Expert Opinion and the Demand for Experience Goods: An Experimental Approach in the Retail Wine Market

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Abstract

The effect of expert opinion on consumer demand for experience goods is difficult to quantify as the relationship between reviews and purchases may be driven by product quality, and further, it is unclear whether expert opinion increases demand through the provision of quality or existence information. Utilizing an experimental approach in the retail wine market to overcome these obstacles, we find that although there is no overall consumer response to expert opinion labels for wine, demand for a subset of highly reviewed wines increased; indicating that labels transmit quality information, as opposed to solely informing consumers of a wine's existence.

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1 Introduction

Product awareness and perceptions of product quality can have large effects on consumption patterns. As a result, manufacturers and marketers have developed a number of methods to both increase product awareness and to broadcast product quality to potential consumers. The methods employed to inform consumers about product quality are particularly important for experience goods, since consumers may only fully determine quality after purchase.[1]

Given the pervasiveness of experience goods within the marketplace, there exists a large and growing theoretical literature that examines ways in which uncertainty regarding product quality affects consumer demand (see Akerlof, 1970; Nelson, 1970; Wiggins and Lane, 1983; and Wolinsky, 1995). Further, given the variety of methods employed by manufacturers and marketers to inform consumers of a product's quality, a closely related empirical literature has developed that analyzes the

(1997), who examine the effect of movie critics on the demand for movies, find that movie critics appear to have little effect on consumer demand. Reinstein and Snyder (2005) also focus on the motion picture industry by exploiting the timing of movie reviews by Siskel and Ebert. The authors find no overall effect of reviews, but show that positive reviews increased box office revenues for narrowly-released movies and dramas. Although their identification strategy more convincingly isolates the effect of expert opinion from product quality than that used in Eliashberg and Shugan (1997), it is unclear why demand increased for only narrowly-released movies and dramas, and not other films.

Yet even if expert reviews affect consumer demand for a particular good, demand may change because consumers respond to the quality signal in the review, or alternatively, because consumers are merely alerted to the presence of that good. We are aware of only two papers that investigate the extent to which any publicity is good publicity. In their analysis of the impact of positive and negative book reviews in the New York Times, Sorensen and Rasmussen (2004) show that although both positive and negative reviews increase book sales, positive reviews have a larger effect on book sales than negative reviews. Reinstein and Snyder (2005) find similar results that indicate that only positive movie reviews affect movie demand.

Our paper contributes to the empirical literature by examining the impact of expert opinion on retail wine purchases. To distinguish the effect of expert reviews from that of product quality, we utilize an experimental approach implemented at stores in a national retail grocery chain. Wines in a retail store in Northern California were randomly chosen to display wine scores from a proprietary wine scoring system, and wine opinion labels were then displayed for one month during the spring of 2006. Based on wine sales trends for previous years, a control store was subsequently selected for the treatment store to allow for the use of a difference-in-difference approach. We then tested whether consumers responded to expert opinion, and investigated the extent to which any publicity is good publicity by examining consumers' responses across wines of differing quality.

We find that on average, sales of wines with expert opinion information did not increase. However, we do find that demand for a subset of the treated wines increased. In particular, low-priced high-scoring wines experienced an increase in

2 Theoretical Framework

We illustrate the potential impacts of expert opinion in the wine market with a simple model of consumer demand. The model shows that expert opinion provision does not necessarily increase demand for wine. Further, it indicates that both positive and negative wine reviews may increase wine demand for a given consumer.

Let k be an individual's familiarity with the existence of a given bottle of wine and I be that individual's perception of the wine's quality. We assume that an individual buys a bottle of wine if two conditions are satis ed: (1) k k_{min} and (2) I I_{min}. That is, an individual must have a minimal level of knowledge regarding the existence of the wine (condition 1) and the consumer's perception of the wine's quality level must exceed a minimum threshold (condition 2).

Both positive and negative expert reviews for wine increase k. For simplicity, we assume that if a wine is not reviewed then k falls below k_{min}, and if a wine is reviewed, k necessarily exceeds k_{min}.[2] We make this assumption because in a retail store that stocks a large number of wines, a consumer is unlikely to notice a given bottle of wine, unless the bottle is highlighted by, for example, an expert opinion label. One effect of a review is therefore to highlight the existence of a wine and to increase the likelihood that a consumer purchases that wine. Although a wine review is a necessary condition for a wine to be purchased in this simple model, it is not sufficient since I, an individual's perception of a wine's quality, must exceed I_{min}. Denote I_{PR} as the value I takes when a wine receives a positive review and I_{NR} as the value I takes when a wine receives a negative review. We analyze three cases below.[3]

If $I_{PR}, I_{NR} < I_{min}$, then expert reviews do not affect wine demand. This may occur if a consumer remains skeptical of a wine's quality even after a positive review. For example, a wine from an unknown wine growing region, or a wine made from a varietal for which the consumer has little past experience may deter a consumer

[2] The model's results are not qualitatively affected by relaxing this assumption.

[3] To simplify the discussion we do not consider the case where a poor review may decrease consumer demand. Although this is likely, including such a possibility does not alter the conclusions derived from our model.

from purchasing that wine. When I

a percentage of total grocery sales. To the extent that consumers in more wealthy areas and those buying more expensive wines are likely to be more fully informed regarding wine quality than consumers in other areas, we have selected a store that should reduce the likelihood of finding a significant treatment effect.

Wine scores from a proprietary wine scoring system were displayed in the treatment store for four weeks during the month of April 2006 for a random selection generate total number of bottles sold per month, average pre-discount price, average post-discount price, and whether a bottle of wine was discounted in any one week during a given month. For those wines for which wine scores exist, we then merge wine score information from the proprietary wine score system with the wine sales data.

Due to differences between the retail chain's database of stocked wines and those wines actually stocked at the time of the experiment within the retail store, 112 wines were labeled in the treatment store. Descriptive statistics for treated wines, untreated wines with scores, and untreated wines without scores are given in Table 2 for the pre-treatment month (March) and treatment month (April) in the treatment store. As the table indicates, there are few differences between treated wines and untreated wines for which scores exist. For example, the mean score for treated wines is equal to 84.1 while the mean score for untreated wines with scores is 83.7. This difference is not signi cant. Further, the pre-treatment difference between price and quantity is not signi cantly diff ness check used in many difference-in-difference approaches to determine whether there exist differences in the pre-treatment trends (see for example Meyer, 1995), while the former condition helps to ensure that differential responses to changes in price and the existence of promotions across treatment and control stores are small or nonexistent, thus making it less likely that the estimated treatment effects are biased.

Speci cally, for the treatment store we estimate the following equation for the 18 months preceding the treatment intervention:

$$
\begin{aligned}
Q_{it} = {} & \alpha + \beta_1(\text{price})_{it} + \beta_2(\text{discount})_{it} + \beta_3(\text{red})_{it} + \beta_4(\text{price} \quad \text{red})_{it} \\
& + \beta_5(\text{price} \quad \text{discount})_{it} + \beta_6(\text{red} \quad \text{discount})_{it} + \beta_7(\text{month})_t \\
& + \beta_8(\text{month} \quad \text{price})_{it} + \beta_9(\text{month} \quad \text{discount})_{it} + \beta_{10}(\text{month} \quad \text{red})_{it} + /_{it}
\end{aligned}
$$

where Q_{it} is the number of bottles sold of wine i during month t, price is the average price for wine i during month t, discount is a dummy variable equal to one if a wine was on sale for any one week during month t, red indicates if a given wine is a red wine, and month is a vector of month xed effects. We use the estimates from the regression to generate predicted quantity values for each candidate control store and we then calculate the diff

The selected control store is an appropriate control in that it is similar to the treatment store in two additional respects. First, as Table 1 shows, the store characteristics for the control store differ only marginally from those of the treatment store. Second, the use of an alternate method for selecting the control store yields

4 Empirical Strategy

Given the experimental design, we utilize a differences-in-differences approach to analyze the effect of the treatment on treated wines and to determine whether expert opinion provided quality information or simply highlighted the existence of treated wines. Specifically, we first examine the effect of the treatment on the treated wines by comparing the change in the sales of treated wines from the pre-treatment to treatment month in the treatment store, to the change in the sales of treated wines from the pre-treatment to treatment month in the control store. We do so by running the following difference-in-difference specification for the pre-treatment and treatment month on only those wines that received an expert opinion label:

$$(1) \qquad Q_{ist} = \beta_0 + \beta_1 T_{is} + \beta_2 t_{it} + \beta_3 T_{is} \times t_{it} + \epsilon_{ist}$$

where Q_{ist} is the number of bottles of wine i sold in store s in time t, T_{is} is an indicator variable that is equal to one for treated wines in the treatment store and equal to zero for treated wines in the control store, and t_{it} is a month dummy that is equal to one during the treatment month and equal to zero during the pre-treatment month. The coefficient on T_{is} can be interpreted as a treatment group specific effect, that on t_{it} as a time trend common to the control and treatment stores, and the coefficient for $T_{is} \times t_{it}$ can be interpreted as the true effect of the treatment. This specification corresponds to Specification 1 in the tables below.

Although useful for examining the average treatment effect on the treated, this specification does not address the extent to which the expert opinion effect is related to quality information provision versus general publicity. To examine the manner in which consumers use expert opinion information, we include interactions between score, price, and the treatment. If expert opinion primarily provides quality information to consumers, then only those treated wines that received higher scores should experience an increase in quantity sold. Alternatively, if the primary effect of expert opinion labels is to alert consumers to the existence of a wine, then the treatment should have an impact irrespective of a wine's score.

This specification also fails to control for potentially important covariates such as promotions or discounts, which if omitted, could lead to a biased estimate of the treatment effect. For example, if wines in the treated store were all placed

zero.

Results from the rst columns of Tables 3a and 3b are supported by results from Speci cation 1, which are provided in Table 4. Although the coefficient for the treatment effect (store month) is positive across all OLS speci cations, it is never signi cant. Thus, the average effect of the treatment on the treated wines is not signi cantly different from zero. The only variable which is consistently signi cant is the promotion dummy. It is always positive, indicating that a wine placed on promotion can expect on average to sell approximately 13 to 15 bottles more per month than if it were not discounted. Since non-promoted treated wines sold an average of 4 bottles, this effect indicates that the average number of bottles sold of a treated wine increases by 425 to 475 percent when it is placed on promotion.

Table 5 provides results for Speci cation 2. As in Table 4, the average effect of the treatment is positive across all speci cations but is not signi cantly different from zero, and the promotion effect is positive and highly signi cant. The results also indicate that although there is no overall differential effect of quality on treated wine sales (Store Month HighScore), the treatment did affect the demand for low-priced high-scoring wines (Store Month LowPrice HighScore). The coefficient is positive and signi cant across all speci cations and indicates that the estimated effect on a treated low price wine of moving from low to high score lies between 8 and 1f9.7i--337.2(a).56dtionan therefore less likely to respond to additional quality information. Thus, the effect of expert opinion on consumer demand for expensive wines should be significantly reduced. Alternatively, it make take a long period of time before consumers fully adopt and trust a new source of information. When expert opinion information is posted, consumers may initially be skeptical of the information's accuracy. Instead of fully trusting the new information source immediately, consumers may attempt to verify the accuracy of the new source by sampling labeled wines for which the costs of experimentation are low. That is, they may only purchase wines the are relatively inexpensive. If the information provided by the expert opinion labels is then found by the consumer to be accurate, the individual may buy more expensive wines in the future. To the extent that this explanation is valid, it suggests that a treatment period of one month may not be sufficient to observe the full effect of expert opinion provision.

Tables 6 through 9 investigate the robustness of our results and show that the results presented in Tables 4 and 5 are likely not driven by unobserved time effects, and that they are robust to the use of different control stores and the use of the other treatment store. We first investigate the extent to which the results are sensitive to on the treated is not significantly different from zero, however, the effect of the treatment on low-priced high-scoring wines is consistently significant and positive. The magnitude of the coefficient is now somewhat reduced, yet given that low-priced high-scoring wines sold an average of 8.6 bottles during March in the treatment store, sales of such wines increased by 47 to 106 percent as a result of the treatment. Although this increase is larger than that observed in the other treatment store, the range of increased sales overlaps for both stores. Therefore, overall, it appears that our results are not substantially affected by the treatment or control store used in the analysis.[16]

We next assign a false treatment to the March and April period in 2005 to examine the extent to which our results are generated by other external factors. For example, the effect identified in Tables 4 and 5 may be an artifact of seasonal or other advertising trends not observed in the data. Table 9 provides results for Specification 2 and shows that there is no significant and consistent effect of the treatment on low-priced high-scoring wines. In columns (1) and (2) the estimate is negative and significant, however, the coefficient estimate becomes insignificant once the promotion dummy is included. Although not reported, we assigned false treatments to all months between March 2005 and March 2006. In every case, the average treatment effect and the effect of the treatment on low-priced high-scoring wines is not significantly different from zero. Given that we find such an effect during the actual treatment month, and the significance and sign of the treatment effect is similar using other control and treatment stores, it appears that the treatment had no overall effect on treated wines, but that it did have a significant and positive effect on the demand for low-priced high-scoring wines.

Finally, we examine the impact of the treatment on untreated wines using Specification 3. As the results provided in Table 10 indicate, the treatment did not have a significant impact on untreated wines in the treatment store. Specifically, the coefficient on Store Month is generally marginally positive, but always insignificant. Thus, consumer demand for untreated wines apparently remained stable during the

[16] As with the discussion for Tables 6 and 7, the use of other control stores identified by the residual methodology with the alternate treatment store yield similar results.

treatment period in the treatment store. There are several potential explanations for this last finding. First, it may be that substitution by consumers towards treated wines and away from untreated wines was not one-for-one. That is, at least some consumers, when buying labeled wines, also continued to buy unlabeled wines. Alternatively, substitution may have been one-for-one, but consumers who previously did not purchase wine due to a lack of quality information entered into the wine market when expert opinion was provided. Finally, consumers may have substituted temporarily by stocking up on treated wines or spatially by reducing the quantity of wine purchased at competing stores.

6 Conclusions

Our results strongly suggest that expert opinion can affect the demand for wine by transmitting product quality information to consumers. Unlike most previous work that examines the impact of expert opinion on consumer demand, we are able to disentangle the endogenous relationship between product quality and expert opinion provision through the use of an experimental approach in a large national retail grocery chain. By randomly selecting 150 wines to display expert opinion information and through the selection of a control store with similar characteristics to those of thus gain little information when expert opinion is displayed. Finally, we find that as demand increased for a subset of treated wines, demand did not change for untreated wines. Thus, consumers either did not completely substitute towards treated wines or a sufficient number of consumers entered into the wine market to offset those consumers who substituted away from untreated wines.

Our

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Table 1: Store Characteristics[17]

	Treatment Store	Control Store	All Other Stores (Average)
Wine Sales Rank	23	31	
Wine Sales (2005 $)	711,511	639,459	362,107
Number Bottles Sold	76,686	65,861	42,422
Percent Wine Sales of Total Grocery Sales	7.3	10.3	5.0
Percent Sales Premium Wine	8.7	10.9	5.0
Median Household Income (2005 $)	115,299	129,274	72,134
Shelf Space (Linear Feet)	500	510	391

[17] This table provides descriptive statistics of store characteristics for the treatment store, the control store, and all other stores. The variables are de ned in the following manner: (1) wine sales rank gives the number of stores above a given store that have higher wine sales in dollars, (2) wine sales and number bottles sold is measured for a 24 week period ending on 1/15/06, and (3) percent sales premium wines is the percent of sales during the 24 week period that were obtained from the sale of bottles with prices greater than $8. Sales data are provided by Infoscan and median household income data are provided by the retailer.

Table 2: Descriptive Statistics for Treated and Untreated Wine in the Treatment Store[18]

	Treated Wines	Untreated Wines (With Scores)	Untreated Wines (Without Scores)
Score	84.1	83.7	
	[3.5]	[3.0]	
Quantity (March)	12.2	14.3	9.2
	[20.3]	[19.9]	[18.2]
Quantity (April)	14.5	18.4	9.1
	[21.9]	[20.0]	[18.0]
Price (March)	11.8	10.9	11.8
	[7.8]	[6.3]	[9.0]
Price (April)	12.5	11.6	11.9
	[10.3]	[7.2]	[8.9]
Percent Discounted (March)	57.1	64.0	54.2
Percent Discounted (April)	57.1	65.7	54.4
Percent Red	63.4	61.9	60.6
Number Observations	112	253	629

[18] For all continuous variables, we report the mean and standard deviation. Quantity gives the average number of bottles sold in a given month, price indicates the average price in a given month, percent discounted indicates the percentage of wines that were discounted in a given month, and percent red gives the percentage of wines that were red wines.

Table 3a: Descriptive Statistics for Treated Wines in the Treatment Store[19]

	All Wines	High Score Low Price	Non High Score Low Price
Score	84	86.8	83.5
	[3.5	[1.0]	[3.6]

Table 3b: Descriptive Statistics for Treated Wines in the Control Store[20]

	All Wines	High Score Low Price	Non High Score Low Price
Score	83.9	86.4	83.6
	[3.5]	[0.7]	[3.6]
Quantity (March)	13.9	23.5	12.6
	[14.9]	[26.5]	[12.4]
Quantity (April)	13.6	20.5	12.6
	[14.4]	[24.1]	[12.4]
Price (March)	11.6	9.1	9.7
	[10.1]	[9.9]	[10.1]
Price (April)	11.7	8.8	10.1
	[10.2]	[10.0]	[9.8]
Percent Red	65.9	40.0	69.2
Percent Discounted (March)	72.7	90.1	70.5
Percent Discounted (April)	65.9	81.8	63.6
Number Observations	110	18	92

[20] The mean and standard deviation are provided for all continuous variables. A wine is considered to have a high score if its score is greater than or equal to an 86, and it is considered to be a low price wine if the per unit price is less than $12. Quantity gives the average number of bottles sold in a given month, price indicates the average price in a given month, percent discounted indicates the percentage of wines that were discounted in a given month, and percent red gives the percentage of wines that were red wines.

Table 4: OLS Results for Speci cation One[21]

Dependent Variable: Number of Bottles Sold of Treated Wine i in Store s during Month t

	OLS (1)	OLS(2)	OLS (3)	OLS(4)	OLS (5)	OLS (6)
Treated Store	-1.62	-1.79	0.71	0.58	-0.07	-0.07
	[1.18]	[1.20]	[1.35]	[1.37]	[1.87]	[1.84]
Treated Month	-0.25	-0.25	0.77	0.80	0.65	0.71
	[0.77]	[0.77]	[0.95]	[0.97]	[1.11]	[1.23]
Store*Month	1.48	1.48	0.46	0.43	0.65	0.77
	[1.07]	[1.07]	[1.36]	[1.39]	[1.43]	[1.55]
Red Dummy		-7.01*		-7.93**	-5.76	
		[4.22]		[3.91]	[3.62]	
Promotion Dummy			14.96***	15.43***	12.69***	13.04***
			[2.52]	[2.62]	[2.42]	[2.54]
Red & Promotion Interactions	No	No	No	No	Yes	Yes
Wine Fixed Effects	No	No	No	No	No	Yes
R^2	0.01	0.03	0.15	0.19	0.20	0.22
Number Observations	400	400	400	400	400	400

[21] The regression is run using Speci cation 1 for treated wines in the treatment and control store for the pre-treatment and treatment month. The red and promotional interactions are not signi

Table 6: OLS Results for Specification One (Alternate Control Store)[23]

Dependent Variable: Number of Bottles Sold of Treated Wine i in Store s during Month t

	OLS (1)	OLS(2)	OLS (3)	OLS(4)	OLS (5)	OLS (6)
Treated Store	-1.87	-1.89	-1.25	-1.25	-1.60	-1.00
	[1.28]	[1.29]	[1.28]	[1.30]	[2.19]	[2.16]
Treated Month	1.06	1.06	1.82*	1.84*	2.83	2.57
	[0.75]	[0.75]	[1.04]	[1.08]	[1.69]	[1.68]
Store*Month	0.17	0.17	-0.58	-0.62	-0.63	-0.68
	[1.03]	[1.03]	[1.33]	[1.37]	[1.38]	[1.53]
Red Dummy		-5.41		-7.22*	-4.70	
		[4.56]		[4.24]	[4.40]	
Promotion Dummy			16.53***	17.25***	17.68***	15.52***
			[2.73]	[2.93]	[3.23]	[3.04]
Red & Promotion Interactions	No	No	No	No	Yes	Yes
Wine Fixed Effects	No	No	No	No	No	Yes
R^2	0.01	0.02	0.15	0.17	0.18	0.19
Number Observations	444	444	444	444	444	444

[23] The regression is run using Specification 1 for treated wines in the treatment and alternate control store for the pre-treatment and treatment month. The red and promotional interactions are not significant and thus not reported. Standard errors are clustered by wine and are given in brackets. Standard errors are clustered by wine and are given in brackets. * Indicates that a point estimate is significant at a 10 percent level, ** indicates that a point estimate is significant at a 5 percent level and *** indicates that a point estimate is significant at the 1 percent level.

Table 7: OLS Results for Speci cation Two (Alternate Control Store)[24]

Dependent Variable: Number of Bottles Sold of Treated Wine i in Store s during Month t

	OLS (1)	OLS(2)	OLS (3)	OLS(4)	OLS (5)	OLS (6)
Treated Store	-3.22	-3.57	-1.95	-2.57	-0.97	-1.23
	[2.42]	[2.72]	[1.61]	[1.99]	[2.95]	[2.73]
Treated Month	-2.94	-2.66	-1.44	-0.08	-0.92	-0.67
	[2.08]	[2.27]	[1.44]	[1.87]	[2.15]	[1.98]
Store*Month	2.33	2.64	1.77	3.08	2.65	2.89*
	[2.90]	[3.34]	[1.93]	[2.46]	[2.31]	[1.53]
Low Price Dummy	8.61**	8.13*	6.91*	6.46*	6.00*	
	[4.18]	[4.36]	[3.37]	[3.57]	[3.45]	
High Score Dummy	-2.99	-3.69	-1.29	-1.56	-2.02	
	[3.09]	[3.45]	[2.04]	[2.50]	[2.39]	
Store*Month*Low Price	-4.70	-5.03	-5.13*	-6.89	-6.25*	-6.64
	[4.15]	[4.62]	[2.89]	[3.48]	[3.18]	[3.37]
Store*Month*High Score	-1.58	-2.12	0.91	-0.85	-0.54	-1.02
	[3.08]	[3.55]	[2.53]	[3.07]	[2.89]	[3.05]
Store*Month*Low Price*High Score	12.34*	13.11*	9.60*	10.20*	11.83*	10.17*
	[6.76]	[7.26]	[5.74]	[5.69]	[6.27]	[5.51]
Red Dummy		-2.90		-5.24	-3.16	
		[3.67]		[3.52]	[3.96]	

Table 8: OLS Results for Speci

Table 9: OLS False Treatment Results for Speci cation Two (March and April of 2005)[26]