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## When does the price affect the taste? Results from a wine experiment

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# When Does the Price Affect the Taste? Results from a Wine Experiment\*

Johan Almenberg and Anna Dreber

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## Abstract

We designed an experiment that examines how knowledge about the price of a good, and the time at which the information is received, affects how the good is experienced. The good in question was wine, and the price was either high or low. Our results suggest that hosts offering wine to guests can safely reveal the price: much is gained if the wine is expensive, and little is lost if it is cheap. Disclosing the high price before tasting the wine produces considerably higher ratings, although only from women. Disclosing the low price, by contrast, does not result in lower ratings. Our finding supports the notion that price not only serves to clear markets, it also serves as a marketing tool; it influences expectations that in turn shape a consumer's experience. In addition, our results suggest that men and women respond differently to attribute information concerning wine.

**Keywords:** price-quality heuristic; attribute information; expectations; marketing; blind tasting; wine

**JEL Classification:** C91; D03; D83; M31

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## **1. Introduction**

Much economic analysis assumes that price simply reflects market structure, but price can also be a marketing tool, for example if the price tag itself affects how a good is perceived (see, e.g., Cialdini 1998). Textbook illustrations of supply and demand typically feature downward sloping demand curves. For most goods this is a highly plausible assumption. Price may have a positive effect on demand, however, when the good in question is used for the purpose of costly signaling. In the case of positional goods (Veblen goods), the purpose is to signal affluence and thereby assert high status (see, e.g., Frank 1985, 1999). A closely related example on the supply side is when increased monetary incentives crowd out intrinsic motivation for providing a service (Gneezy and Rustichini 2000a, 2000b; Mellström and Johannesson 2008). In this case the purpose may be to signal altruism and thereby achieve social esteem (Bénabou and Tirole 2006; Ellingsen and Johannesson 2008). In both cases the price tag carries a semantic component, in the sense that it affects the signaling value of the commodity in question.

In practice, it can be hard to distinguish the signaling value of a high price from the tendency to associate high price with high quality. Consumers have been found to expect a positive correlation between price and quality (Rao and Monroe 1989). Consistent with this expectation a meta-analysis has found positive correlations between price and quality ratings for most of the 1,200 product markets surveyed, but also that the range of these correlations is large, and even negative for some markets (Tellis and Wernerfelt 1987). Consumers' perceptions of objective price-quality relationships have been found to be only moderately accurate (Lichtenstein and Burton 1989), and the price-quality heuristic can be misleading, for example when goods of low quality are priced high (Cialdini 1998).

In this paper, we address one particular good – wine – to shed some more light on the relationship between the price of a wine and the individual enjoyment of the wine. Specifically, we explore if, and how, information about the price of a wine affects the experience of tasting the wine. The novelty of our paper is that we vary both the timing of the price information and the magnitude of the price for a good such as wine. These variables have previously not been explored jointly, and in particular not for an “ambiguous” good like wine.

Attribute information, such as the price or the ingredients of the good, has a more powerful effect on the perception of quality when the experience of the good is ambiguous (Hoch and Ha 1986). Tasting wine is a relatively ambiguous experience for many consumers. Objective measures of wine quality are not easily defined, and consumer tastes with regard to wine are highly heterogeneous (Amerine and Roessler 1976; Lecocq and Visser 2006). Wine judges display low within-subject correlations when unknowingly judging the same wine multiple times (Hodgson 2008).<sup>1</sup> Tasters are only marginally better than a random guess at distinguishing vintage years from non-vintage years from the same vineyard, or reserve bottlings from regular bottlings from the same vineyard and year, despite large differences in price (Weil 2001, 2005).<sup>2</sup> And in a large sample of blind tastings, Goldstein et al. (2008) find that more expensive wines fail to get higher ratings.

Previous research indicates that price information may be an important determinant of the experienced pleasantness of a wine (Brochet 2001; Plassmann et al. 2008). Using functional magnetic resonance imaging (fMRI), Plassmann et al. (2008) conduct a within-subject study with 20 participants. Each subject tasted three wines multiple times, but were not always told which wine they were tasting. Subjects believed they were tasting five different wines that differed greatly in price. Two of these wines were in fact duplicates of two of the other wines, but labeled with a different price tag. For the tasting observations where the subjects were unaware of the price, ratings did not differ between two samples of the same wine. By contrast, when the supposed price was disclosed, the price level was found to correlate positively with experienced pleasantness, measured through both subjective reports and fMRI scans.<sup>3</sup> This research highlights the

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<sup>1</sup> In fact, only about 10% of the judges were able to replicate their score within a single medal group. Moreover, when the judges were consistent this usually happened for wines that they disliked. This study is particularly interesting given that another study has found a positive relationship between price and medal status such that awards can influence a winery's economic success (Lima 2006).

<sup>2</sup> In Weil (2005) subjects are to distinguish between a reserve bottling and a regular bottling, from the same producer and year. Among those who can distinguish between these two bottlings, only half prefer the reserve, whereas the wines differ in price by an order of magnitude.

<sup>3</sup> Subjects' brains were scanned while subjects tasted the wine. The results show that increasing the price of the wine increases blood-oxygen-level dependent activity in an area thought to encode for experienced pleasantness (the medial orbitofrontal cortex).

potential role of marketing in shaping how we experience the goods that we consume.

Plassmann et al. (2008) do not ascertain whether expectations constitute the mechanism whereby price affects the tasting experience. We extend their analysis by using an alternative methodology from consumer research. Our aim is to shed more light on the price effect of wine, and, in particular, to better understand the mechanism through which price information exerts influence on the tasting experience. Unlike in Plassmann et al. (2008), our setup relies on between-subject comparisons, and does not involve deception.<sup>4</sup>

Our approach combines an information treatment with a timing treatment. By varying both the provision and the type of extrinsic information, as well as the timing of this information relative to the first-hand experience of the wine, our experiment sheds light on how consumers use extrinsic information about the product in forming an opinion about it. A blind setting, in which the extrinsic information is not disclosed, is compared to a setting in which the information is disclosed before tasting, as well as a setting in which the information is disclosed after tasting.

A similar setup has been used in consumer research, applied to clothing, paper towels and ground beef (Hoch and Ha 1986; Levin and Gaeth 1988). It has recently been applied to beer by Lee et al. (2006) who look at how knowing about a “secret ingredient” (vinegar added by the experimenter) affects experienced pleasantness (Lee et al. 2006). All three studies find that extrinsic information provided prior to first-hand experience with the good in question has a significant effect of how the good is experienced, whereas extrinsic information provided after the experience does not. These studies highlight the role of *consuming expectancies*, a subclass of “conceptual consumption” which includes a wide range of cognitive concepts (see, e.g., Ariely and Norton 2009 for a review).

We replace the beer in Lee et al. (2006) with wine, and replace information about a secret ingredient with information about the wine’s retail price per bottle (\$40 or

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<sup>4</sup> It is not self-evident that labeling a \$90 wine as a \$10 wine captures the appropriate price effect, which would be the difference in subjective well-being experienced when tasting a wine without knowing the true price relative to tasting this wine when aware of the price.

\$5). Vinegar in beer is likely to be bad news about the beverage to the minds of most beer consumers. By contrast, our experiment was designed to allow for positive information (the wine is expensive) as well as negative information (the wine is cheap).<sup>5</sup> Thus, we focus on price as an attribute, an important element in marketing (Cialdini 1998).

The first purpose of our study is to gage the magnitude of both the positive and the negative expectational effect. Given previous work (e.g., Plassmann et al. 2008), we hypothesize that individuals will assign a higher rating to the wine when they know its high price, relative to those tasting it without knowing the price. We assume that many consumers expect a \$40 wine to be a highly pleasant experience. We hypothesize that individuals will assign a lower rating to the wine if they know the price and consider it to be cheap. We assume that many consumers will not expect a \$5 wine to be a very positive experience.

Second, we expect the timing of the price information to make a difference. Hoch and Ha (1986), Levin and Gaeth (1988), and Lee et al. (2006) find that information has a significant effect only when disclosed prior to first-hand experience of the good in question. On the basis of this we expect the information about price to have a larger effect, relative to the blind condition, in the before condition than in the after condition. In other words, we expect individuals to give higher ratings to the expensive wine when they know about the high price before tasting, but not necessarily when finding out about the price after tasting, and similarly with the cheap wine we expect individuals to give lower ratings when they know about the price before tasting.

Third, we test whether there is a gender difference in how the price information matters. The possibility of a gender difference was not intended as the focus of our study. It is highly plausible, however, that concerns about identity and social image form part of a price effect. Gender differences in behavior are commonplace in the experimental economics literature in general (Croson and Gneezy 2009) and a number of studies find that men and women respond differently to treatments designed to trigger social concerns (e.g., Hasseldine and Hite 2003; Griskevicius et al. 2007; Mellström and Johannesson 2008). Given

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<sup>5</sup> Whether the prices are perceived in this way depends partly on the subjects' spending habits. We address this issue later in the paper.

this, we have no reason to expect the effect of price on experienced pleasantness to be the same for men and women. Plassmann et al. (2008) do not control for such gender effects, nor do the previous studies that employ the same design with regard to the timing of information. Effetz and Shayo (2009) use a simpler timing design involving candy and don't find any gender differences with regard to the timing effect. We believe that wine differs from candy in two important respects: (1) wine is a (potentially) positional good; (2) many tasters find the experience of a wine rather ambiguous.

We find that an expensive wine gets considerably higher ratings when tasters are informed about the high price before tasting, relative to tasting "blind" – but only from female tasters. By contrast, women that taste the wine before being told the price do not assign significantly higher ratings, suggesting that once they form a first-hand opinion the attribute information only has some effect. For men there is no significant difference between any of the three conditions. A possible interpretation of this discrepancy is that men and women respond differently to attribute information, with men being less sensitive to such cues. Alternatively, this might point to differences in how men and women relate to wine, or status goods, or both.

For the tasters that sampled the cheap wine, being informed about the price tag did not produce any noticeable changes in average ratings. This could point to an asymmetry between how positive and negative information shape perceptions of quality. Another possible explanation is that the bad news simply wasn't that bad: whereas the expensive wine was considerably more expensive than the tasters reported usually spending on wine, the cheap wine was simply in the lower range of typical spending. We elaborate on this later in the paper.

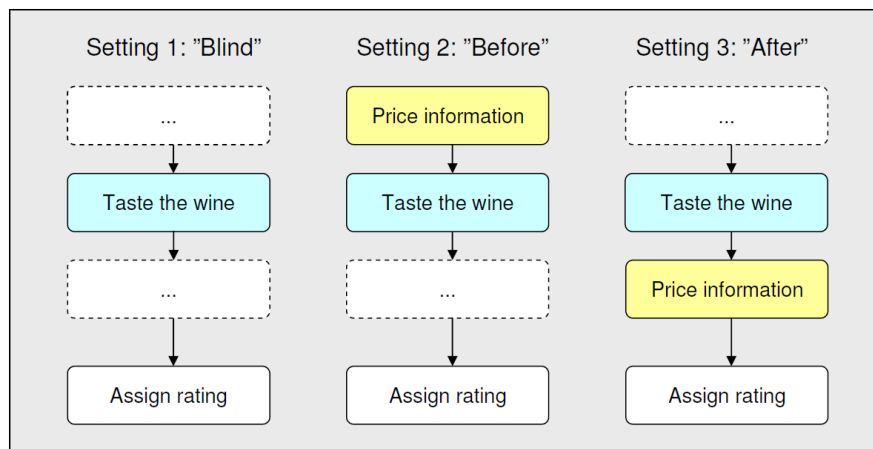
The outline of the paper is the following. We start by describing the setup of the experiment, then present our results, and finish the paper with a discussion.

## **2. Setup**

All subjects followed the same procedure, illustrated in Figure 1 below. First, they received some information about the experiment. Next, they tasted one of two wines. The wine was either expensive or cheap. Finally, they received a short questionnaire, at the beginning of which they were asked to rate the wine. There

were three information settings. In the “blind” setting, the price was not mentioned in the experiment. In the “before” setting, the price was mentioned in the information about the experiment, prior to tasting the wine. In the “after” setting, the price was mentioned at the top of the questionnaire, after having tasted the wine but still before rating it. Subjects were allocated randomly to one of the three information settings and one of the two wines. In other words, we use a between-subject design.

Figure 1  
Experimental setup.



Apart from the price, subjects received the same information in all three settings. They were told that the wine came from Portugal, that it was made out of a blend of different grapes, that they were to receive a glass of wine that they were to taste and that they subsequently would be asked to rate the wine.<sup>6</sup> In the actual tasting of the wine, subjects were given wine glasses filled with a small quantity of the wine and then given a few minutes to taste the wine. Once the subjects had indicated that they were done tasting, they were asked to set aside the glass until the experiment was over. Next, they were asked to assign a rating, using a visual analogue scale ranging from “undrinkable” to “perfection”, with “OK” as the midpoint. Aside from this the scale was not labeled. Subjects were asked to circle

<sup>6</sup> Subjects in the same session were randomized to different treatments. Making sure everybody read something made subjects not realize there were different treatments. In addition, we did not want subjects to sense that we were exploring the effect of the price tag. Embedding the price information among other information about the wine made this less obvious (see the Appendix for the instructions).



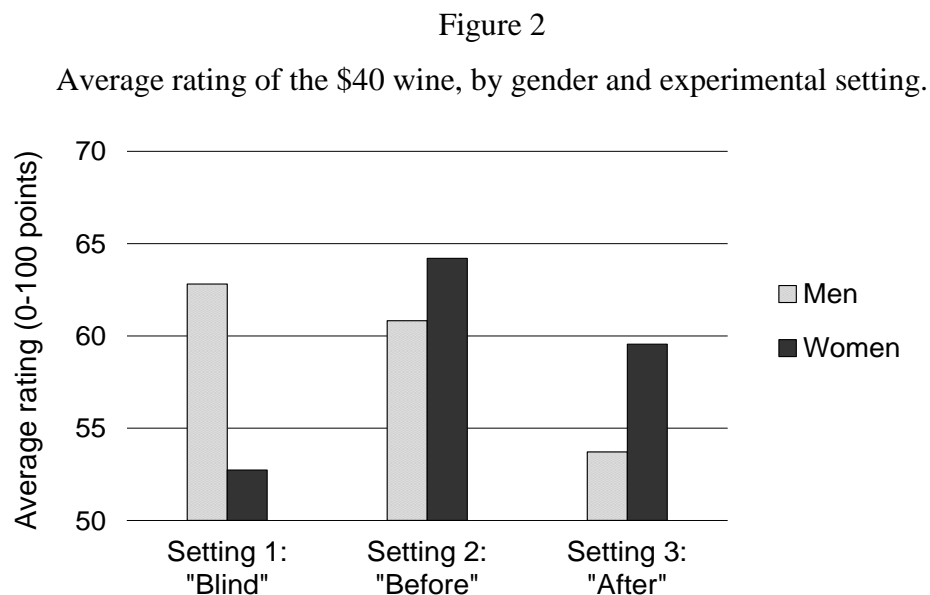
a point (a tick mark) anywhere on the axis. In the statistical analysis we convert this to a 100 point scale.

### 3. Results

The study was conducted in Boston and Cambridge, Massachusetts, during the fall/winter semester of 2008-09. 135 individuals (40% women) tasted and rated a red wine with a retail price of \$40, and 131 individuals (33% women) tasted and rated a red wine with a retail price of \$5. The subjects consisted mainly of students and researchers at three universities. The average age was 29 (min: 21; max: 66). 43-47 subjects participated in each treatment.

#### 3.1 The Expensive Wine

Across all experimental settings and subjects the average rating of the expensive wine was about 59 out of 100. Average ratings by setting and gender are shown below. The only significant gender difference is in the blind setting, with men giving the expensive wine a higher rating than women (t-test:  $p=0.038$ , Mann-Whitney:  $p=0.031$ ).



The experimental data shows that the price can have a large effect on wine ratings, but this effect differs greatly between the sexes. Compared to the blind setting, women, on average, assigned considerably higher ratings to the wine when they were informed about the \$40 price tag before tasting. In terms of a 100 point scale, this effect implies that the rating increases by, on average, about 11.5 points

relative to when the female subjects have no information. In terms of the visual analogue scale that subjects used for rating the wine, this effect represents about a quarter of the distance between “OK” and “perfection”. The effect is statistically significant at the 5% level, regardless of whether we run the regression separately for both sexes or jointly, incorporating a dummy for being female as well as interaction terms for being female and the two information treatments. In the joint regression, the interaction term is statistically significant, and a Wald test rejects that the sum of the coefficients on “before” and the interaction term “before × female” is equal to zero ( $p=0.024$ ). Men, by contrast did not assign higher ratings to the wine when they were informed about the price before tasting it compared to when they had no information.

Table 1  
Experimental results for the expensive wine. Blind setting is baseline.

	All subjects	Men	Women
Information about the price:			
<i>Before</i> tasting (and rating)	-2.00 (0.643)	-2.00 (0.642)	11.48 (0.028)**
<i>After</i> tasting (but still prior to rating)	-9.11 (0.088)*	-9.11 (0.088)*	6.83 (0.216)
Gender			
<i>Female</i>	-10.09 (0.039)**		
Gender interactions			
<i>Before</i> × <i>Female</i> <sup>1</sup>	13.47 (0.044)**		
<i>After</i> × <i>Female</i>	15.93 (0.037)**		
Constant	62.81 (0.000)***	62.81 (0.000)***	52.72 (0.000)***
Observations	135	81	54
$R^2$	0.058	0.044	0.083
Robust p-values in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%			

<sup>1)</sup> Note: a Wald test rejects that  $Before + Before \times Female = 0$ .  $Prob > F = 0.024$ .

Neither women nor men assigned higher ratings to the wine when they were informed about the price tag after tasting compared to the blind setting. There is a noticeable tendency for men to assign lower ratings to the wine when they are told about the price after tasting. This effect is marginally statistically significant ( $p=0.09$ ). Ten subjects, however, reported having some form of wine training, and if we extend our regression analysis to control for this the coefficient becomes smaller for men and seizes to be even marginally statistically significant

(coefficient size: -7.40 instead of -9.10,  $p=0.185$ ). We do not present this extended framework as our main model, because the number of subjects reporting wine training was small. Controlling for expertise is justified, however, since it has previously been found that experts rate wines differently from non-experts (Goldstein et al. 2008). Moreover, they were all men. Nonetheless, this indicates that the negative effect for men in the after condition is not robust.

We also compare the “before” and “after” coefficients for women. The estimated “before” coefficient is almost twice the size of the “after” coefficient. Nevertheless, a Wald test is unable to reject that the two coefficients are equal ( $p=0.36$ ). It is thus possible that a high price also affects how women rate wines after they have tasted it, but that our sample size is simply too small to capture this effect. Note, however, that the “before” coefficient is statistically significant from the control whereas the “after” coefficient is not, thus a larger sample size could on the other hand lead to a significant difference between the “before” and “after” coefficients.

In other words, extrinsic information about the price arriving after the subject has had first-hand experience of the good does not significantly alter the subject’s opinion of the good’s quality. This is consistent with previous studies using the same design with other types of information: Hoch and Ha (1986), Levin and Gaeth (1988), Lee et al. (2006) all find that information provided before experiencing the good has a significant effect on how the good is perceived, and that information provided afterwards does not.

### **3.2 The Cheap Wine**

Across all experimental settings and subjects the average rating of the cheap wine was about 57. In the blind setting, the average rating was actually slightly higher for the 5\$ wine than for the \$40 wine (60.0 versus 58.5), in line with the finding in Goldstein et al. (2008) that most people do not prefer expensive wines, although this difference is not statistically significant.

For the cheap wine, we are unable to reject the null hypothesis that knowledge about the price has no effect on ratings, for either gender in any of the settings. Our data gives some indication of a corresponding negative effect of knowing

about the low price of a cheap wine, but the absolute size of the effect is small and not statistically significant.

Table 2  
Experimental results for the cheap wine. Blind setting is baseline.

	All subjects	Men	Women
Information about the price:			
<i>Before</i> tasting (and rating)	-4.39 (0.40)	-4.39 (0.40)	1.15 (0.87)
<i>After</i> tasting (but still prior to rating)	-7.13 (0.19)	-7.13 (0.19)	-3.08 (0.72)
Gender			
<i>Female</i>	3.02 (0.67)		
Gender interactions			
<i>Before</i> x <i>Female</i> <sup>1</sup>	5.54 (0.53)		
<i>After</i> x <i>Female</i>	4.05 (0.69)		
Constant	58.98 (0.000)***	58.98 (0.000)***	62.00 (0.000)***
Observations	131	88	43
$R^2$	0.042	0.022	0.008
Robust p-values in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%			

In a post-experiment questionnaire, subjects reported spending on average \$13 on a bottle of wine, with a standard deviation of about \$6. Only two of 266 subjects reported spending \$40 or more. Only about 5% reported spending more than \$20. In the light of this, the \$40 must be considered expensive relative to what the subjects usually spent on wine. By contrast, 16 subjects reported spending 5\$ or less on average, and 40 % reported spending \$10 or less.<sup>7</sup> Hence, the treatment effect of the low price cannot be considered to be directly proportional to the treatment effect of the high price – i.e., it is possible that the cheap wine simply wasn't cheap enough. Subjects were asked to indicate their average weekly consumption of wine (number of glasses; frequency in parenthesis): < 1 (33%), 1-3 (40%), 4-6 (21%), 7-10 (6%), or > 10 (0%).

<sup>7</sup> There were no observable gender differences in spending behavior.

## 4. Discussion

Consumer' perceptions of objective price-quality relationships are not always very accurate, and this can have important implications. In the marketplace, consumers may face vast amounts of information about the good they are about to consume. Price may be one of the more salient types of information, and if many people are not ready to expand time and effort to investigate the price-quality relationship, then this leaves room for the use of price as an advertising tool, in a way that may be unrelated to the objective quality of the good (e.g., Cialdini 1998).

We find that women assign considerably higher ratings to a wine if they are informed that it is expensive before tasting it. If they are informed that a wine is expensive after tasting it, assigned ratings are still higher than in the blind condition, but neither this difference nor the one between "after" and "before" are statistically significant. When the wine is cheap, we do not find any negative effects of being informed about the price. For male tasters, we do not find any significant effects of knowing about the price – high or low – on average ratings.

Our main finding should surprise few: knowledge about the high price of a good can affect how it is experienced. In a world where luxury goods manufacturers routinely incorporate easily recognized logotypes into their designs, it can safely be assumed that knowledge about the high price of a good is considered a positive attribute that may confer status on its owner (Frank 1999). In addition, many consumers use a price-quality heuristic that leads them to expect higher prices to be correlated with better quality, potentially influencing the actual consumption experience. Tasting wine has been shown to be an ambiguous experience for many, if not all, consumers. Objective measures of wine quality are not easily defined; consumer tastes with regard to wine are highly heterogeneous. Extrinsic information, such as the price of the good, is likely to play a particularly important role when consumers are less confident in their own perceptions of quality.

In our view, the absence of a significant corresponding negative effect for a low price is most likely due to the design of our treatment, and not indicative of a deep asymmetry in how people react to high and low prices. In the post-experiment questionnaire, subjects reported their average level of spending on wine. The

expensive wine was considerably higher than this average expenditure. The cheap wine, by contrast, was not below average expenditure in a way that can be considered proportional. In other words, most of our subjects typically consumed cheap wine. It is not surprising then that being informed about the cheap price did not have significant effects on ratings. It could be argued that a \$5 wine is probably more in line with what tasters in the blind setting are used to drinking and would expect to be offered, compared to a \$40 wine. However, the \$5 wine was the cheapest wine with characteristics comparable to the \$40 wine, thus a different type of subject pool might be interesting to study in the future (i.e. subjects who find \$5 wines to be very cheap).

With regard to the gender difference, our finding can be interpreted in two ways: (1) There is no gender difference. Either the female price effect is a false positive or the absence of a male price effect is a false negative. (2) Men and women respond differently to social cues and/or to status concerns regarding positional goods. It is not self-evident that men and women should have evolved to react the same way to such cues, and ample experimental evidence indicates that such differences exist (e.g., Croson and Gneezy 2009). For example, in many experiments women are more sensitive than men to subtle cues and are more likely to behave according to the social norm. Thus, in our context women might be more inclined to give higher ratings to an expensive wine because it “should” taste better – an expectation which in turn might actually change their tasting experience. In our view, the second explanation is at least as plausible as the first, and merits further exploration. Even though the wine tasting was not a social interaction, status concerns could be triggered heuristically by the mere fact of subjects consuming a positional good or for purposes of self-signaling. Thus, disentangling concerns for social cues/norms from concerns for status is another potential venue for future research. It is interesting to note that Weil (2005, 2007) finds some evidence of a gender difference in two studies with the twin and singleton design. In that setup, two bottles of wine are poured into four containers and tasters are given three of the containers and asked to distinguish which one differs from the other two. A random guess has 1/3 chance of being correct. Men appear to be somewhat more correct than women when guessing.

Our study builds on previous research on the relationship between the price and the subjective experience of wine, in particular Goldstein et al. (2008) and Plassmann et al. (2008), through the application of a methodology used in marketing research. That marketing actions can affect the experience of a good is in itself not a novel finding. Marketing research has for a long time sought to schematize and empirically evaluate the interaction of top-down cognitive processes, to which extrinsic information is addressed, with bottom-up sensory processes, i.e., the experience of the intrinsic qualities of the good. Combining different variables in the way we did it and applying it to wine is however novel.

Attribute information may lead consumers to invest more effort when experiencing the good (Hoch and Ha 1986). We did not control for the amount of time spent tasting the wine. It should also be noted that neither our study nor Plassmann et al. (2008) provides much detail about how expectations, once formed, interact with first-hand experience of a good. We do not know whether our subjects were actively searching for confirmatory evidence of an expensive/nice taste, or whether the wine simply tasted better during the actual tasting, such that the cognitive work on expectations occurred while processing the price information rather than while tasting. Future research should seek to shed more light on this process. Other interesting extensions include specifying what type of taste-related judgment the subjects are expected to make (e.g., quality or taste pleasantness) as well as testing scale reliability by using more than one measure.

It would also be interesting to explore whether our findings extend to a more natural setting than a stylized blind tasting.<sup>8</sup> A recent study that takes place in both the laboratory and the field finds that for the goods studied (candy and restaurant meals), prices mainly affect demand through the budget constraint (Heffetz and Shayo 2009). As we point out above, however, attribute information has a stronger effect on quality perception when the experience of the good is ambiguous (Hoch and Ha 1986), as arguably is the case for wine. It would thus be interesting to explore a setup similar to that of Heffetz and Shayo (2009) with a product such as wine.

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<sup>8</sup> For a discussion of the importance of the lab vs. the field, see, e.g., Harrison and List (2004), Levitt and List (2007) and Falk and Heckman (2009).

Finally, a very natural extension is to explore whether our findings extend to other types of goods, and in particular whether the difference in how men and women respond to attribute information is product-specific or indicative of a more general difference in preferences between men and women.

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