... balance is a characteristic of the observed sample, not some hypothetical population' and that 'the idea that hypothesis tests are useful for checking balance is therefore incorrect.' Mutz and Pemantle (2015) note that randomization is a process rather than an outcome and that the intuition that '... formal tests [...] may be useful to detect errors in the implementation of randomization [...] are not, in and of themselves, sufficient evidence of a randomization problem.' They conclude that the process of randomization is either done correctly or not; there is no middle ground.

3.1 Hedonic evaluation of wines

We first start by analyzing the hedonic score data for wine evaluations. Figure 2 shows histograms of wine evaluations for each wine, pooled over all treatments. It is obvious that the grape wine is evaluated better than the pomegranate wine and although the figure pools the data over all treatments, a similar picture emerges if one examines score differences on a treatment by treatment basis (see figures A.1, A.2 and A.3 in Appendix A). We can use a Sign test to calculate the differences between the hedonic scores for the two wines and test the null hypothesis that the median of the differences is zero. The null is highly rejected (p-value < 0.001) over the one sided alternative that the median of the difference: Hedonic score grape wine$-$Hedonic score pomegranate wine > 0. The null is highly rejected as well (p-value $= 0.004$), if we do the test separately for each within-subjects treatment.

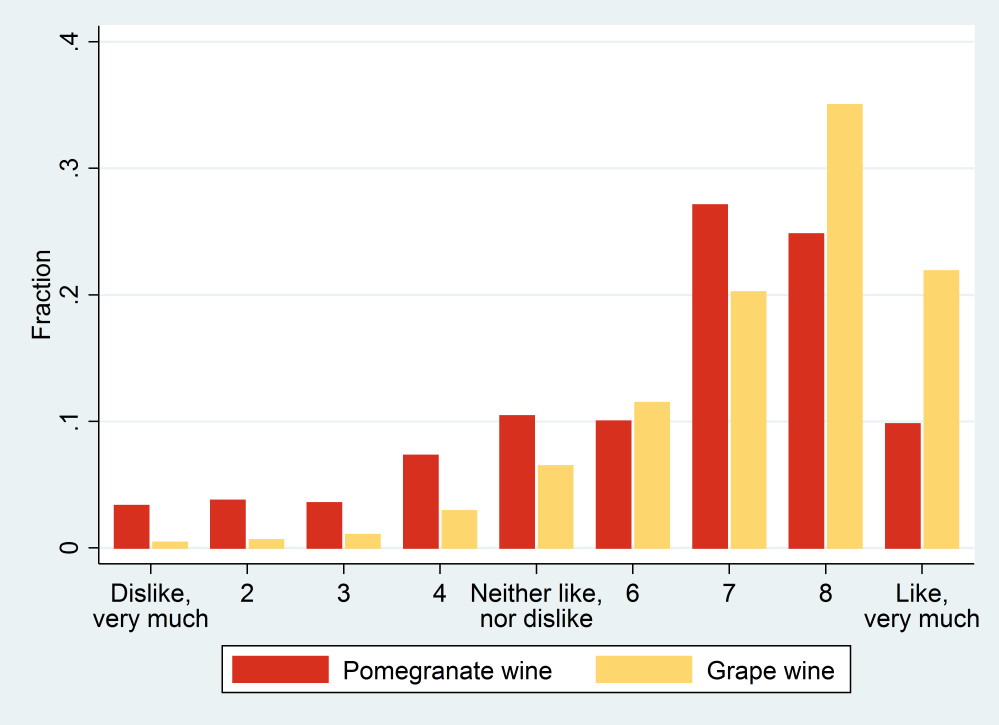

Figure 2: Hedonic evaluation scores by wine

We can further examine the factors that affect hedonic score evaluations by means of random effects ordered logit regressions which are shown in Table 2 (Table A.1 in Appendix A shows results with additional controls added in the model specification). Table 2 depicts results separately for each type of wine as well as a pooled model. The pooled model interacts the treatment dummies with the wine dummy (Grape wine) to examine any differential treatment effects across products.

For one, we can see in Table 2 that the Information treatment boosts hedonic scores

for both wines with respect to the Visual treatment. In addition, tasting improves hedonic evaluation of the grape wine when compared with evaluation based on expectations only. However, tasting does little in that direction for the pomegranate wine. Second, the pooled model shows a positive and statistically significant effect for the grape wine dummy which indicates an overall liking in favor of the grape wine. The interaction terms for the within subjects treatments indicate that the Sensory and Information treatment effects are larger in size for the grape wine as compared to the pomegranate wine.

Paired comparison data are depicted in Figure 3. The question we seek to answer is whether the two types of wine are perceived as dissimilar at each of the within-subjects treatments. Besides the visual dissimilarity, which is more pronounced in the Visual treatment (i.e., subjects are shown to prefer the grape wine more than the pomegranate wine), we can test whether the observed percentages are significantly different from expected percentages using a χ^2 goodness of fit test. For the Visual treatment when we test whether the observed percentages (49.38% prefer the grape wine and 30% prefer the pomegranate wine) are different than an equal split between the two wines (i.e., 50% to prefer the grape wine and 50% to prefer the pomegranate wine), we reject the null ($\chi^2 = 12.13$, p-value $= 0.007$). Although in the Sensory treatment there is a shift toward the pomegranate wine, we fail to reject the null ($\chi^2 = 5.52$, p-value $= 0.137$) of an equal split between the two wines. The shift toward preferring the pomegranate wine is further reinforced in the Information treatment and the observed difference in favor of the pomegranate wine is statistically different than an equal split of subjects between the two wines ($\chi^2 = 6.25$, p-value $= 0.044$). Furthermore, a Pearson χ^2 test of whether choice in the paired comparison is not related to the within subjects treatments, rejects the null ($\chi^2 = 19.48$, p-value $= 0.003$) which indicates that the within subjects treatments exert a statistically significant effect on paired comparison.

In a conditional analysis context, the factors that affect choice in the paired comparison test can be examined by means of a multinomial logit model. Results are shown in Table 3 (Table A.2 in Appendix A shows results with additional controls added in the model specification). Results reconfirm Figure 3. The Sensory and Information treatments exert a statistically significant effect and the negative sign indicates it is less likely that someone will choose the grape wine over the pomegranate wine as compared to the Visual treatment. That is, the negative coefficients for the within subjects treatments highlight the shift toward the pomegranate wine illustrated in Figure 3. In addition, when we test for a difference between the Sensory and the Information treatment coefficients, we fail to reject the null for the outcomes 'Choose the grape wine' and 'Like both wines equally well'.

Table 2: Random effects ordered logit models of hedonic evaluations

	Pomegranate wine	Grape wine	Pooled model with clustered standard errors
Pomegranate: 500ml, Grape: 500ml	0.113	-0.418	0.158
	(0.723)	(0.554)	(0.249)
Pomegranate: 500ml, Grape: 750ml	0.567	-0.027	0.315
	(0.725)	(0.556)	(0.231)
Pomegranate: 750ml, Grape: 500ml	0.276	0.555	0.197
	(0.724)	(0.556)	(0.240)
Sensory treatment	-0.401*	0.783***	-0.214
	(0.216)	(0.222)	(0.214)
Information treatment	0.894***	1.422***	0.429**
	(0.221)	(0.232)	(0.202)
Grape wine			0.737***
			(0.257)
(Pomegranate: 500ml, Grape: 500ml)× Grape wine			-0.350
			(0.285)
(Pomegranate: 500ml, Grape: 750ml)× Grape wine			-0.324
			(0.272)
(Pomegranate: 750ml, Grape: 500ml)× Grape wine			0.167
			(0.303)
Sensory treatment× Grape wine			0.695***
			(0.254)
Information treatment× Grape wine			0.417*
			(0.233)
Gender	-0.547	-0.832**	-0.400***
	(0.518)	(0.399)	(0.136)
Age	0.049**	0.030*	0.018***
	(0.024)	(0.018)	(0.006)
σ_u^2	9.137***	4.790***	
	(1.599)	(0.935)	
Observations	480	480	960
Log-likelihood	-796.788	-707.661	-1703.873

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Base categories are: (Pomegranate wine: 750ml, Grape wine: 750ml), Visual treatment.

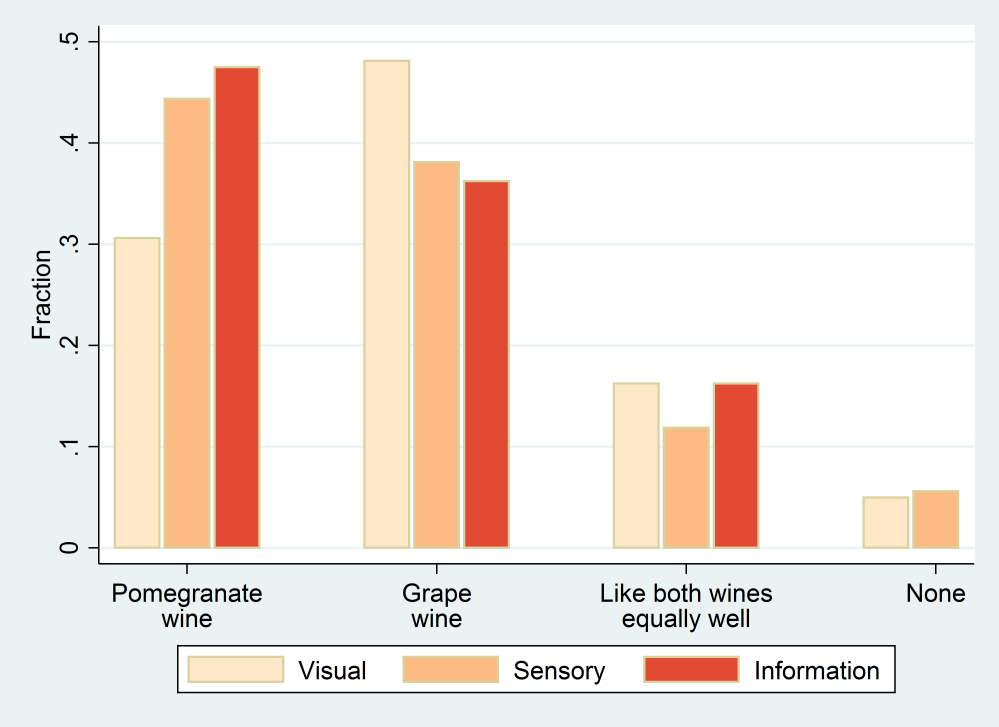

Figure 3: Paired comparisons of wines by within-subjects treatment

Table 3: Multinomial logit model for pairwise comparisons

	Choose grape wine	Like both wines equally well	No choice
Constant	0.518	-1.930**	-1.779
	(0.618)	(0.845)	(1.374)
Pom: 500ml, Grape: 500ml	-0.679*	0.132	1.293
	(0.368)	(0.525)	(0.883)
Pom: 500ml, Grape: 750ml	-0.011	0.661	0.787
	(0.363)	(0.504)	(0.928)
Pom: 750ml, Grape: 500ml	-0.399	0.198	-0.217
	(0.354)	(0.516)	(1.055)
Sensory treatment	-0.614**	-0.693**	-0.238
	(0.256)	(0.308)	(0.439)
Information treatment	-0.729***	-0.439	-15.181***
	(0.265)	(0.337)	(0.418)
Gender	0.225	-0.115	0.469
	(0.252)	(0.352)	(0.622)
Age	0.002	0.024	-0.023
	(0.012)	(0.015)	(0.025)
Observations		480	
Log-likelihood		-518.418	

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 'Choose pomegranate wine' is the base outcome. Base categories are: (Pom: 750ml, Grape: 750ml), Visual treatment.

3.2 Descriptive analysis of bids

Table 4 shows descriptive statistics of bids per treatment for each type of wine. For the pomegranate wine there are two observations to be made. First, across all between-subjects treatments, bids decrease in the Sensory treatment (after tasting) as compared to the Visual treatment but are increased above the level of bids in the Visual treatment when information about the wine is provided. Second, the pomegranate wine is valued more when in a 500ml bottle format and competes with a 750ml bottle of grape wine. For the grape wine there is a linear relationship of bids with the within subjects treatments, that is, bids increase in the Sensory treatment and are further increased in the Information treatment. With respect to bottle size effects, the grape wine is valued more when it is bottled in a 750ml bottle and competes with a 500ml bottle of pomegranate wine. Table 4 is complemented with appropriate statistical tests for treatment effects (i.e., the Kruskal-Wallis test (Kruskal and Wallis, 1952), the K-sample median test (Mood, 1954) and the Friedman test (Friedman, 1937, 1939)) that reveal statistically significant treatment effects. We quantify these effects in a regression context momentarily.

The bottle size effects are graphically depicted in Figure 4 which shows average bids over rounds and over the within subjects treatments per bottle size and wine type. It is obvious that there is an inverse relation between bottle size and valuations for pomegranate wine which is more pronounced in the Information treatment. For the grape wine, there is a positive relationship between bottle size and valuations which remains stable over the within subjects treatments.

3.3 Econometric analysis

To check whether the results obtained above hold in the context of conditional analysis as well as to quantify treatment effects, we estimated random effects regression models where the grouping structure of the data consists of three levels of nested groups (i.e., three random effects): the auction group, j, the individual, i, and the auction round, t. The model specification we estimate is of the form:

$$Bid_{jit} = x_{jit}b + u_j + v_{ji} + \varepsilon_{jit} \tag{1}$$

where $j = 1 \dots J$ indexes the auction groups, $i = i \dots N$ indexes individuals in an auction group, $t = 1 \dots T$ indexes auction rounds (in our case $J = 32$, $N = 160$ and $T = 9$) and x is a vector of independent variables. The random effects, u_j, v_{ji} and ε_{jit} are i.i.d. $N(0, \sigma_u^2)$, $N(0, \sigma_v^2)$ and $N(0, \sigma_\varepsilon^2)$, respectively and independently of each other.

In addition, about 5.5% of all bids for the pomegranate wine is exactly zero. This calls

Table 4: Descriptive statistics of bids per wine product and treatment

		Pomegranate wine				Grape wine			
		Visual	Sensory	Information	Friedman's χ^2 (p-value)	Visual	Sensory	Information	Friedman's χ^2 (p-value)
Pomegranate: 500ml, Grape: 500ml	Mean	4.05	3.76	4.68	7.55 (0.023)	3.72	4.22	4.83	14.517 (0.001)
	S.D.	2.40	2.25	2.50		2.15	2.06	2.47	
	Median	3.50	3.92	5.00		3.50	4.50	5.00	
Pomegranate: 750ml, Grape: 750ml	Mean	5.23	4.40	4.84	23.78 (< 0.001)	6.08	6.22	6.08	21.304 (< 0.001)
	S.D.	4.50	3.82	4.12		4.07	4.58	4.55	
	Median	3.60	3.50	4.00		5.00	5.00	5.00	
Pomegranate: 500ml, Grape: 750ml	Mean	6.08	5.53	6.26	7.85 (0.020)	6.58	6.76	7.23	9.867 (0.007)
	S.D.	4.85	4.50	4.33		4.95	4.28	4.14	
	Median	4.90	4.05	5.00		5.00	5.00	6.35	
Pomegranate: 750ml, Grape: 500ml	Mean	4.29	4.11	4.93	0.538 (0.764)	4.16	4.91	5.29	21.029 (< 0.001)
	S.D.	3.34	3.43	3.66		2.84	3.35	3.47	
	Median	3.90	3.50	4.50		3.85	4.50	5.00	
Kruskal-Wallis test	χ^2 (p-value)	11.66 (0.009)	9.245 (0.026)	10.626 (0.014)		45.520 (< 0.001)	24.197 (< 0.001)	24.553 (< 0.001)	
K-sample equality-of-medians test	χ^2 (p-value)	10.338 (0.016)	3.980 (0.264)	8.960 (0.030)		24.839 (< 0.001)	6.278 (0.099)	17.379 (< 0.001)	

The Kruskal-Wallis test, tests for equality of the between-subjects treatment separately for each of the within-subjects treatments and wine type (column-wise). Similarly for the K-sample test, which performs a non-parametric K-sample test on the equality of medians. The Friedman test, compares the within-subjects treatment (Visual, Sensory, Information) for each of the between-subjects treatments and wine type (row-wise).

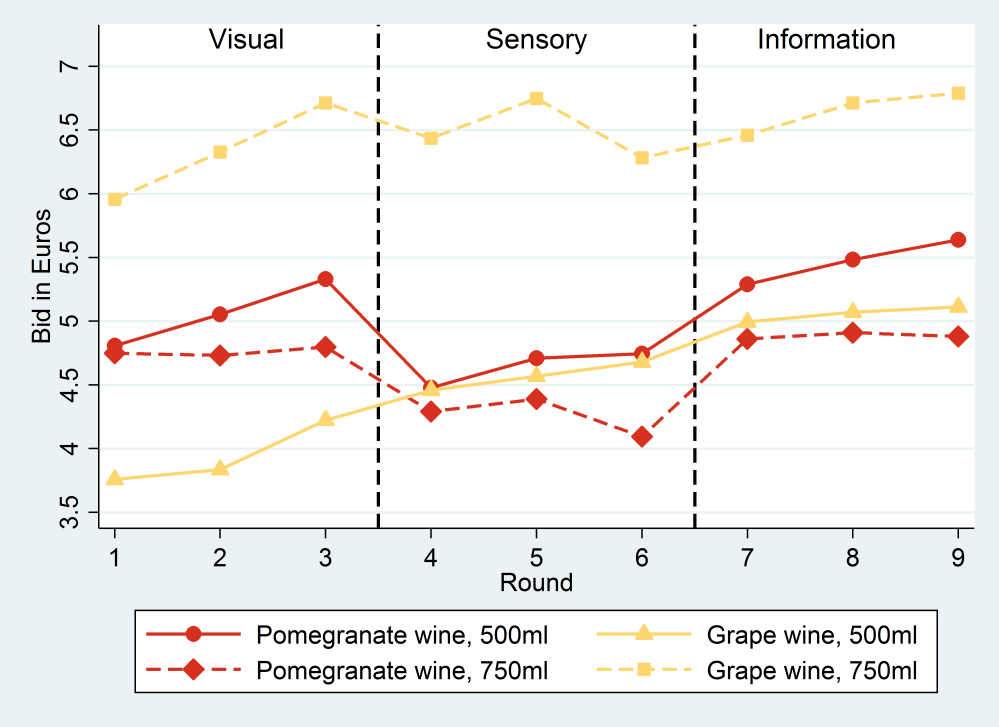

Figure 4: Average bids per round and treatment

for the use of a censored regression model for the pomegranate wine to address possible censoring from the left (Tobit model). The Tobit model complicates slightly the analysis since there are four marginal effect that the researcher might be interested in: a) marginal effects on the latent variable, $\frac{\partial E[Bid^*|x]}{\partial x}$ (these are the raw coefficient estimates) b) on the observed variable, $\frac{\partial E[Bid|x]}{\partial x}$ c) on positive bids, $\frac{\partial E[Bid|Bid>0,x]}{\partial x}$ and d) on the probability of being uncensored, $\frac{\partial Pr[Bid>0|x]}{\partial x}$. For the grape wine, zero bids are a small fraction of total observations (0.7%), therefore we estimate a random effects linear regression model.

Results are exhibited in Table 5 (Table A.3 in Appendix A shows results with additional demographic and attitudinal variables added in the model specification). Last column shows results from the linear regression model while all the other columns show marginal effects from the Tobit model identified by appropriate headings.

We first start with the results from the within-subjects treatments. For the grape wine, bids increase statistically significantly after tasting (Sensory treatment) and further increase after information is revealed (Information treatment). A Wald test of whether the coefficients for the Sensory and Information treatments are statistically different, fails to reject the null ($\chi^2 = 1.51$, p-value $= 0.218$), which indicates that the two treatments have a similar effect on bids as compared to the Visual (baseline) treatment. In terms of magnitude, the effects are rather small: €0.22 and €0.35 for the Sensory and Information treatments, respectively.

For the pomegranate wine, the effect in the Sensory treatment is statistically significant and negative but rather small in magnitude. For example, for those that bid positively, tasting the pomegranate wine reduces bids by €0.21. In addition, the likelihood of someone bidding a positive amount is reduced after tasting by 1.4%. The information treatment does not exert a statistically or economically significant effect with respect to the Visual treatment. This result illustrates a U-shaped effect of the within-subjects treatments on bidding behavior where bids are first decreased after tasting (Sensory treatment) but then are brought back to the level of the Visual treatment after information is revealed in the Information treatment.

For the between-subjects treatments (designed to examine bottle size effects) we find a negative effect on the grape wine for the smaller bottle size format. For example, when compared to a treatment where grape wine is bottled in a 750ml bottle, the 500ml bottle is valued €1.58 and €1.24 less in the two respective treatments. Although the effect is statistically significant at the 10% for one of the treatments, when we control for additional factors (Table A.3 in Appendix A) both treatment effects are statistically significant. In any case, the size of the effects is substantial. In terms of average predicted WTP, we find that a 500ml grape wine is valued at €4.52 while a 750ml bottle at €6.49, which implies a premium of 43.6% for an increase in volume of 50%.

The picture with respect to bottle size effects is reversed for the pomegranate wine. Table 5 shows that with respect to the treatment where both wines have a bottle size of 750ml, no other treatment differs statistically significantly. This implies, however, that a 500ml is valued at least as much as a 750ml bottle which, given the volume difference, implies a premium for the bottle size of 500ml on a per Liter basis. In terms of average predicted valuations, conditional on bidding positively, a 500ml pomegranate wine is valued at €5.59 whereas a 750ml bottle is valued at €5.25, which implies a 6.08% discount for an increase of 50% in volume. That is, the producer is better off by selling 500ml bottles of pomegranate wine.

The effect sizes in Table 5 show that the premium that a smaller bottle size of pomegranate wine can gain, is higher if the pomegranate wine is paired with a bigger bottle size of grape wine. This is likely due to a comparison effect which makes the smaller bottle size look even better for the pomegranate wine when it is compared with a large bottle of grape wine.

Table 5: Random effects Tobit model (pomegranate wine) and random effects linear regression model (grape wine)

	Pomegranate wine				Grape wine
	$\frac{\partial E[Bid^*\|x]}{\partial x}$	$\frac{\partial E[Bid\|x]}{\partial x}$	$\frac{\partial E[Bid\|Bid>0,x]}{\partial x}$	$\frac{\partial Pr[Bid>0\|x]}{\partial x}$	

Constant	11.863***				12.440***
	(3.983)				(3.937)
Pom: 500ml, Grape: 500ml	-0.685	-0.598	-0.482	-0.037	-1.582*
	(0.941)	(0.820)	(0.663)	(0.051)	(0.881)
Pom: 500ml, Grape: 750ml	1.046	0.954	0.802	0.042	0.963
	(0.944)	(0.860)	(0.724)	(0.039)	(0.884)
Pom: 750ml, Grape: 500ml	-0.540	-0.473	-0.383	-0.028	-1.242
	(0.943)	(0.826)	(0.669)	(0.049)	(0.884)
Sensory treatment	-0.288***	-0.254***	-0.208***	-0.014***	0.218**
	(0.104)	(0.092)	(0.075)	(0.005)	(0.111)
Information treatment	-0.096	-0.085	-0.070	-0.005	0.355***
	(0.105)	(0.093)	(0.077)	(0.005)	(0.115)
Endwowment	-2.619***	-2.314***	-1.899***	-0.128***	-2.233***
	(0.749)	(0.663)	(0.552)	(0.040)	(0.742)
Hedonic evaluation	0.726***	0.641***	0.527***	0.036***	0.610***
	(0.044)	(0.042)	(0.041)	(0.004)	(0.055)
Gender	0.119	0.105	0.086	0.006	-0.067
	(0.458)	(0.405)	(0.332)	(0.023)	(0.455)
Age	0.022	0.019	0.016	0.001	-0.007
	(0.023)	(0.020)	(0.016)	(0.001)	(0.022)
σ_u	1.420***				1.253***
	(0.320)				(0.323)
σ_v	2.708***				2.702***
	(0.181)				(0.177)
σ_ε	1.564***				1.702***
	(0.032)				(0.034)
Observations			1440		1440
Log-likelihood			-2845.039		-3073.426

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4 Conclusions

The objective of this paper was twofold; first to investigate the impact of taste and information on WTP for two wines and second, to test whether bottle size formats for wines signal quality changes. Our findings advance knowledge on two separate fronts in the behavioral marketing literature and provide further insights relevant for wine marketing as well as for the broader market of consumer-packaged goods.

First, we add to the behavioral marketing literature by investigating whether packaging elements influence consumer decision making by signaling price and quality changes. Results from the second price auction indicate that subjects are willing to pay more for the increased quantity for the grape wine but that the premium increase is consistent with diminishing marginal utility. On the other hand, for the pomegranate wine, our estimates imply a premium for the smaller bottle size which is consistent with changes in perceived quality of the wine. The differential effect of bottle sizes for different wine types implies that the quote that 'good things come in small packages' should be evaluated on a product by product basis. Based on our findings, we endorse a modified proverb: 'Good things *may* come in small packages but *sometimes* bigger is better'. Managerially, our study establishes the relationship between wine bottle sizes and willingness to pay as well as it offers an alternative approach for marketers to influence consumer's perceived product quality.

Second, this paper contributes to prior research about the role of information in consumer behavior as it examines whether prior expectations, tasting and product information may shape hedonic and sensory judgments and alter consumers' WTP for wines. We find that tasting has a negative effect on willingness to pay with respect to expectations from the visual treatment (prior expectations) but that when information about wines is provided, willingness to pay is brought back to the level of the visual treatment. This finding should be of particular interest to industry as it highlights that information provided on the wine label is one of the key factors determining consumers' WTP. More specifically, results indicate that even if drinkers are not fond of the taste of a wine, provision of detailed information on the bottle for the specific wine could strongly affect positively their WTP. This suggests that information on the label is an important element in the toolkit that marketers can use to influence products perceived quality and consumption choices.

Having said the above, we'd like to emphasize that the role of perceived product quality, expectations and tasting has to be evaluated on a wine by wine basis so that it would be useful to examine the generalizability of our findings across a wider range of wine types, level of wine sweetness and different bottle information.

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A Appendix: Additional tables/figures

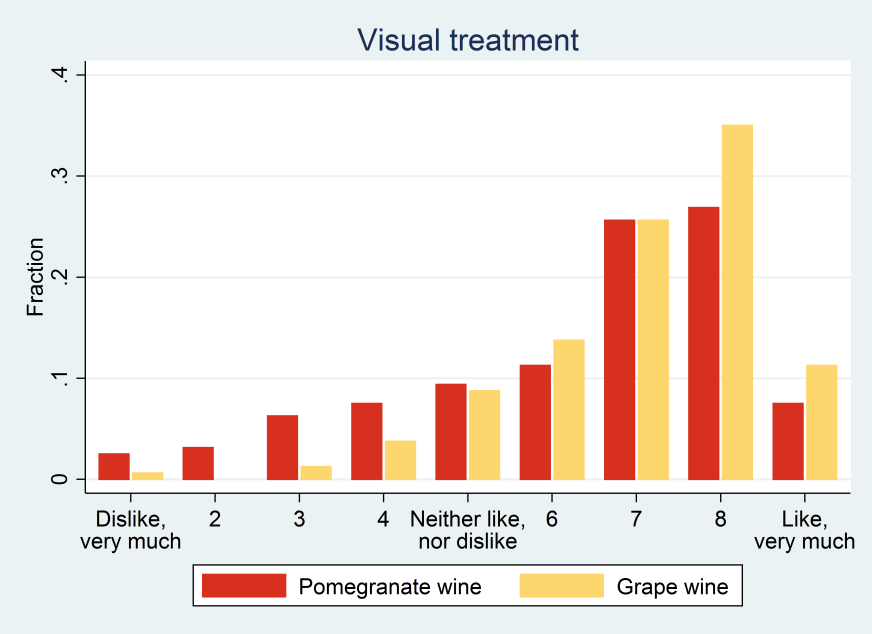


Figure A.1: Hedonic evaluation scores (Visual treatment) by wine

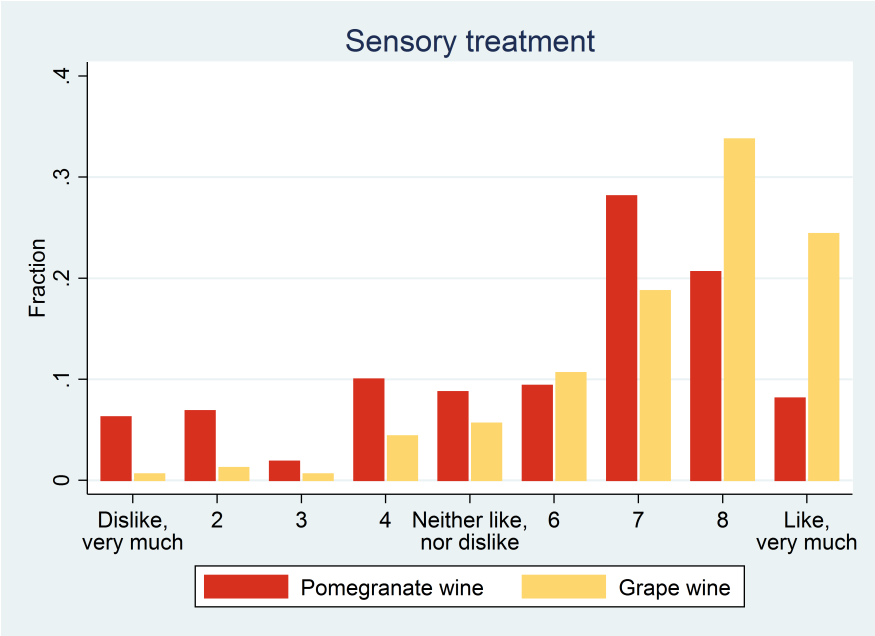


Figure A.2: Hedonic evaluation scores (Sensory treatment) by wine

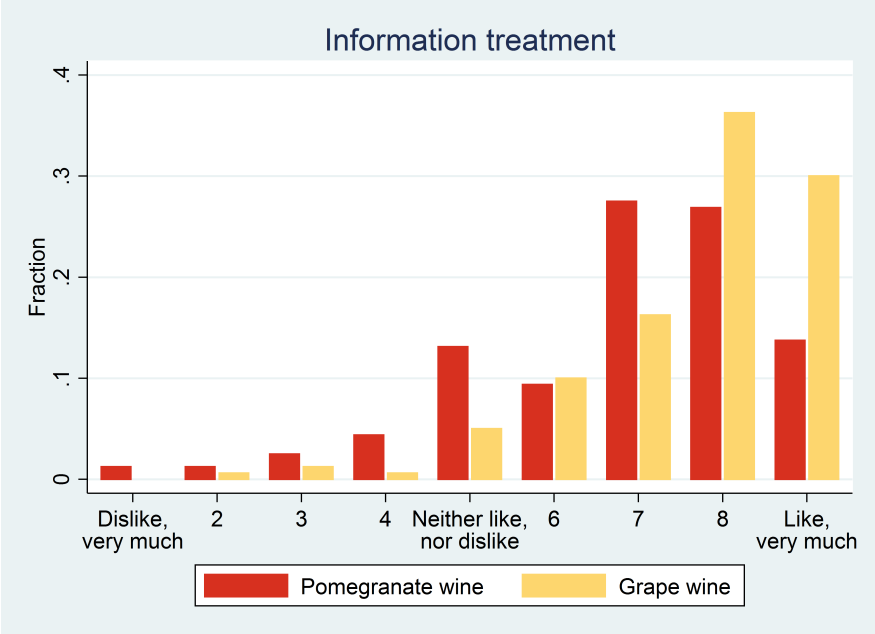


Figure A.3: Hedonic evaluation scores (Information treatment) by wine

Table A.1: Random effects ordered logit models of hedonic evaluations with additional demographics

	Pomegranate wine	Grape wine	Pooled model with clustered standard errors
Pomegranate: 500ml, Grape: 500ml	0.432	-0.464	0.178
	(0.770)	(0.563)	(0.250)
Pomegranate: 500ml, Grape: 750ml	0.648	0.042	0.333
	(0.749)	(0.547)	(0.258)
Pomegranate: 750ml, Grape: 500ml	0.191	0.262	0.135
	(0.792)	(0.580)	(0.262)
Sensory treatment	-0.377*	0.827***	-0.191
	(0.220)	(0.225)	(0.220)
Information treatment	0.892***	1.433***	0.424**
	(0.226)	(0.236)	(0.209)
Grape wine			0.710***
			(0.274)
(Pomegranate: 500ml, Grape: 500ml)× Grape wine			-0.275
			(0.303)
(Pomegranate: 500ml, Grape: 750ml)× Grape wine			-0.277
			(0.291)
(Pomegranate: 750ml, Grape: 500ml)× Grape wine			0.066
			(0.321)
Sensory treatment× Grape wine			0.711***
			(0.267)
Information treatment× Grape wine			0.471*
			(0.245)
Gender	-0.956*	-1.220***	-0.592***
	(0.570)	(0.421)	(0.154)
Age	0.069**	0.036	0.025***
	(0.030)	(0.022)	(0.009)
Body Mass Index	0.007	0.007	-0.002
	(0.065)	(0.048)	(0.020)
Education: University student	0.468	-0.338	0.041
	(0.931)	(0.677)	(0.236)
Education: University graduate	0.481	0.223	0.192
	(0.672)	(0.492)	(0.168)
Education: Post-grad student or higher	1.261	0.906	0.554*
	(1.013)	(0.748)	(0.315)
Household size	-0.570**	-0.171	-0.157***

	(0.229)	(0.166)	(0.058)
Income: Above average	0.862	-0.118	0.066
	(0.882)	(0.643)	(0.233)
Income: Average	0.522	-0.248	-0.024
	(0.834)	(0.612)	(0.232)
Income: Below average	0.386	-0.096	0.040
	(1.000)	(0.732)	(0.314)
Smoking: No	0.240	0.719	0.306*
	(0.595)	(0.438)	(0.163)
Smoking: I've quit	-1.006	0.121	-0.202
	(1.230)	(0.907)	(0.285)
Alcohol consumption: 2 or 3 times per week	-1.308*	0.681	-0.136
	(0.757)	(0.556)	(0.240)
Alcohol consumption: 4 times a week or more often	-0.825	1.109	0.162
	(1.035)	(0.762)	(0.326)
N of drinks in a day: 3 or 4	0.130	0.294	0.096
	(0.713)	(0.526)	(0.197)
Wine consumption: Once a week	0.227	-0.327	-0.058
	(1.067)	(0.779)	(0.295)
Wine consumption: Twice a week	0.629	-1.380*	-0.266
	(1.076)	(0.790)	(0.316)
Wine consumption: 3-4 times a week	1.476	-0.746	0.147
	(1.154)	(0.844)	(0.342)
Wine consumption: (almost) daily	1.012	-1.093	-0.102
	(1.399)	(1.023)	(0.427)
σ_u^2	9.110***	4.240***	
	(1.611)	(0.858)	
Observations	468	468	936
Log-likelihood	-756.887	-679.880	-1634.131

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Base categories are: (Pomegranate: 750ml, Grape: 750ml), Visual treatment, Education: up to senior hi-school, Income: Good or very good, Smoking: Yes, Alcohol consumption: 2 or 4 times per month, N of drinks in a day: 1 or 2, Wine consumption: Once every 15 days.

Table A.2: Multinomial logit model for pairwise comparisons with additional demographics

	Choose grape wine	Like both wines equally well	No choice
Constant	0.081	-1.303	-2.378
	(1.277)	(1.724)	(2.657)
Pomegranate: 500ml, Grape: 500ml	-0.893**	0.099	0.798
	(0.417)	(0.548)	(1.088)
Pomegranate: 500ml, Grape: 750ml	-0.051	0.425	0.318
	(0.374)	(0.544)	(1.292)
Pomegranate: 750ml, Grape: 500ml	-0.346	0.148	-0.611
	(0.389)	(0.550)	(1.432)
Sensory treatment	-0.610**	-0.755**	-0.013
	(0.271)	(0.322)	(0.572)
Information treatment	-0.692**	-0.444	-15.860***
	(0.277)	(0.357)	(0.610)
Gender	0.388	-0.037	1.278*
	(0.289)	(0.368)	(0.703)
Age	-0.008	0.033*	-0.016
	(0.015)	(0.018)	(0.042)
Body Mass Index	0.015	-0.048	-0.103
	(0.034)	(0.039)	(0.070)
Education: University student	-0.358	0.357	2.112**
	(0.441)	(0.613)	(1.052)
Education: University graduate	-0.036	-0.070	0.745
	(0.317)	(0.462)	(0.664)
Education: Post-grad student or higher	-0.218	0.879	2.651*
	(0.470)	(0.753)	(1.464)
Household size	0.205*	0.012	0.433
	(0.113)	(0.149)	(0.370)
Income: Above average	-0.595	-0.302	-2.385
	(0.444)	(0.569)	(1.653)
Income: Average	-0.199	-0.519	-0.623
	(0.396)	(0.554)	(1.055)
Income: Below average	-0.495	0.297	0.449
	(0.506)	(0.620)	(1.082)
Smoking: No	0.297	0.223	-0.057
	(0.278)	(0.394)	(0.807)
Smoking: I've quit	0.650	-0.334	1.654
	(0.610)	(0.828)	(1.870)

Alcohol consumption: 2 or 3 times per week	0.325	-0.028	0.074
	(0.397)	(0.459)	(0.958)
Alcohol consumption: 4 times a week or more often	-0.233	0.549	-0.978
	(0.482)	(0.630)	(1.311)
N of drinks in a day: 3 or 4	-0.133	-0.897**	0.128
	(0.392)	(0.455)	(0.759)
Wine consumption: Once a week	0.024	0.437	-0.881
	(0.546)	(0.672)	(1.409)
Wine consumption: Twice a week	-0.106	0.177	0.801
	(0.538)	(0.656)	(1.160)
Wine consumption: 3-4 times a week	-0.463	-0.177	1.493
	(0.567)	(0.789)	(0.944)
Wine consumption: (almost) daily	0.122	0.094	-13.830***
	(0.655)	(0.910)	(1.423)
Observations	468		
Log-likelihood	-465.926		

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Base categories are: (Pomegranate: 750ml, Grape: 750ml), Visual treatment, Education: up to senior hi-school, Income: Good or very good, Smoking: Yes, Alcohol consumption: 2 or 4 times per month, N of drinks in a day: 1 or 2, Wine consumption: Once every 15 days.

Table A.3: Random effects Tobit model (pomegranate wine) and random effects linear regression model (grape wine) with additional demographics

	Pomegranate wine				Grape wine
	$\frac{\partial E[Bid^*\|x]}{\partial x}$	$\frac{\partial E[Bid\|x]}{\partial x}$	$\frac{\partial E[Bid\|Bid>0,x]}{\partial x}$	$\frac{\partial Pr[Bid>0\|x]}{\partial x}$	
Constant	15.565***				14.037***
	(4.403)				(4.262)
Pomegranate: 500ml, Grape: 500ml	-0.792	-0.687	-0.563	-0.042	-1.567*
	(1.027)	(0.890)	(0.731)	(0.055)	(0.894)
Pomegranate: 500ml, Grape: 750ml	1.248	1.141	0.977	0.048	1.274
	(1.017)	(0.927)	(0.795)	(0.041)	(0.884)
Pomegranate: 750ml, Grape: 500ml	-0.865	-0.749	-0.613	-0.046	-1.566*
	(1.042)	(0.901)	(0.738)	(0.056)	(0.910)
Sensory treatment	-0.248**	-0.217**	-0.181**	-0.012**	0.208*
	(0.103)	(0.090)	(0.075)	(0.005)	(0.113)
Information treatment	-0.030	-0.027	-0.022	-0.001	0.342***
	(0.104)	(0.092)	(0.077)	(0.005)	(0.116)
Endwowment	-2.450***	-2.155***	-1.794***	-0.119***	-1.873**
	(0.756)	(0.666)	(0.562)	(0.039)	(0.745)
Hedonic evaluation	0.730***	0.642***	0.535***	0.036***	0.614***
	(0.046)	(0.043)	(0.042)	(0.004)	(0.056)
Gender	0.184	0.162	0.135	0.009	-0.117
	(0.473)	(0.416)	(0.346)	(0.023)	(0.469)
Age	0.032	0.028	0.023	0.002	0.006
	(0.026)	(0.023)	(0.019)	(0.001)	(0.026)
Body Mass Index	-0.113**	-0.099**	-0.082**	-0.005**	-0.080
	(0.055)	(0.048)	(0.041)	(0.003)	(0.054)
Education: University student	-1.402*	-1.206*	-0.988*	-0.076	-1.898**
	(0.776)	(0.654)	(0.533)	(0.047)	(0.762)
Education: University graduate	-0.486	-0.430	-0.359	-0.023	-0.679
	(0.558)	(0.494)	(0.413)	(0.026)	(0.553)
Education: Post-grad student or higher	0.535	0.485	0.414	0.022	0.541
	(0.848)	(0.772)	(0.663)	(0.033)	(0.840)
Household size	-0.459**	-0.403**	-0.336**	-0.022**	-0.323*
	(0.201)	(0.177)	(0.150)	(0.010)	(0.193)
Income: Above average	-0.108	-0.096	-0.080	-0.005	-0.006
	(0.746)	(0.663)	(0.555)	(0.035)	(0.736)
Income: Average	-0.108	-0.096	-0.080	-0.005	0.503
	(0.709)	(0.630)	(0.528)	(0.033)	(0.698)
Income: Below average	-0.779	-0.679	-0.560	-0.040	-0.846
	(0.828)	(0.721)	(0.596)	(0.043)	(0.820)

Smoking: No	1.003**	0.878**	0.726**	0.050*	1.086**
	(0.509)	(0.445)	(0.370)	(0.027)	(0.498)
Smoking: I've quit	1.155	1.015	0.843	0.057	0.968
	(1.038)	(0.933)	(0.790)	(0.046)	(1.026)
Alcohol consumption: 2 or 3 times per week	0.213	0.189	0.159	0.010	-0.194
	(0.638)	(0.566)	(0.475)	(0.030)	(0.628)
Alcohol consumption: 4 times a week or more often	-0.858	-0.739	-0.608	-0.046	-0.408
	(0.850)	(0.729)	(0.599)	(0.046)	(0.844)
N of drinks in a day: 3 or 4	0.964	0.861	0.726	0.043*	0.705
	(0.590)	(0.532)	(0.452)	(0.025)	(0.583)
Wine consumption: Once a week	-1.336	-1.186	-0.996	-0.061	-1.230
	(0.988)	(0.892)	(0.767)	(0.043)	(0.932)
Wine consumption: Twice a week	-0.837	-0.753	-0.639	-0.036	-0.741
	(0.990)	(0.902)	(0.778)	(0.039)	(0.928)
Wine consumption: 3-4 times a week	-0.924	-0.829	-0.702	-0.040	-1.163
	(1.022)	(0.927)	(0.795)	(0.042)	(0.984)
Wine consumption: (almost) daily	-0.808	-0.727	-0.617	-0.034	-1.825
	(1.198)	(1.081)	(0.923)	(0.050)	(1.168)
σ_u			1.653***		1.307***
			(0.336)		(0.312)
σ_u			2.467***		2.466***
			(0.170)		(0.167)
σ_v			1.536***		1.700***
			(0.032)		(0.034)
Observations			1404		1404
Log-likelihood			-2757.412		-2983.997

Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Base categories are: (Pomegranate: 750ml, Grape: 750ml), Visual treatment, Education: up to senior hi-school, Income: Good or very good, Smoking: Yes, Alcohol consumption: 2 or 4 times per month, N of drinks in a day: 1 or 2, Wine consumption: Once every 15 days.

B Appendix: Pictures and other experimental stimuli

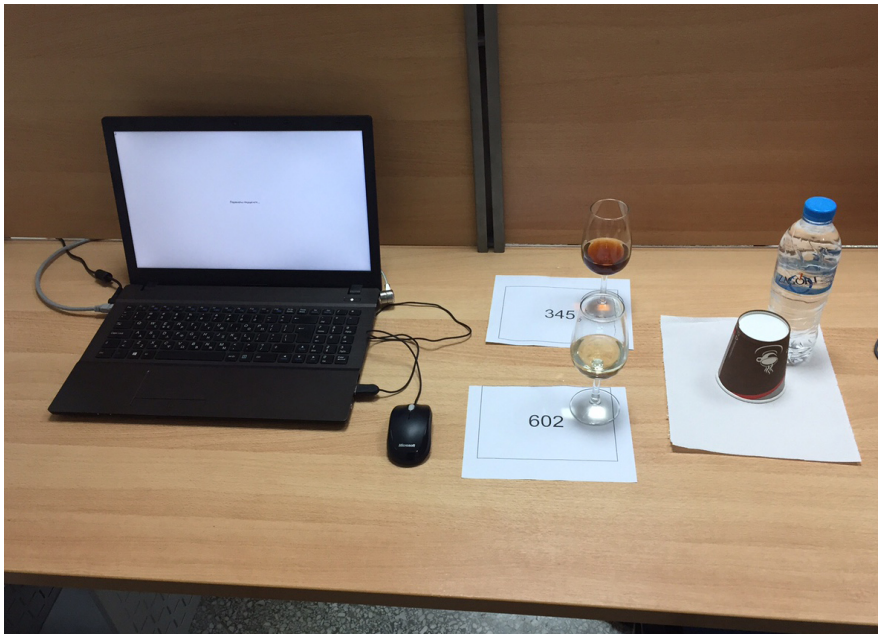


Figure B.1: Private booth

(a) Chocolate

(b) Biscuits

Figure B.2: Picture stimuli used in training auction rounds

(a) Pomegranate wine in 500 ml bottle

(b) Grape wine in 500 ml bottle

(c) Pomegranate wine in 750 ml bottle

(d) Grape wine in 750 ml bottle

Figure B.3: Picture stimuli: Wines in different bottle sizes

C Appendix: Experimental Instructions

Instructions

[This is a translation of the original instructions written in Greek]

Introduction

Welcome to our survey! It is very important **not to communicate with other participants**. Any attempt to communicate will result in the failure of this survey. The session today will last approximately 90 minutes.

In some parts of the survey you will interact with other participants. However, you will never know which participant you will be interacting with. In this sense, this survey will be anonymous. If you have any questions during the session, please raise your hand and the researcher in charge will answer your question.

The researcher in charge will answer all questions except questions that concern the way you should behave during the survey. The reason is that no one, including us, can tell you how you should behave. If we knew that we wouldn't have to conduct this survey today. All questions should be addressed to the researcher in private, not in public.

Before we start, I will ask each one of you to draw a three digit number from this cup. This number is unique for each one of you, as well as for all sessions we will be conducting. That is, this number is your ID since no other participant in this survey will have the same number as you. This is the number we will use to pay you.

There are no "right" or "wrong" decisions or answers in this survey. Nevertheless, your actual income will depend on your decisions and the decisions of other participants. Our advise is to pay attention to these instructions. Every participant receives €20 for their presence here today. For practical reasons, you will receive the money at the end of the session and will be added to your income as determined by the decisions you make.

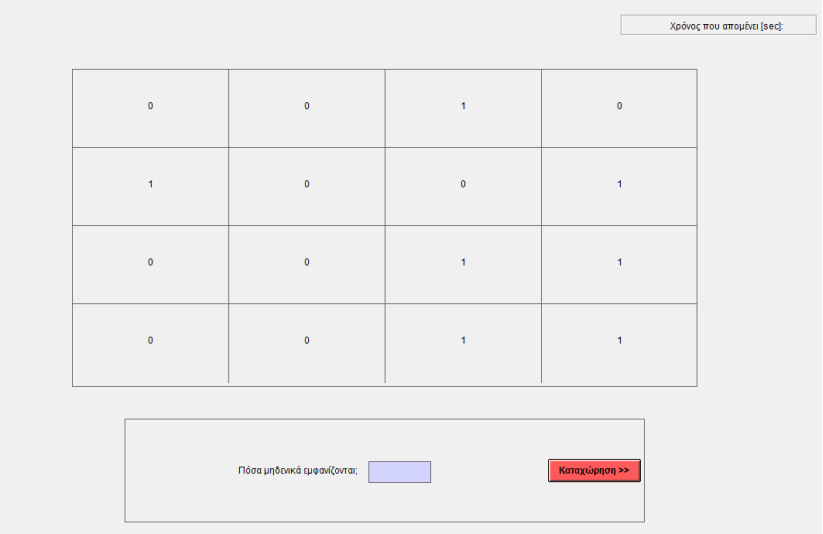
Survey description

This survey consists of **three different stages**. In **stage one** you will be asked to give the correct answer in a task. In **stage two** you will participate in a series of auctions. In this stage you will also be asked to do sensory evaluations of two wine products. In **stage three** you will be asked to choose between different lotteries that can earn you extra money.

After completing stage three, a short questionnaire will follow and your payments will be delivered to you. After payment you will be free to leave the lab.

Stage 1: The counting task

In the first stage, all participants have to complete a task. The task consists of determining the right number of zeros in a matrix of 0's and 1's. The matrix size (that is, the number of rows and columns) will be the same for all periods and participants. The task will show up in your screens, similar to the example image below.



Each participant has 25 seconds to answer. After typing the number, the participant has to confirm their answer by pressing the button "Entry". If a participant answers correctly in 25 seconds, s/he wins €0,5. In any other case s/he wins nothing. This stage will be **repeated ten times**. Therefore, if you answer correctly all the times, you can earn up to €5 on top of your participation fees.

Stage 2: The 2nd price auction

In Stage 2 you will participate in a type of auction known as 2nd price auction. This auction has 4 steps:

Step 1: I will describe the auctioned product.

Step 2: Each one of you will submit an offer to purchase the product.

Step 3: The computer will rank the offers from the highest to the lowest.

Step 4: The person with the highest offer purchases the product **but will pay the price of the second highest bidder**. If you don not submit the highest bid, you do not purchase the product.

Think about the following **example**:

Lets assume that 5 people bid for purchasing a USB memory stick (16 GB). Each person submits offers separately from other persons. Submitted bids are shown in the following table:

Person	**Bid**
1	15
2	12
3	20
4	18
5	13

After ranking bids from highest to lowest (this will be taken care of by the computer), we have:

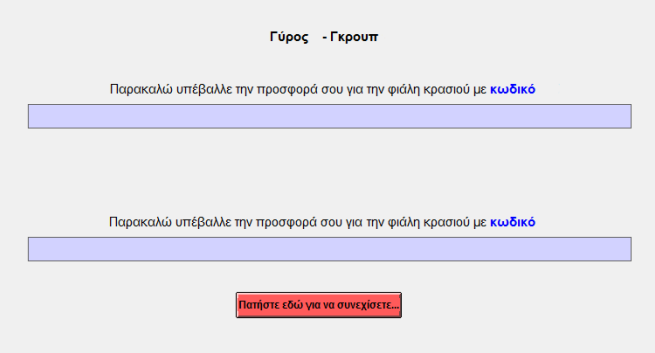
Person	**Bid**
3	**20**
4	18
1	15
5	13
2	12

Person 3 purchases the product because s/he bid the highest bid (20) but will pay 18 (second highest price). All other participants in the auction pay nothing and do not receive a USB memory stick.

In this type of auction, it is always in your best interest to bid exactly as much as the good is worth to you. **If you bid more** than the actual value the good is worth to you, the second highest price may be higher than what you are willing to pay. In addition, you don't profit **by bidding less** than your real willingness to pay because at the end you might not purchase the product, when in reality you would be willing to pay the second highest price.

Stage 2: The auction procedure

In the auction stage you will bid for two different products. These two products are two types of wine. For each type of wine you will separately submit a bid. An example of the screen you'll see, is shown below:



In this auction **you will participate in groups of 5 people**. Each group is **independent** of the other and you will not know which person participates in each group. Even though you will bid simultaneously for the two different wines, at the end we will randomly choose one of the wines and only decisions you made about the chosen wine will be implemented. For the random choice we will use a bingo cage with 2 balls numbered with the numbers 1 and 2 which correspond to the two wines. The random draw will be done separately for each group.

Practically this means that if, for example, you are the highest bidder for Wine 1 but you are not the highest bidder for Wine 2 and Wine 2 is randomly chosen, then you do not purchase Wine 2. If, however, Wine 1 was randomly chosen, then you will have to purchase a bottle of Wine 1. That is, today from this session, you can purchase **at maximum** one bottle of wine and not more than one.

An example of the wine auction procedure can be described with the following steps:

Step 1: Each person submits a bid for each wine in separate input fields in their computer screen.

Step 2: The computer ranks bids from highest to lowest, separately for each wine.

Step 3: The second highest bid determines the price at which each wine will be sold to the highest bidder.

Step 4: The person with the highest bid purchases the wine (in the case where this wine is randomly chosen) at a price equal to the second highest bid. This price is deducted from overall money earned by the person. (Note: if there are more than one persons that are the highest bidders, the computer will randomly choose one of them.)

Step 5: Persons with bids lower or equal to the 2nd highest price do not purchase the wine.

Stage 2: The auction procedure (continued...)

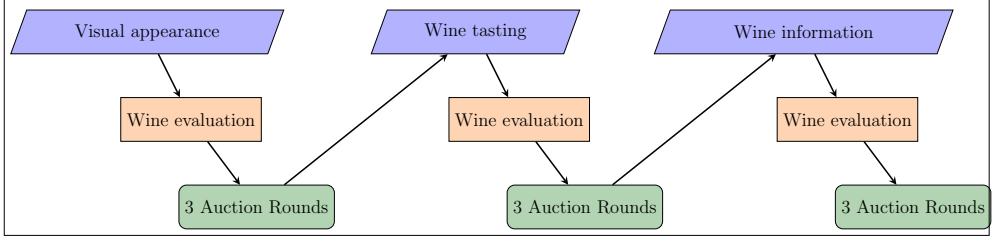
Before the auction you will be asked to evaluate both wines and choose between them.

In the **first phase** you'll evaluate the wines **with only information the visual appearance of wines**, served on a glass with a serving size of 40 ml. Please note that both wines at this phase will appear without any other distinct characteristic but will be distinguished by a code number only. After evaluating the wines, three auctions rounds will follow where in each round you will be asked to submit a bid for the wines.

In the **second phase** you'll evaluate the wines **after tasting them**. Instructions for tasting the wines will show up on your computer screen. Attention! The tasting phase is standardized and must be strictly followed. The computer will inform you which of the two wines you must taste each time and will provide detailed instructions for the tasting procedure. After evaluating the wines, three auction rounds will follow where in each round you will be asked to submit a bid for the wines

In the **third phase** you will be given **information for each type of wine**. Next, and after evaluating the wines for a third time, three auction rounds will follow where in each round you will be asked to submit a bid for the wines.

In total, the auction for the wines will be repeated for **9 rounds**. The sequence followed in Stage 2 is graphically depicted in the following flow chart:



Stage 2: The auction procedure (continued...)

After every auction round you will receive some feedback. The computer will inform you whether you were or not the highest bidder, as well as whether you submitted the same offer with another person in case you were the highest bidder.

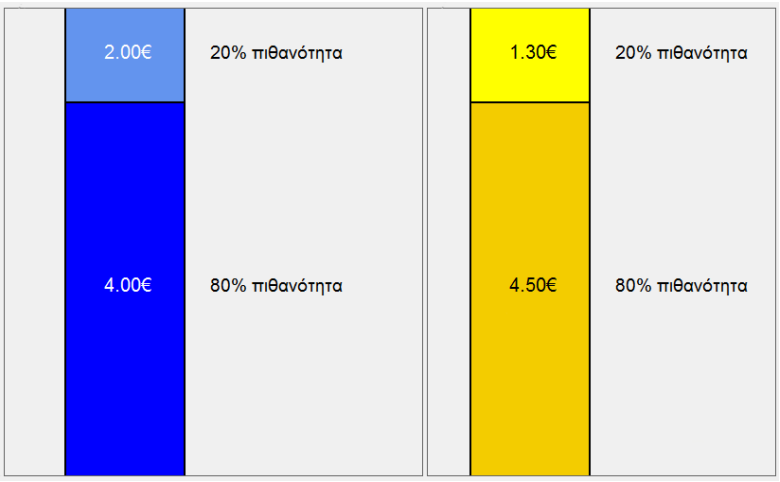
At the end of the Stage 3 (described momentarily) we will randomly choose one of the wines, using the method we described previously. In addition, we will choose one round out of the 9 auction rounds. The draw will be done in front of you, using a bingo cage. In the bingo cage there will be 9 balls numbered from 1 to 9. Then, we will draw one of the balls and the number of the ball will correspond to the chosen auction round. You will be informed about the chosen auction round only after you submit all your bids. Therefore, your best strategy is to think of every round as if it is the binding round.

Next, you will receive feedback about the outcome, that is, whether in that specific auction round you were the highest bidder or not, whether you'll purchase a wine or not, which wine you'll purchase and at what price.

Before **Stage 2** there will be 3 **trial** rounds in order to familiarize yourself with the auction procedure. The trial rounds will be about goods that do not exist in the laboratory and since these rounds will be trial, you can't buy the goods or pay money for the goods. **The purpose of the trial rounds is simply educational**.

Stage 3: Choice between lotteries

In this stage you will be successively shown a sequence of **20 choices**. For each choice there are **two alternatives** from which you can choose. Each alternative has two **monetary** amounts and a **probability** to win each amount of money. In each choice, the two alternatives will be presented at the left and right side of the screen. The following picture shows an example.

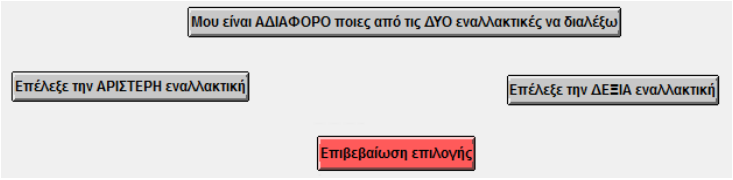


The left alternative of this example depicts two monetary amounts: €2 and €4. You can earn only one of these amounts of this alternative. The probability to earn each of these amounts is given as a percentage (out of 100%) on the right of each amount. The right alternative depicts two different monetary amounts: €1.30 and €4.50 and their respective probabilities.

Stage 3: Choice between lotteries (continued..)

Each monetary amount has a different color. Colors are use to make clear potential earnings from each alternative. In addition, alternatives are presented so that the lowest monetary amount is on the top and the highest monetary amount is on the bottom. Each choice differs from the previous and the next one with respect to **monetary amounts** or with respect to **probabilities** of monetary amounts. Your task is to choose the alternative you prefer the most.

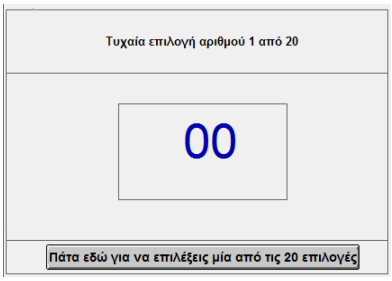
As shown in the picture below, you have three options in order to state your preference. You can: a) choose the **left** alternative b) choose the **right** alternative and c) state that both alternatives are **indifferent**, that is, they are equally preferred. In the latter case, the computer will randomly pick one of the alternatives for you.



After choosing one of the three options (the respective button will be colored red as a confirmation of what you chose), you click on the confirmation button to move on to the next choice. In all, you will make **20** such **choices**.

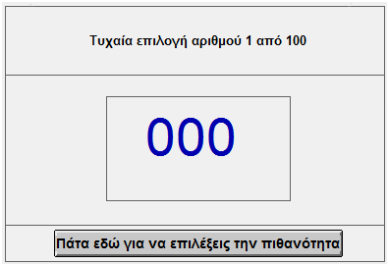
Given your choices in the lottery stage, you will receive extra earnings determined like this: When you are finished with the 20 choices, **we will randomly choose one of these choices** to be realized. The computer will then show you the chosen option and the alternative you chose and will give you feedback for your earnings. You will learn which choice will be realized only after you choose your preferred alternative for all 20 choices. Therefore, your best strategy is to think of every choice as if it is the binding choice that will count toward your earnings.

Stage 3: Earnings from the "Choice between lotteries" stage

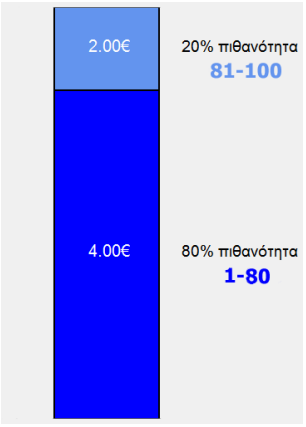


For drawing one of the 20 choices randomly, the computer will show you a window like the one shown on the left. In this window there will be **numbers changing from 1 to 20** very fast (about 1 number/second), which are selected by the computer randomly. By clicking on the button, the numbers will stop changing after a time delay of 1 to 3 seconds. This way, it is impossible to affect the draw of the number and therefore the choice of **one out of 20 choices is completely random**.

How will you get paid for the drawn choice? A window like the one shown on the right, will show **numbers changing from 1 to 100** very fast. These numbers are selected by the computer randomly. By clicking on the button, the numbers will stop changing after a time delay of 1 to 3 seconds. This way, it is impossible to affect the draw of the number and therefore the choice of **one out of 100 is completely random**.



The number drawn this way is **the chance to win one of the monetary amounts** of the alternative you chose in the randomly drawn choice. To make this clear, lets review an example shown in the picture on the left. the alternative shown pays the amount of €4 with probability 80% and the amount of €2 with probability 20%. If the drawn number is between 1 and 80 you will earn €4. If the drawn number is between 81 and 100 you will earn €2.



After completing Stage 3 you will be asked to fill in a questionnaire. In the meantime we will prepare you payments. Next, we will give you an envelop with your payment.

THANK YOY FOR PARTICIPATING IN OUR SURVEY!!