

**Eliciting Willingness to Pay with an English Clock Auction: An Alternative to
Hypothetical Responses in Advertising Experiments**

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We compare willingness-to-pay across four advertisements that vary health and performance claims. Hypothetical willingness-to-pay responses indicate no ad effect in aggregate or by buyer type. However, observed willingness-to-pay from a theoretically truthfully revealing English clock auction are significantly lower and indicate that buyer type does influence an ad's impact.

INTRODUCTION

In part, advertising is designed to increase buyer awareness and inform potential customers about a product or brand. Businesses spend tremendous amounts of money on advertising campaigns, logo development and other components of their marketing strategy with the ultimate goal being to improve profits. A consumer's decision to purchase a good comes down to a comparison of their perceived value for the product, as a bundle of attributes, relative to its price.² Only if the price is below a potential customer's maximum willingness to pay will the consumer complete a purchase. At the most basic level, advertising often attempts to increase consumers' willingness to pay (from now on referred to as WTP). This could increase profits in two ways. First, such a shift could increase the number of people in the market willing to pay the current price. Second, it would allow a higher price to be charged without a reduction in the number of transactions.

Clearly, knowledge about the effects of advertising is extremely valuable; however, approaches to measuring its impact vary widely. For example, researchers attempt to gauge buyer sentiment towards a product, brand, or promotion through focus groups and surveys. Alternatively, one can use test markets and observe consumer reaction to real purchasing decisions. The hypothetical responses of the former approach tend to be relatively more ambiguous; however, the latter method tends to be more costly. The goal of this study is to compare hypothetical responses with revealed choices in the context of an advertising experiment. Specifically, we conduct two studies, one in which participants complete survey responses making hypothetical decisions and a second in

² When a consumer is choosing among several substitute goods the price of one good includes the forgone opportunity of consuming one of the substitute products.

which agents make salient transaction decisions. What distinguishes our work from previous studies is our use of an English clock auction, an incentive compatible mechanism that has been found to outperform the techniques typically employed for such purposes, namely the Vickery auction and its derivative the Becker-DeGroot-Marschak procedure.

By changing how we collect information, we can determine whether shifts in attitudes and intentions translate into changes in actual WTP behavior. To assess the extent to which consumers' WTP for a branded product is affected by their exposure to different claims about the product we experiment with four different advertisement conditions. The following sections provide a detailed discussion of WTP elicitation methods. Next, the product and the advertising claims including the rationale behind these choices are presented. This is followed by a description of the relevant consumer variables that may impact product choice and willingness to pay. The remainder of the paper is devoted to the results and the implications of the findings.

WILLINGNESS-TO-PAY ELICITATION TECHNIQUES

The study of advertising effects has devoted much time to the influence of advertisements on persuasion and attitudinal shifts (cf. Mitchell and Olson 1981). Some proposed models of advertising processing reflect an interest in attitude formation as the primary outcome variable, but do not address the impact of such attitudes on consumers' actual choice behavior (cf. MacInnis and Jaworski 1989). Using the Elaboration Likelihood Model (ELM) as an orienting framework (Petty and Cacciopo 1981, 1986), other researchers have focused on post-exposure measures of attitude toward the brand, persuasion and brand choice. In this context, choice typically consists of a hypothetical

selection between the brand(s) featured in the advertisements and/or other alternatives. In order to increase the level of involvement when hypothetical scenarios are used, some researchers tell participants that they may actually receive the product chosen during the experiment (e.g., Park and Hastak 1994).

While advertising research has largely focused on persuasion and not WTP, there are numerous studies that have attempted to measure this construct for other purposes. A recent review of the WTP literature by Horowitz and McConnell (2002) classified the various types of elicitation methods that are in wide use.³ The most common techniques involve hypothetical responses.⁴ These hypothetical procedures include: 1) open-ended questions where respondents are directly asked their WTP, 2) single close-ended yes-no question, 3) a series of iterated closed-ended questions, and 4) payment cards. Where an open-ended question is essentially a fill in the blank response, payment cards are a multiple choice format.

These elicitation techniques have been used in marketing studies. For example, WTP is sometimes gleaned from the subjects' agreement to statements that specify a monetary value or an incremental percentage to a stated cost (i.e., "I would be willing to pay \$10" or "I would be willing to pay 10% more"). Agreement is typically expressed along a Likert scale (Laroche, Bergeron, Barbaro-Forleo, 2001; Jiang 2002). Alternatively, subjects may be asked directly how much they are willing to pay for a product, at which time they may or may not be provided with a range of values (Vlosky, Ozanne, and Fontenot 1999).

³ This survey examines the differences in WTP and Willingness to Accept (referred to as WTA). However, that literature probably constitutes the largest segment of WTP research.

⁴ Another category of WTP elicitation techniques involves incentive compatible auctions conducted with salient payoffs. This category is discussed in detail in the following subsection.

One of the most commonly used elicitation methods in marketing studies is conjoint analysis (Green and Rao 1971; Green and Srinivasan 1978; Green and Srinivasan 1990). This method allows the calculation of subjective utilities for specific attribute levels by asking consumers to make trade-offs, with price being one of the attributes considered. Consumers are typically given a series of cards depicting a combination of various attribute levels and are asked to rank from the most to the least attractive of all the possible combinations. The information obtained from such ranking suggests the relative importance of price against the featured attributes and its impact on overall evaluation of a product, and hypothetically on consumers' choice. While widely used, there are some limitations to conjoint analysis. Hoffman et al. (1993) take issue with the assumption that true preferences can be inferred from aggregating attribute-level data.

Revealed Willingness to Pay

An alternative approach to relying on hypothetical WTP responses is to collect data from actual decisions that consumers make when faced with a transaction. Unfortunately, the most common retail price setting practice is where the seller posts a take it or leave it price to the buyer. Under this type of exchange only boundary information is collected. Individuals who complete a purchase are revealed to have a WTP at least as high as the asking price and individuals who do not make a purchase are revealed to have a WTP weakly less than the posted price. With such data it is impossible to determine the magnitude of a shift in willingness to pay information.⁵ Collecting this type of information for a series of prices does begin to complete the WTP

⁵ This same problem also arises in hypothetical responses to single yes-no questions.

composition of customers. Unfortunately, such data collection can be quite costly and time consuming.

Fortunately, there are numerous auction formats where individual agents provide WTP information as part of the price determination process. One of the most celebrated of such institutions is the second price auction. Under this institution each agent privately and simultaneously submits a bid. The winner of the auction is the person submitting the highest bid but the selling price is equal to the second highest bid. Vickery (1961) showed that under the rules of this auction, each player has a dominant strategy to truthfully reveal his or her WTP. The intuition for this result is straightforward. An agent who bids above value risks winning the auction and paying a price in excess of his or her WTP. Similarly, bidding below WTP will have no impact on the price if the agent wins but lowers the chances of winning.

The truthful revelation property of the second price auction has made it attractive to researchers attempting to collect WTP information. One inherent feature of Vickery's auction is that there must be multiple buyers in the auction otherwise the buyer knows the price will be zero and truthful revelation is no longer a dominant strategy. However Becker, DeGroot, and Marschak (1964), commonly referred to as BDM, created a mechanism that allowed a second price auction to be performed on a single individual. This was accomplished by soliciting a person's WTP and then randomly drawing a dollar amount to serve as the second bid in the auction. The second price auction and the BDM derivative have been widely used to elicit WTP information in a variety of contexts

including lottery choice tests of expected utility theory.⁶ Other researchers have used these procedures to identify how much individuals are willing to pay for specific goods. For example, Hoffman, et al. (1993) use an auction to determine consumer WTP for beef⁷ and Wertenbroch and Skiera (2002) use the BDM derivation to identify WTP for Coca-Cola. Other products include coffee cups, chocolates, and hunting permits (see Horowitz and McConnell 2002 for a survey).

While the second price auction and the BDM procedure are theoretically truthfully revealing, laboratory testing with induced values has found that behavior differs significantly from theoretical predictions. With the technique of induced values researchers set a subject's true value for a fictitious commodity by agreeing to pay the subject a prespecified amount. After assigning induced values researchers can observe bidding behavior and compare it to the theoretical predictions in a given auction. Beginning in the early 1980's, researchers found that individuals only learn to place a bid equal to the induced value in second price auctions after several replications (e.g., Coppinger et al. 1980 and Cox et al. 1982). Initially participants in these auctions attempt to game the auction by misrepresenting their true values. Thus, data generated via a one-shot Vickery auction including the derived BDM procedure are not reliable measures of WTP. Hoffman et al. (1993) acknowledge this problem and attempt to control for it by first having the subjects participate in a series of practice auctions.

⁶ Initial work in this area was done by psychologists who were conducting non-salient studies of WTP (cf. Slovic and Lichtenstein 1968). Starting with Grether and Plott (1979) economists began studying this mechanism with saliently motivated subjects in preference reversal experiments.

⁷ Hoffman et al. (1993) actually use a fifth price auction. This is a multi-unit version of the second price auction. In the fifth price auction the four highest bidders win each paying a price equal to the fifth highest bid. This variation of the Vickery auction is also incentive compatible meaning that each agent should truthfully reveal his or her WTP.

English Clock Auction

This does not imply that truthfully revealed WTP information is unattainable. The ascending English clock auction also has the property of being truthfully revealing. This auction is related to the familiar English oral auction. In the English oral auction, a potential buyer publicly states a WTP and is tentatively considered the buyer. If another bidder is willing to pay more than the current bid, that person must state a new higher price publicly and then this person becomes the tentative buyer. The English oral auction ends once no one is willing to raise the price. Assuming that the minimum increment, which is the smallest acceptable size of a price increase, is sufficiently small and that values are continuously distributed such that there is no chance of a tie, bidders should truthfully reveal a willingness to increase the price by the minimum increment. Of course, like posted prices this process only yields limited information. Specifically, only one agent has to reveal a willingness to raise the price. So even though another person may be willing to raise the price (indicating a higher WTP) this person does not have to reveal that information if someone else raises the price.

The ascending clock auction is a more “mechanical” version of the ascending oral auction. Essentially the English clock auction forces the price to rise by the minimum increment and ascertains for each bidder if the bidder is willing to pay the current price. Functionally, the clock starts with a low price that each agent is willing to pay. The clock price then gradually “ticks” upwards. Until a buyer indicates she wishes to exit the auction, she is treated as though she is willing to pay the current clock price. Once a buyer exits the auction she cannot reenter. When the next to last bidder exists, the auction ends and the sole remaining bidder wins the item at a price equal to the final

clock price. The intuition for the truthful revelation is again straightforward. If the current price is below value exiting assures zero profit and remaining active allows for the potential to earn some positive profit. When the clock price exceeds value exiting assures zero profit and remaining active exposes the bidder to a potential loss with no possibility for gain. Thus the optimal decision of a bidder is to exit the auction when the price is equal to her WTP. Behaviorally this auction format has been found to generate truthful revelation of induced values in the laboratory (See McCabe, Rassenti and Smith 1990 and Harstad 2000).⁸

Unfortunately, as pointed out by Hoffman et al. (1993) the ascending clock auction does not provide complete WTP information on the winner.⁹ Thus researchers are left with a choice when using auctions to elicit WTP, use a Vickery styled auction and generate data that is subject to attempted strategic manipulation by respondents or use an ascending clock auction and lose some data. We take the view that it is better to have unbiased data and take missing observations into account when conducting analysis than to conduct analysis on data that is likely suspect. Hoffman et al. (1993) suggest that one way to potentially resolve this problem is to allow the English clock auction to increase until all buyers have exited the market. However, such a practice if known to the subjects might cause them to question the legitimacy of the transaction price. Specifically, the winner may be concerned that the price is set higher than the actual clock price when the next to last buyer exited the market in an attempt to raise seller profits (and hence lower

⁸ It is worth noting that Cox and Grether (1996) conducted lottery choice experiments using an English clock auction to elicit WTP for risky lotteries instead of the BDM procedure and found that this procedure led to a significant reduction in the number of preferences reversals. See footnote 5.

⁹ Like the multiunit extension of second price auction employed by Hoffman et al. (1993), the ascending clock auction can be extended to a multiunit version. For example, to sell four units of a good the clock would stop when the fifth to last person exits and the four remaining bidders would each pay a price equal to the stopped clock price.

the amount the experimenter has to spend). With this belief truthful revelation is no longer a dominant strategy in this auction.

Overview of Advertising Experiment

To compare hypothetical survey responses and revealed WTP data from an ascending English clock auction we employ a complete 2x4 full-factorial design. The first factor is the elicitation method and the second factor is the advertisement claim that is shown to the respondents.

Stimuli

Research suggests that the trade-off between a product's taste and its healthfulness influences consumers' decisions when purchasing reduced fat products (Tepper and Trail 1998). The tradeoff is further complicated by the fact that healthy alternatives typically command a premium price. Four versions of an advertisement for a salty snack product were created. The brand (Boston's snack mix) was selected given its limited distribution to health-food stores in the area. The four versions corresponded to different advertising claims of interest. Specifically, one advertisement featured the claim "50% Less Fat than Regular Snack Mixes" and a second ad featured the claim "Tastes Better than Regular Snack Mixes." The baseline case had no claims presented and the final treatment featured both claims. All ads featured a photograph of the product package along with a headline banner depicting the brand logo. The image of the package was digitally altered to make it consistent with the claims featured in the ads (see Appendix A for reproductions of the ads).

Prior research assessed consumers' willingness to pay for cholesterol lowering margarine. Females, older consumers, and those with high knowledge of nutritional facts

and with high concern for their health were willing to pay more for the margarine spread. Subjects were asked to indicate WTP using a line scale anchored at £.50 and £2.50, corresponding to the actual range of retail prices. Interestingly, however, the average amount consumers were willing to pay was significantly less than the actual market price for the product (£1.42 versus £2.49 respectively; Bower, Saadat, and Whitten 2002). While consumers may appreciate the added benefits of healthy food alternatives, they may not be willing to pay the higher price associated with such products.

Given the focus of our study, we included consumer characteristics that may influence a consumer's willingness to pay for healthy alternatives, such as their general disposition to always seek lower prices or to associate a product's price with its quality.

Consumer Profiles on Price Sensitivity Dimensions

Lichtenstein, Ridway and Netemeyer (1993) suggest value consciousness, price consciousness, coupon proneness, sale proneness and price mavenism as ways in which the negative role of price impacts consumer purchase behavior. In its positive role, price is said to contribute to a price-quality schema and to consumers' prestige sensitivity. Given the purpose of this study, we concentrated on the most relevant constructs; value consciousness, price consciousness, and price-quality schema.

Value consciousness is described as consumers' concern for the price versus the quality received from a transaction. Price consciousness, on the other hand, refers to the degree to which consumers' focus exclusively on paying low prices. This type of consumer is unwilling to pay for unique product attributes if the price difference is too high (Monroe and Petroschius 1981). When consumers use price as a surrogate indicator of quality across situations and products, they are said to possess a price-quality schema

(Lichtenstein and Burton 1989). The schema is said to reflect the generalized belief that price is positively related to quality.

An interesting finding by Lichtenstein, Bloch and Black (1988) is that price consciousness is negatively related to price-quality inferences. Consumers who rely on price as a proxy for quality are less likely to focus exclusively on getting the lowest prices. On the other hand, when price conscious consumers focus on lower prices they either do not associate price and quality, or are unwilling to forgo any additional money for added product attributes.

STUDY 1: WTP from Hypothetical Responses

Based on the previous discussion and consistent with the literature on advertising effects, we expect consumers' perceptions of the brand, attitudes, purchase intentions and WTP to correspond to the brand's depiction in the advertisements. Specifically, we expect consumers' attitudes towards the brand to be more positive and WTP to be greater when the brand is depicted as possessing various desirable attributes ("less fat and tastes better"), than when no desirable attributes are presented. Similarly, we expect that consumers' intentions to purchase will be higher and WTP will be greater when both attribute claims are featured in the ads than when the ad is depicted as superior on only a single attribute.

Participants

Participants in this study were 96 male and female undergraduate students in various sections of principles of marketing classes at a midwestern university. They received course credit in exchange for participation in this study.

Procedure

Experimental sessions consisted of groups of twenty to twenty-five participants who were told the purpose of the study was to document consumers' buying habits for specific product categories. Upon entering the behavioral lab room, subjects were asked to read an informed consent form and to provide their signature as an indication of their willingness to participate. They were each seated at a computer terminal which had the instructions displayed on the screen. The instructions asked students to use their mouse to trigger the computerized program once they had read the instructions or answered all questions presented on the screen.¹⁰ The following screen presented students with one version of the advertisement, which was programmed to remain on the screen for thirty seconds. After the image was presented, the program automatically triggered a series of questions about their willingness to pay, followed by questions relating to their attitudes, preferences and prior buying habits for the product category advertised. Once participants had completed the computerized questionnaire, they were thanked and dismissed.

Category Purchasing Habits

A majority of the participants (93.5%) said they were not aware of Boston's brand of salty snacks and none of the subjects had ever purchased the Boston's brand of snacks before. There were no statistical differences across ad conditions on all of the above. However, a majority of participants purchase salty snacks regularly. Approximately 93% purchase this product at least once a month, with 42.75% reporting that they buy this product at least once a week. They primarily purchase salty snacks at supermarkets and

¹⁰ All stimuli for both study 1 and study 2 were presented and data collected via the Media Lab computer program version 2002.2.10 except the ascending English clock auction which was coded by the researchers.

convenience stores (76% and 71% respectively). Four percent indicated that they never purchase this product category.

Ad ratings

Participants were asked to rate the advertisements on 10 bipolar adjectives on a 7-place response format, with higher numbers indicating the most desirable level of each adjectives. The items corresponded to two subscales (ethos and logos) of the Persuasive Disclosure Inventory (Feltham 1994). The ethos scale taps whether the source (in this case, the parent company of the brand) is seen as believable, credible, trustworthy, reliable and dependable. The logos subscale relates to the informational value of the advertisement (in this case, the ad claims). The items were rational, informative, factual, knowledgeable, and logical. The ethos Cronbach's $\alpha = .947$ and for the logos scale was Cronbach's $\alpha = .825$.

There were no significant differences across conditions on the ethos subscale meaning that each of the ads was comparable. However, there was a significant difference across ad conditions in the logos scale meaning that the subjects viewed the ads as having differing levels of informational content. Post Hoc analysis indicate that the comparison between the ads featuring the "less fat" claim and "tastes better" condition was significant, with the sum score of the "less fat" condition being higher than that of the "tastes better" condition. In order to better identify the source of the differences, analyses of the individual items were conducted. A significant difference was found between the ads only on the informativeness item ($F=3.42$, $df 3,87$, $p<.02$). Post Hoc Bonferroni comparison tests showed that the "less fat" ad was rated significantly more informative than the "tastes better" ad (mean scores 5.09 and 4.0

respectively). This can be explained by prior research that suggests that abstract information tends to be perceived as less informative than concrete information (cf. Borgida and Nisbett 1977). Taste, as a performance dimension, is a subjective and abstract construct while fat and amount of fat can be quantified; the latter being perceived as more informative about a brand and product previously unknown to this sample.

Attitude toward the brand

Subjects were asked to report their attitude towards the brand of snacks advertised (Boston's). Participants were presented with 3 bi-polar adjectives on a 7-point scale format: "Boston's is a good/bad, reliable/unreliable, trustworthy/not trustworthy brand." They were also asked to respond to two items to assess their general attitude toward the brand, and their feelings towards the brand. There were no significant differences across conditions on any of the 5 attributes, with the means at the midpoint of the scales (mean range 2.96-4.05 on a 7-point scale). This is suggestive of a neutral attitude towards a brand that was unfamiliar to the participants, so that a single ad exposure was insufficient to solidify a brand attitude (Smith and Swinyard 1982)

Perception of the brand as healthy

Subjects were asked to report their perception of the Boston brand of snacks. They were presented with four bi-polar adjectives on a 7-point scale format: "Boston's brand products are _____" healthy/unhealthy, nutritious/not nutritious, low in fat/high in fat, low in calories/high in calories. Lower numbers corresponded to the desirable level of the attribute. The reliability for the 4-item scale was Cronbach's $\alpha = .82$.

There were significant differences across the advertising conditions on the health perception scale ($F=3.691$, $df 3, 88$, $p<.015$). Post Hoc Bonferroni tests showed that in the absence of any claims, the brand was perceived as less healthy than when the ads featured the “less fat” claim or both fat and taste claims (see Table 1).

Table 1 here

Ranking of Attribute Importance

Subjects were asked to rank the importance of a series of attributes considered when purchasing salty snacks. They were asked to rank the following attributes from most important (9) to least important (1): price, taste, package size, calories, fat content, cholesterol content, sodium content, brand name and variety of flavors. A majority of subjects reported that sodium was the most important attribute when purchasing salty snacks (80% ranked at 7 or above), followed by cholesterol (78.9% ranked at 7 or above). The next most important attribute was calories, ranked by 35.8% at 7 or above.

Univariate analysis of variance yielded significant differences between conditions only for the ranking of calories ($F=3.22$, $df 3,91$, $p<.02$), and marginally significant differences for fat content ($F=2.259$, $df 3, 91$, $p<.08$). Post hoc Bonferroni comparisons of the various conditions yielded significant differences between the less fat and tastes better conditions and the condition without claims. Specifically, the importance rating for calories was significantly lower for the ad without claims when compared to each of the single claim conditions (less fat vs. no claim $p < .06$; tastes better vs. no claim $p < .05$; see Figure 1). Comparison of mean importance ratings of fat content were only marginally

significant between the condition that included both claims and the ad without claims (p<.07; see Figure 1)

Figure 1 here

Price-related Constructs

Participants were asked to rate their agreement to a series of statements on seven-point Likert format items corresponding to the value consciousness scale, the price consciousness scale and the price-quality schema scale. The seven-item value consciousness scale (VC) measures the degree to which consumers are concerned about the quality received for the price paid. The price consciousness scale (PC; five items) measures the degree to which consumers focus exclusively on paying low prices. The price-quality schema (PQ) is a four-item scale that measures the generalized belief held by some consumers that higher prices are positively associated with higher quality (Lichtenstein, Ridway and Netemeyer 1993).

Reliability for each of the summed scales was at an acceptable level for this sample, with VC Cronbach's $\alpha = .86$, PC Cronbach's $\alpha = .81$, and PQ Cronbach's $\alpha = .87$. There were no differences in consumer responses to these scales across ad conditions.

Intent to purchase

Subjects were asked to report the likelihood of purchasing the advertised product on their next shopping trip and in future shopping trips on a seven-point Likert scale anchored by 1 (not likely at all) and 7 (very likely). There were significant differences

across conditions on one of the measures of intent to purchase. For the likelihood of purchase on the next shopping trip, subjects in the no claim condition were more likely than subjects in other conditions to say they would purchase the advertised product ($F=3.137$, $df\ 3,88$, $p<.03$). For the measure of future intent to purchase, differences were marginally significant, with subjects who saw an ad with no claims being more likely to say they would purchase the advertised product on a future shopping trip ($F=2.25$, $df\ 3, 88$, $p<.08$).

Willingness to Pay

Subjects were asked to provide a dollar amount they would be willing to pay for the advertised product. This question was asked in two different formats, an open-ended free response and as a choice of prices within specified ranges. The mean dollar amount participants were willing to pay for the product was \$1.82, with the minimum being \$0.05 and the maximum being \$4.59. There were no significant differences across ad conditions on the amount participants were willing to pay for the advertised product ($F=.423$, $df\ 3, 88$, $p<.73$). As a check, subjects were also asked to select one of a series of price-range options according to how much they would be willing to pay for the advertised product. Under this measure, there were no significant differences of participants' WTP across ad conditions. Further, the vast majority (87.8%) of subjects selected a range of values consistent with their open-ended WTP.

Discussion of Study 1 Results

Perceptions of the brand as healthy were consistent with the advertising depictions. The brand was perceived as healthy when the ads featured the 50% less fat claim whether the claim was presented by itself or along with the taste claim. However,

brand depictions did not impact attitudes, but sometimes impacted the corresponding importance attribute ratings. That is, subjects did not rate taste as being more important after being exposed to the *tastes better* claim. Similarly, being exposed to the less fat claim did not impact ratings of the importance of fat when choosing among salty snacks. A weak impact was detected only when comparing the ad featuring both attributes against the no-claim ad. Fat was rated as more important by groups exposed to the former condition.

The importance ratings for attributes not featured in the ads, however, appear to be influenced by the advertising claims. Specifically, whether the brand was depicted as low in fat *or* as better tasting triggered the participants' interest in the caloric content of snack products. This is consistent with consumer expectations regarding this product category: if it tastes good it must not be good for you. Also, nutritional labeling has educated consumers that a low-fat product is not necessarily a low-calorie alternative (Andrews, Netemeyer and Burton 1998).

Interestingly, even though sodium and cholesterol content were ranked as very important attributes by a majority of participants (80% and 78.9% respectively rated the attributes at 7 or above on the 9-point importance scale), concern about these attributes was not differentially influenced by the various depictions of the brand. That is, while a claim of reduced fat triggers interest in the caloric content of snack products, it does not lead to concern about their cholesterol level. Similarly, a claim to better taste does not trigger concern for the sodium content of these products, but it does raise the profile of calories.

Surprisingly, intentions to purchase the advertised product were stronger when brand information was absent from the advertisement. It is unclear whether this reflects the subjects' heightened curiosity about an unfamiliar brand for a product category that is familiar, as subjects report purchasing salty snacks on a regular basis.

Contrary to expectations, neither purchase intentions nor brand perceptions corresponded to higher WTP values. The average price expressed by consumers did not vary with the brand's depiction in the advertisements, even when the brand was portrayed as superior on desirable attributes.

STUDY 2: Revealed WTP

In contrast to Study 1, which focuses on measuring an ad's influence on the respondents' perceptions of the brand and how their perception impacted stated WTP, Study 2 focuses on behavior and revealed WTP information.

Participants

Participants in this study were 90 male and female undergraduate students at the same Midwestern university as the respondents in Study 1. These 90 subjects had not participated in Study 1. They did not receive course credit, and instead were guaranteed a \$5 show up fee for participating in the study.

Procedure

To compare elicitation techniques, a second series of experiments was conducted where subjects were again shown one of the same four snack ads. In this set of experiments WTP was determined via an ascending clock auction. A total of seven laboratory sessions were completed with at least 12 participants per session.¹¹ In these

¹¹ Having twelve people in each session enables us to handle the winner's missing WTP when determining the effect of the advertisements.

experiments, subjects entered the laboratory after giving signed consent and read computerized directions on the auction mechanism. The directions made explicit that it was in a subject's best interest to truthfully reveal WTP.¹² Once all of the subjects had completed the directions a practice auction was conducted for a fictitious good. The results of the practice auction were then discussed and any questions were answered publicly. This process allowed the subjects to become familiar with the auction and the computer interface. Only after all subjects were ready did the experiment continue.

In the second stage subjects were shown one of the four snack ads for a period of 30 seconds. Subjects were randomly assigned to treatments, conditioned on there being the same number of participants in each treatment in each session. The experimenters then held up the product that would be auctioned off in the front of the room so that all of the subjects 1) could verify the quantity of snacks in the package and 2) were given credible evidence that the auction was binding. Care was taken such that the subjects could not distinguish any differences between the text on the actual packaging and the electronic ad on the screen. Next the auction was conducted with a starting price of \$0.00 and increased by \$0.01 each second. Note that with free disposal, the ability to throw the product away immediately, all subjects should be willing to pay a price of \$0.00 for the snacks.

To ensure that each subject had the liquidity necessary to make a purchase at all reasonable prices, each subject was given \$8.00 for participating in the approximately 30 minute session. All subjects were told at the beginning of the experiment that they were being given \$8.00 for participating and that this was the money they could use in the auction.

¹² A copy of these directions can be made available upon request.

After the auction determined the winner and the buying price, the experiment moved into the final stage where the personal information and other measures were collected. Once a subject completed the questionnaire, he or she was allowed to go individually to a separate room in the lab to receive payment and the product if that subject had won the auction. Those who did not win the auction received the \$8.00 and the winner received the package of Boston's snack mix plus \$8.00 minus the final clock price for the snack at the conclusion of the experiment.

Category Purchasing Habits

A majority of the participants (80%) said they were not aware of Boston's brand of salty snacks, and 96.7% reported they had never purchased the Boston's brand of snacks before. There were no differences across ad conditions or between studies. Approximately 95% purchase this product at least once a month, with 30.8% reporting that they buy this product at least once a week. A majority of participants purchase salty snacks at supermarkets (81%) or convenience stores (62.6%). Three percent indicated that they never purchase this product category.

Ad Ratings

As in the first study, participants were asked to rate the advertisements on 10 bipolar adjectives corresponding to two subscales (ethos and logos) of the Persuasive Disclosure Inventory (Feltham 1994). The ethos subscale reliability was Cronbach's $\alpha = .94$ and the logos' subscale reliability for this sample was Cronbach's $\alpha = .88$.

There were no significant differences across conditions on the ethos subscale but some differences were found across ad conditions in the logos scale. Post Hoc analyses

indicate significant differences between the less-fat and the no-claim condition ($F=2.59$, $df\ 3, 87$, $p<.05$). Analyses of the individual items yielded a significant difference between the ads only on the informativeness dimension ($F=3.14$, $df\ 3, 87$, $p<.02$). Post Hoc Bonferroni comparison tests showed that the less fat ad was rated as more informative than the no-claim ad (mean scores 5.26 and 3.78 respectively). This finding is not surprising given the absence of any brand information in the latter ad.

Rankings of Attribute Importance

Subjects in this experiment were also asked to rank the importance of the same attributes as in study 1. For this sample, cholesterol was ranked as very important by a majority of subjects (80% ranked at 7 or above out of 9). Sodium was the next most important attribute, ranked at 7 or above by 70.4% of the sample; fat content followed with 45% ranking it at 7 or above.

Price-related Constructs

Participants were asked to rate their agreement for a series of statements on seven-point Likert format corresponding to items in value consciousness, price consciousness and price-quality schema, the same scales administered to participants in the first study (Lichtenstein, Ridway and Netemeyer, 1993). Reliability for each of the summed scales was at an acceptable level for this sample, with Cronbach's $\alpha = .88$ for value consciousness, Cronbach's $\alpha = .83$ for price consciousness equal, and Cronbach's $\alpha = .84$ for the price quality schema. Again, there were no differences in consumer responses to these scales across ad conditions.

Willingness to Pay

The advantage of the English clock auction is that it has been found to generate more accurate WTP information. The drawback is that the auction yields information for all but one of the participants, the winner. This missing observation makes parametric analysis difficult.¹³ However, as long as there are at least three subjects in each treatment during a session, the median WTP is well defined for that session. We exploit this fact in testing the null hypothesis of no ad treatment effect. In fact, this is why the experiments for this study were always conducted with at least 12 participants per session.

We find that the ads have no significant impact on revealed WTP for buyers as a whole. Figure 2 shows the median revealed value by treatment for each of the seven laboratory sessions.

Figure 2 here.

Clearly evident from this figure is the lack of treatment effect. Formally, we test the null hypothesis of no treatment effect against the alternative that each of the less-fat ad, the taste ad, and the combined claim ad all lead to weakly higher WTP than the no claim baseline and at least one of the three ads is associated with a strictly higher WTP. Using a Fligner-Wolfe test¹⁴ the null is not rejected (FW= 319.5, p-value =0.426).

Given that the product in question is food and the subjects actually have an opportunity to complete a purchase, one might be suspect of the independence assumption as different sessions were conducted at different times of day. For example,

¹³ While the data are simply truncated, the truncation point differs for each session, rendering standard techniques for handling this problem inadequate.

pre lunch sessions might have involved hungrier subjects than the post lunch sessions. To control for this possibility, we also report the Friedman statistic for testing the null hypothesis against the alternative that some ad claim (or lack thereof) resulted in a different median WTP. The test statistic is $S=1.114$, where S is distributed approximately $\chi^2_{(df = \# \text{ treatments} - 1 = 3)}$. Hence, the conclusion is the same as before, we fail to reject the null hypothesis of no treatment effect.

As a final comment in this section, we address the criterion validity of the ascending English clock auction. None of the individuals who actually bought the snack indicated they wished they had not made the purchase at the final clock price. Also, none of the subjects who did not make a purchase indicated they were in fact willing to make a purchase at the ending price.

COMPARISON OF RESULTS: STUDIES 1 & 2

Given that the purpose of study 2 was to compare behavior from the English-clock auction against the hypothetical scenario, results are discussed for contrasting our findings between the two studies.

Attribute Importance Ratings

An elicitation method by ad condition interaction was found when looking at the attribute importance ratings. Specifically, whether subjects rated certain attributes as important appears to depend on the method used to elicit the WTP information. When brand information is presented, there are no differences in importance ratings for calories and fat between the elicitation methods. However, in the absence of brand information (no claim condition) subjects tend to rate calories ($F= 2.3$, $df 3,178$, $p<.07$)

¹⁴ The Fligner-Wolfe test is a multiple condition generalization of the Wilcoxon Rank Sum test. For a discussion of the Fligner-Wolfe test the reader is directed to Hollander and Wolfe (1999).

and fat ($F= 2.79$, $df 3, 178$, $p<.04$) lower on the importance scale in the hypothetical scenario than in the auction study. The other factors such as pack size, taste, cholesterol, and sodium did not vary across elicitation methods.

This finding may be interpreted in the context of the information consumers have at the point of purchase. That is, when encountering a new brand in a familiar product category, consumers may or may not have been exposed to brand information in the form of ads. The no-claim condition in the auction study approximates such a scenario, where even though they saw an advertisement, it consisted of only a picture of the package and the brand name. The absence of calories and fat information suggests that such information is salient, but only when consumers face a real decision. We would anticipate that in an actual point of purchase situation these consumers would be more likely than others to pick up the product and examine the package in search of such nutritional information.

Figure 3 here.

Price Sensitivity Dimensions

One-way analyses of variance were conducted to test for the effect of the elicitation method on subjects' self-ratings on each of the price-sensitivity dimensions. There was a significant main effect of elicitation method on the subjects' self-ratings on value consciousness ($F= 18.69$, $df 1, 185$, $p <.0001$) and price consciousness ($F=20.55$, $df 1, 185$, $p<.0001$). Specifically, subjects in the auction condition tended to rate themselves as being more value conscious ($M= 38.58$, out of a maximum scale score of 49) and more

price conscious ($M= 16.66$, lower values indicate being more price conscious, minimum scale value being 5) than in the no auction condition ($M= 33.48$ and $M=21.06$ respectively). There were no significant differences in their self-reports in the price-quality dimension ($F=.09$, $df 1, 185$, $p<.76$).

These findings suggest that the way in which WTP values are elicited can trigger consumers' pre-existing dispositions towards value and price consciousness making these dimensions more salient and influential in the context of a purchase decision.

Consumers' perceptions of price-quality associations however do not appear to be influenced by the WTP elicitation method. It makes intuitive sense that consumers' internal correlation between price and quality should remain constant whether they are in a real purchase situation or making a hypothetical choice.

Willingness to Pay

The missing observations of Study 2 preclude us from conducting the same analysis for it as we did for Study 1. However, we can apply the Study 2 techniques to the hypothetical WTP data of Study 1. Ultimately, the hypothetical data lead to the same conclusion, an absence of ad-treatment effect. However, as Study 1 involved more subjects in the lab per session, there were fewer sessions. To account for this we used a bootstrapping procedure. For each ad condition, we randomly drew 3 of the observed hypothetical WTP values with replacement from the set of all Study 1 observations for the given treatment. Based upon these 12 data points (3 observations x 4 treatments) we calculated the FW test statistic. We repeated this process 40,000 times. Only 8% of generated test statistics were greater than the 319.5 found for Study 2. Further,

approximately 5% of the generated test statistics would be rejected at the 95% confidence level as would be expected if the null hypothesis were true.

It remains to be determined how the elicitation method impacts our measure of WTP. Figure 4 plots the revealed demand curve for the product by study for each ad condition. Since WTP is not collected from the winner of the auction, upper and lower bounds are given for the demand curves of study 2.

Figure 4 here.

Evident from this figure is that the hypothetical WTP responses of study 1 are substantially greater than the revealed responses of study 2.¹⁵ Our previously discussed findings that the ads do not impact aggregate WTP in either study are also easily seen in the bottom panel of Figure 4. Another interesting result is that hypothetical responses tend to cluster around focal amounts. Over 62% of the hypothetical responses were in increments of \$0.50 as compared to only 14% for the revealed WTP observations, a statistically significant difference. This clustering phenomenon is observable in Figure 4 as the large horizontal segments of the demand curves.

To formally test the null hypothesis of no elicitation method effect on reported WTP, we employ a linear mixed effects model. This model allows for the treatment

¹⁵ This finding is consistent with previous studies that have found individuals overstate WTP when they are unlikely to be impacted by their statements (see Posavac 2001).

effects to be fixed while allowing each session to have a random effect.¹⁶ Specifically we estimate the following model:

$$WTP_{ij} = \alpha + \beta_1 \text{Health} + \beta_2 \text{Taste} + \beta_3 \text{Health} * \text{Taste} + \beta_4 \text{Auction} + \beta_5 \text{Auction} * \text{Health} + \beta_6 \text{Auction} * \text{Taste} + \beta_7 \text{Auction} * \text{Health} * \text{Taste} + \varepsilon_i + \varepsilon_{ij}$$

Health and Taste are indicator variables that take a value of 1 for individuals who observed the health (fat) and the performance (taste) ads respectively and are 0 otherwise. Auction is an indicator variable that takes the value 1 for individuals whose WTP was elicited by an ascending clock auction and is 0 for hypothetical responders. ε_i denotes the session specific random effect. Our variable choice is consistent with our treatment of the no claim condition as a baseline. The predicted WTP for an individual in the baseline no claim condition would be α and $\alpha + \beta_4$ for study 1 and study 2, respectively. The additional effect of observing only the “Less Fat” claim would be β_1 and $\beta_1 + \beta_5$ for study 1 and study 2, respectively. The predicted WTP for an individual seeing both claims would be $\alpha + \beta_1 + \beta_2 + \beta_3$ and $\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7$ for study 1 and study 2, respectively.

As discussed above, we are missing the WTP information for winners in the ascending clock auctions. Further the truncation threshold differs across sessions. To account for this in our analysis we estimated the above model specification multiple times, each time allocating different extreme values to the missing observations. A lower bound is known for each missing observation, the transaction price. However, we have no a priori upper bound on values. We chose to use \$4.59 as an upper bound as this was

¹⁶ See Longford (1993) for a discussion of this model which is widely applied in experimental sciences. Unlike the nonparametric FW tests estimating the mixed effects model provides a sense of the magnitude of an effect. The tradeoff is that we are forced to make assumptions about the missing observations.

the maximum WTP observed in the entire project.¹⁷ For brevity we present in Table 2 the estimation results when all missing observations (which are necessarily from Study 2) were pushed to the upper bound. Given that Study 2 WTPs are generally below those of Study 1, this allocation of missing observations is the most conservative test for finding that the elicitation format impacts WTP.

Table 2 here.

Based upon these estimation results, hypothetical WTP in the no claim baseline are $\beta_4 = \$1.24$ (or 191%) greater than in the revealed WTP no claim condition. This elicitation method difference is highly significant (p-value =0.0059). The results in Table 2 reconfirm the lack of an ad effect for hypothetical WTP as the null hypotheses of no effect of the less-fat claim ($\beta_1=0$), no effect of the taste claim ($\beta_2=0$), and no effect of the combined claim ($\beta_1+\beta_2+\beta_3=0$) relative to the no claim condition cannot be rejected at standard significance levels. Similarly this estimation reconfirms the lack of an ad effect in the revealed WTP data as the null hypothesis of no effect of the less-fat claim ($\beta_1+\beta_5=0$), no effect of the taste claim ($\beta_2+\beta_6=0$), and no effect of the combined claims ($\beta_1+\beta_2+\beta_3+\beta_5+\beta_6+\beta_7=0$) cannot be rejected at standard levels of significance.

Advertising Effects and Price Sensitivity Dimensions

¹⁷ The WTP of \$4.59 was from a Study 1 hypothetical response. The maximum WTP revealed in Study 2 was \$3.15. In total, we conducted all 16 possible combinations of missing observations being pushed to the upper and lower extremes (2 extremes for each of the four ad conditions yields $2^4 = 16$ possibilities). The conclusions did not differ depending on how the missing observations were allocated, indicating that the results are robust. This is not unexpected as the missing observations constitute a small percentage of the total observations.

Having established that the ads have no discernable impact on consumers as a whole, we next ask if the ads have an impact on some segment of the market. Specifically, we use the personal characteristic data to categorize individuals into four groups; those who rate themselves as highly price conscious and high on the price-quality schema, those that are low in both, those who are highly price conscious but low on the price-quality schema, and vice versa.¹⁸ We define an individual to be relatively high in a category if the sum of her responses on the given price sensitivity dimension exceeds the total that would result from simply entering the mean value for each component of the measure. Thus our high and low are absolute and not relative categorizations.

Given that subjects are randomly assigned to a treatment there is no guarantee that in each session there will be subjects of each of the four types in each of the four treatments even if we had always had 16 subjects in each session. Thus to test the null hypothesis we continue to use individual WTP data and accommodate the missing observations of study 2.

Based upon the hypothetical responses of study 1, testing the null hypothesis of no treatment effect with a FW test¹⁹, we find that the ad claim treatments continue to have no effect even after conditioning by buyer characteristics. However, using the revealed WTP data of study 2 we do find a treatment effect. Specifically, we find that the ad claims impact WTP for individuals who report not being price conscious and who score low on the price-quality schema. This result is somewhat intuitive ex post as these

¹⁸ Because so few of the subjects reported having low value consciousness, using 8 categories (2 VC levels, 2 PQ levels and 2 PC) was not feasible.

¹⁹ We could have used a linear mixed effects model as we did for aggregate WTP, but it would require 32 parameters (4 conditions x 2 elicitation methods x 4 buyer types) without a priori restrictions on the interaction effects. Since we are primarily concerned with an effect and not its magnitude, we chose to use the less restrictive nonparametric test.

are the individuals who do not focus on price and do not look to price as an indication of quality. For the remaining three buyer types there is no discernable ad claim effect based upon the revealed WTPs. Table 3 gives the relevant FW test statistics for each buyer segment.

To handle the missing observations of study 2, the tests were conducted twice for each buyer segment. First, missing observations from the baseline no ad treatment were given the highest rankings and missing observations from the three ad treatments were assumed to be as low as possible, the price paid in the respective sessions. The second test pushed the missing values from the baseline down to the lowest possible value and assigned the highest ranks to the other conditions.²⁰ The former test is most favorable to failing to reject H_0 and the latter is most favorable for rejecting H_0 . Since the test conclusions do not change based upon how the missing WTP observations are assigned, knowledge of the missing data would not have altered our findings.

Table 3 here.

Given that we find an ad effect for individuals with low PQ and low PC scores who are making actual purchase decisions, we ask which ad or ads increased WTP relative to the no claim baseline. Based upon Wilcoxon Rank Sum test²¹ results for pairwise comparisons between ad conditions we find that the two ads which told the

²⁰ Formally, one would need to consider all possible rank orderings of the missing observations from the three ad treatments; however, in the data we did not have missing observations from all treatments in all buyer groups making the allocation problem more straightforward.

²¹ From a formal standpoint, these tests are not valid as they are being conducted based upon our ex post observation that some treatment had an effect. Hence, we do not present p-values. However, they are potentially insightful for generating hypotheses for future exploration.

subject that the product “Tastes Better than Regular Snack Mixes” (the taste claim only ad and the combined ad) generated higher WTPs than the no claim baseline ad. There was no difference in WTP between subjects who observed only the taste claim and those that observed both the taste and the fat claims.

DISCUSSION OF FINDINGS AND CONCLUSIONS

In comparing hypothetical data collected in the typically fashion with revealed data from an ascending English clock auction we have found 3 major differences. First, when brand claims were presented, the impact that the ads had on attribute importance was exaggerated in the survey response study relative to the revealed response study. Second, the revealed WTP were approximately one third as high as the survey responses. Further, revealed WTPs were smoothly distributed while the survey responses tended to cluster on focal dollar amounts (\$1.00, \$1.50, etc.) perhaps suggesting subjects use different rules for hypothetically appraising items than for their actual purchase decisions. Third, the survey data found no ad effect when controlling for different price-sensitivity dimensions, but subjects who had both low PQ and low PC scores did respond differently to some of the ads and revealed higher WTP values. This finding is particularly important given that one of the goals of advertising is influencing consumers’ choice behavior.

Given these results and the reliability of the ascending clock auction, one should be suspect of marketing decisions based exclusively on survey type responses. Such responses tend to reflect an overbidding bias as consumers are not responsible for payment of their stated WTP values. Consumers’ expressed reservation prices are not reflective of their true economic preferences unless an incentive compatible method is

used (Posavac 2001). Clearly, managerial decisions regarding pricing of new products or brand extensions may lead to costly demand and profitability miscalculations when they are based on such data. As companies struggle to determine the optimal initial price for new products they must consider whether they will achieve return on investment or market share. Achieving such goals is especially difficult when products are priced too high at introduction, which may result from relying exclusively on survey data (Marn, Roegner, and Zawada 2003).

Some previous researchers have relied upon the BDM procedure to elicit revealed WTP. The BDM process is essentially a one person 2nd price auction where first a random number is generated and essentially used as a bid for some fictitious buyer. As pointed out by Wertenbroch and Skiera (2002), the BDM procedure can easily be implemented at the point-of purchase. Unfortunately, experimental studies have found that inexperienced subjects do not truthfully reveal their values under these institutions. In contrast, the English clock auction has been found to actually induce truthful revelation. For point of purchase type research, one could develop a BDM-like procedure for the English clock by first randomly selecting a value for a fictitious buyer and then having this fictitious buyer compete in the auction. The downside of such a procedure is that if the person's value is above the randomly generated value, then the person's value is not identified. However, as shown in our paper, with only three participants the median WTP is well identifiable and this unit of observation can be used for making inference. Operating such a small market (3 people) could easily be done at point of purchase.

Our findings and prior research (e.g., Bower, et al. 2002) suggest that WTP values expressed by consumers are significantly lower than the marketplace price for goods with desirable health attributes. The market price for the product used in our studies was \$3.79. This price is in excess of the vast majority of the WTP prices across both studies. Pricing such items out of the range acceptable to most consumers will make product trial difficult and habitual purchase nearly impossible. Future research utilizing the English-clock auction method for eliciting consumers WTP values should prove valuable to brand managers in determining whether current marketplace prices are in line with consumers' actual values for determining revenue streams.

Table 1

Respondents' Perceptions of the Brand as Healthy

Ad claim condition	Mean out of 28	N	Ho: no difference between condition and baseline
1) Less fat	12.35	23	1 vs. 4: p-value < .05
2) Tastes better	14.33	24	2 vs. 4: p-value > .9
3) Both claims	12.30	23	3 vs. 4: p-value < .05
4) No claims	15.27	22	

Table 2

Estimation Results for Mixed Effects Model

Parameter	Estimate	Standard Error	Degrees of Freedom	t-statistic	p-value
α	1.891	0.225	142	8.391	<0.0001
β_1	-0.177	0.307	142	-0.559	0.5768
β_2	0.247	0.329	142	0.750	0.4544
β_3	-0.219	0.444	142	-0.492	0.6235
β_4	-1.241	0.333	8	-3.722	0.0059
β_5	0.357	0.469	142	0.761	0.4481
β_6	-0.205	0.484	142	-0.424	0.6719
β_7	0.554	0.668	142	0.830	0.4078

Table 3

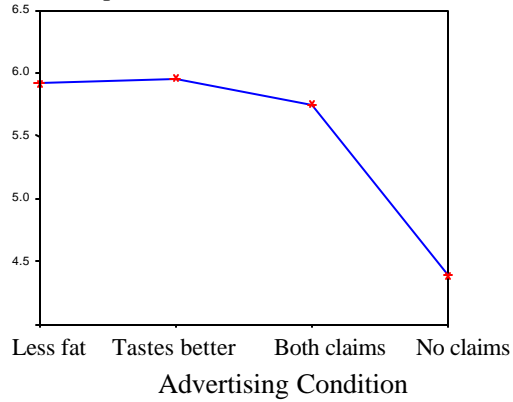
Testing for Treatment Effects within Consumer Characteristics

Price-Quality Schema	Price Conscious	FW statistic	~ p-value
<i>Study 1: Hypothetical Responses</i>			
High	High	244	0.682
High	Low	145	0.383
Low	High	149	0.646
Low	Low	254	0.740
<i>Study 2: Revealed WTP</i>			
High	High	102	0.381
High	Low	352.5	0.343
Low	High	48	0.753
Low	Low	457	0.021
The table is based upon a one sided alternative. P-values are approximate due to ties in the WTP observations within type and study. The p-value for a FW statistic is dependent upon the total number of observations and the percentage of observation that are from the baseline condition.			

Figure 1

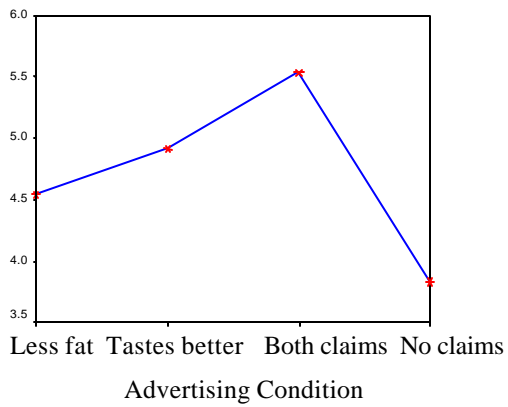
Comparison of Attribute Importance

Mean of Attribute Importance: Calories



Advertising Condition		P value
Mean importance rating: Calories		
Less Fat 5.92	No claims 4.39	.06
Tastes better 5.96		.05
Both claims 5.75		.13

Mean of Attribute Importance: Fat



Advertising Condition		P value
Mean importance rating: Fat		
Less Fat 4.54	No claims 3.83	.9
Tastes better 4.92		.6
Both claims 5.54		.07

Figure 2

Median Revealed WTP by Session

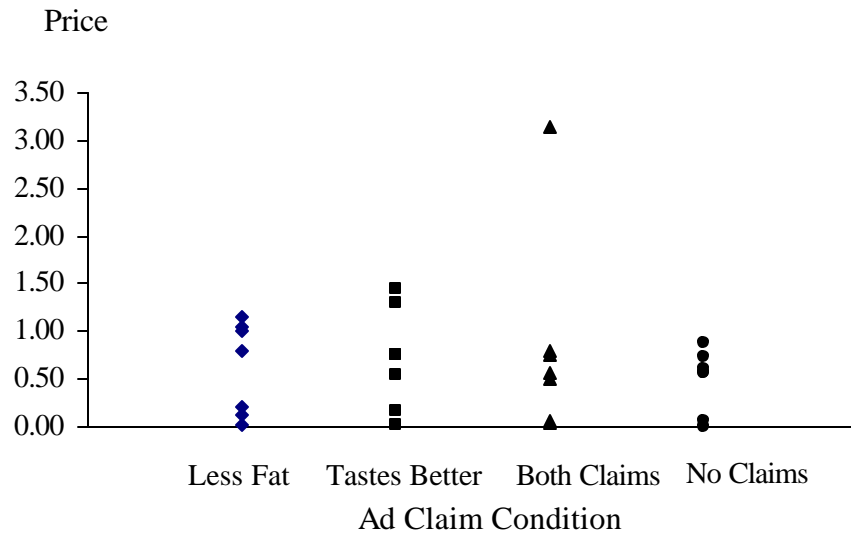


Figure 3

Importance of Fat and Calories across Treatments

Importance Ratings: Fat
Estimated Marginal Means



Importance Ratings: Calories
Estimated Marginal Means

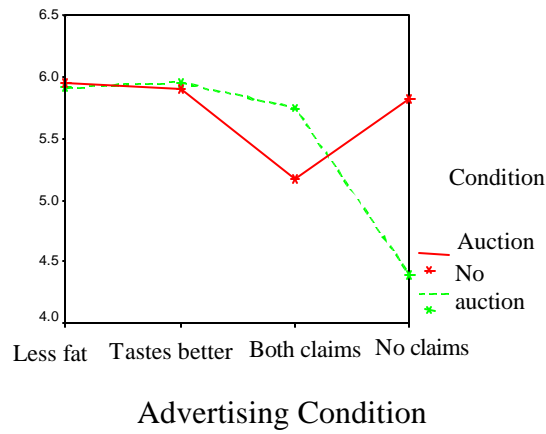
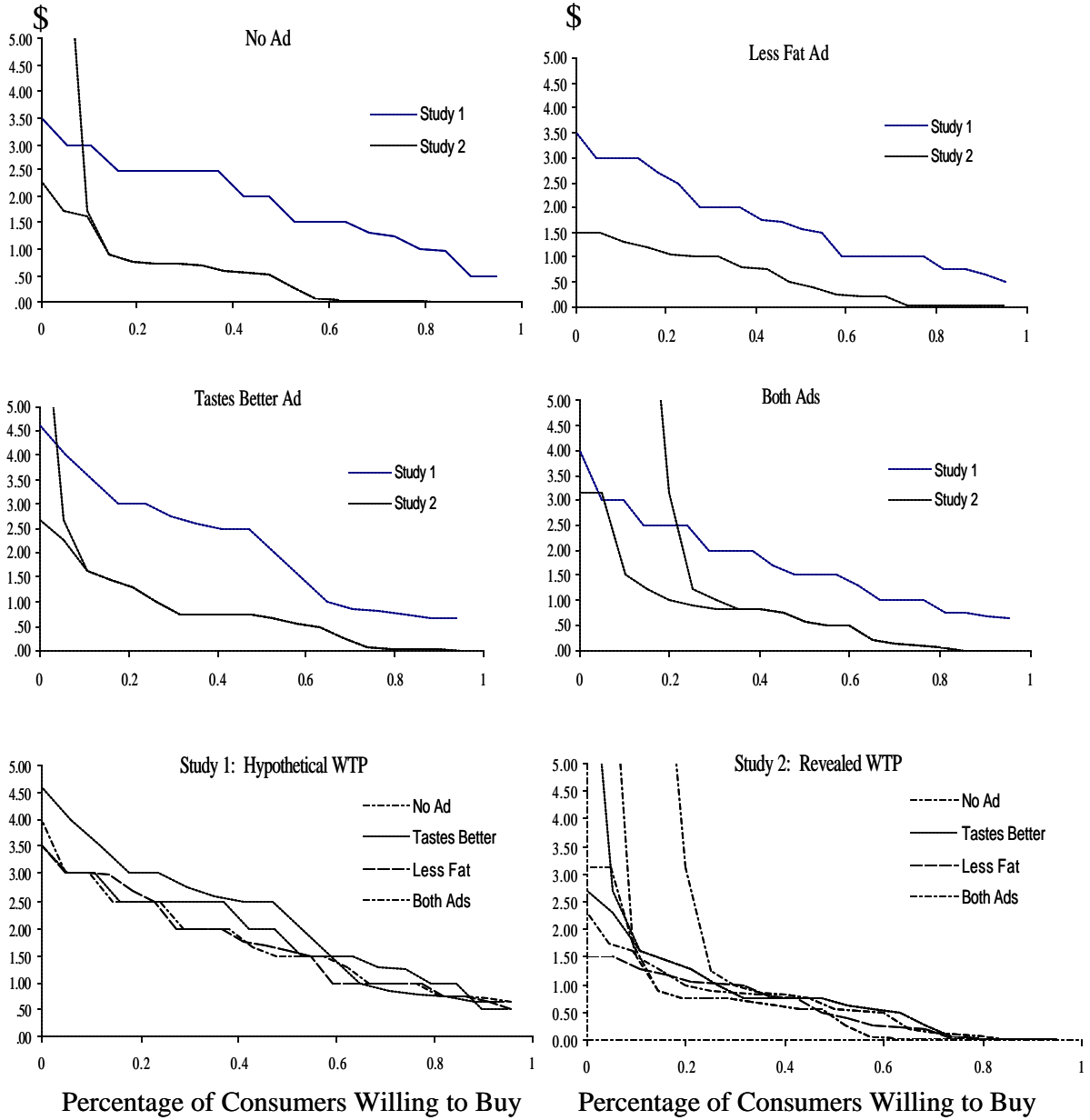


Figure 4

Revealed Demand Curves by Treatment



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Appendix A

Ad Conditions



50% LessFat
than
Regular
Snack Mixes

Tastes Better
than
Regular
Snack Mixes



50% LessFat
than
Regular
Snack Mixes



Tastes Better
than
Regular
Snack Mixes

