Consumer Willingness to Pay for "Second-Generation" Genetically Engineered Products and the Role of Marketing Information

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Key words: auctions, BDM mechanism, cigarettes, field experiment, genetically engineered foods, second-generation

Abstract

Environmental and consumer groups have called for mandatory labeling of genetically engineered (GE) food products in the United States, stating that consumers have the "right to know." Herein we use a nonhypothetical field experiment to examine the willingness to pay for GE-labeled products, using the only "second-generation" GE product currently on the U.S. market—GE cigarettes. Our results suggest consumers pay less for GE cigarettes when marketing information is absent. But, when presented with marketing information on the attributes of the cigarette, we find no evidence that consumers pay less for GE-labeled cigarettes.

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Introduction

Genetic engineering remains a controversial issue. Those who oppose genetically engineered (GE) food products have successfully publicized potential threats that could result from eating GE foods, such as environmental degradation, consolidated multinational power, human health threats (e.g., more allergic reactions), and uncertain long-term impacts (see, for example, Greenpeace [2001 a, b, c] and Friends of the Earth). These concerns have prompted some nations, including the European Union, Australia, and Japan, to require firms to label all GE food products. In contrast, the United States does not require explicit labeling of GE products; rather, labeling in the United States is only required if the product has been modified to alter consumer characteristics. In such cases, only the modified attribute needs to be identified.

Only one such altered "second-generation" GE product currently exists in the United States, Quest™ cigarettes, a product that was introduced into the U.S. market in early 2003.[1] Genetic engineering is used to reduce the level of nicotine, and three versions of these new Quest cigarettes are now on the U.S. market (low-nicotine, extra-low nicotine, and nicotine-free).[2] Under current regulations, the U.S. Food and Drug Administration (FDA) requires the company to label these new cigarettes—but the label needs only to indicate that the products are lower in nicotine. Federal law requires no

[1] Flavor Savor Tomatoes, which were genetically engineered to increase shelf-life, were on the U.S. market in the 1990s but are no longer sold. Another product, Golden Rice, is genetically engineered to increase the amount of vitamin A, but this product is not yet on the market (Lusk).

[2] In the past, most reduced-nicotine cigarettes were bleached to remove nicotine, resulting in a noticeable difference in taste. In contrast, Quest cigarettes taste similar to leading brand-name cigarettes.

explanation of the genetic engineering, merely that the consumption characteristics of the product have changed.[3]

We used experimental methods to examine adult smokers' willingness to pay for this second-generation GE product under a 2x2 informational design: (1) with and without a label indicating the cigarettes are GE and (2) with and without supplementary marketing information related to the consumer qualities of the new cigarettes. We conducted nonhypothetical field auctions at two grocery stores in the Midwest. To our knowledge, this study is the first to use experimental methods in order to determine consumer willingness to pay for second-generation GE products. This study is also the first to examine the effect of conventional marketing information on the demand for a GE-labeled product.[4]

In this paper, we test four hypotheses: (1) overall, bids for GE-labeled cigarettes are identical to bids for non-GE-labeled cigarettes; (2) in the absence of marketing information, bids for GE-labeled cigarettes are identical to bids for non-GE-labeled cigarettes; (3) when consumers are presented with marketing information, bids for GE-labeled cigarettes are identical to bids for non-GE-labeled cigarettes; and (4) bids for

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[3] The United States does not require any additional labeling for GE foods that are "substantially equivalent" to the non-GE substitute (U.S. Food and Drug Administration). Labeling is only required when genetic engineering alters the end product (e.g., an absent allergen materializes). Bt-corn is an example of a "substantially equivalent" GE food product. Bt-corn is genetically engineered to resist pests but is virtually identical to the non-GE corn consumers would otherwise purchase. Other examples include Monsanto's line of Roundup Ready soybeans, potatoes, and canola.

[4] Several studies have examined the impact of positive information on the demand for GE-labeled products, most notably Lusk et al. (2004) and Huffman et al. (2003b), but these studies specifically examine information that discusses benefits of genetic engineering. Information dealing with genetic engineering is not typically disseminated by firms trying to convince consumers to purchase their products. In this study, the marketing information given to consumers only deals with the benefits of the cigarettes and does not mention genetic engineering.

GE-labeled cigarettes when marketing information is presented are identical to bids for GE-labeled cigarettes when marketing information is not presented.

Background

Background on GE labeling

Many countries require manufacturers to label GE products. The countries in the European Union, for instance, require mandatory labeling for all GE products, and the European Parliament recently voted for a 0.9-percent threshold, meaning that all products containing more than 0.9 percent GE material must be labeled as genetically engineered.[5] Other countries that require mandatory labeling for GE products include Australia, Japan, Korea, Brazil, and Thailand (Shipman, 2001; Rousu and Huffman, 2001). There have been several quantitative studies that have reviewed preferences for GE and non-GE food products.

In the United States, consumers prefer non-GE foods instead of first-generation GE food products. Several studies using experimental-auction markets have concluded that, on average, consumers will pay less for GE food products (e.g. see Huffman et al. 2003; Lusk et al. 2001A). While consumers show a general dislike for GE food products, consumers seem more concerned with whether GE content is in fact present in the product than they do with the actual amount of GE content present (Rousu et al., 2004). Studies using surveys and focus groups have found the same general result: U.S. consumers say they will pay less for GE food products (see Chern et al., 2002; Teisl et al., 2002). For a quantitative summary of studies that have estimated WTP for GE food

[5] Member countries must first ratify the new rules before they take effect (CNN.com, 2003).

products, we refer the interested reader to the meta analysis by Lusk et al. (2003) of GE food studies.

Background on how information affects consumer decisions for GE-labeled foods

Until recently, the only GE products available on the U.S. market were first-generation GE products. These products are genetically engineered for agronomic purposes and do not have altered physical, consumer end-use characteristics. Consumer acceptance of these products has been slow, though some observers have hypothesized that consumer demand could increase when the benefits of consuming GE products are more apparent (e.g., see Hoban, 1998). Second-generation GE products are genetically engineered to change the product characteristics (e.g., lower nicotine in GE cigarettes, more vitamin A in golden rice), thus consumers could see greater benefits from consumption and be less hesitant about consuming GE products.

Two studies using experimental auctions have examined how positive information about genetic engineering information effects consumer demand for first-generation GE products. Huffman et al. found that agribusiness information on the benefits of genetic engineering increases consumer demand for GE-labeled potatoes, tortilla chips, and vegetable oil. They also found that agribusiness information has value to consumers. Lusk et al. (2004) extended this study to look at several different types of agribusiness information. They found that all types of information increase acceptance (through auction bids) of GE cookies, but that, depending on the region, different information sources have different effects. Both of these studies examine how information that specifically cites the benefits of genetic engineering changes the demand for first-

generation GE products. It remains unclear, however, how marketing information would affect preferences towards genetic engineering for second-generation GE products.[6]

Experimental Design

We designed a field experiment employing auctions to examine the effect on consumer demand of labeling second-generation GE products as "genetically engineered." There are tradeoffs when deciding to conduct field experiments instead of laboratory experiments. Field experiments allow the researcher less control over the environment but allow for a more real-world setting. Our experiments were conducted in a grocery store, because many smokers purchase their cigarettes at grocery stores (Lusk et al., 2001b). In addition, because participants were already in the store, they had a lower opportunity cost, and we were able to pay a lower participation fee.

People participated in our experiment either one at a time or in small groups of five or less. Because we often had one individual participating at a time, we used the Becker-DeGroot-Marschak (BDM) auction, in which each participant's weekly dominant strategy reveals his or her true willingness to pay for different cigarettes.[7] The BDM auction works as follows: (1) each participant places a *bid* on the cigarettes; (2) we randomly select a *market-clearing price* from a uniform distribution on the fixed interval of \$0.10 to \$6.00,[8] with clearing prices rounded to the nearest dime; and (3) a participant

[6] Scholderer and Frewer examine attitudes towards GE foods using non-experimental economic methods and find that alternative information sources seemed to have no significant effect on consumer attitudes.

[7] Other popular-demand-revealing auction mechanisms, such as the 2nd price auction (Vickrey) and the random nth-price auction (Shogren et al., 2001a) need multiple participants, which restricted their use in this intercept sampling procedure. The benefit of this sampling approach is that consumers received the good and payment at the store and were in a setting where they normally purchase cigarettes.

[8] Following Shogren et al. (2001b), we chose an upper bound to the limit price of \$6.00, which is approximately double the price one might pay at a store. Our lower bound choice was close to zero,

who bids less than the market-clearing price does not "win" and will not purchase any product. A participant who bids more than the market-clearing price wins the auction and purchases the cigarettes at the randomly selected market-clearing price.

We set up tables at two local grocery stores in Ames, IA, which has a population of 50,000 and is home to Iowa State University. Then we posted signs inside the grocery store indicating that smokers could earn $10 for 10 to 15 minutes of their time on a research project for Iowa State University.[9] We did not have any trouble recruiting participants.

This experiment had a total of four treatments, each differing in the information consumers received and in the presence or absence of a GE label. Figure 1 summarizes the four treatments. Some participants bid on cigarettes that had a GE label affixed to its side reading, "This product has been genetically engineered to reduce nicotine." Some consumers were given marketing information on the attributes of the nicotine-free cigarettes before bidding. The four treatments in our 2x2 design were (1) GE label with no marketing information, (2) GE label with marketing information, (3) no GE label with no marketing information, and (4) no GE label with marketing information.

The information sheet that two of our treatments received contains two statements regarding the Quest brand of cigarettes. This marketing information synthesized information from the manufacturer's Web site. The two statements read as follows:

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because we assumed that some participants would have little value for the low-nicotine cigarettes. Most studies have shown that the price distribution in the BDM auction does not matter (for a review, see Horowitz, 2004).

[9] For legal and ethical reasons, we limited our sample to adults who were 18 years of age or older. The experiment monitors checked the participant's photo identification when the participant looked younger than 28 years old.

(1) "Quest is a brand of cigarettes with low or no nicotine," and (2) "Although Quest cigarettes have less nicotine, they look, smoke, and burn the same as conventional cigarettes and offer the same smoking enjoyment" (see Appendix A). We used this information sheet to test whether or not a short marketing message on the modified characteristics of these cigarettes would affect consumer demand for genetic engineering. Participants were randomly assigned a treatment group based on what time they participated in the experiment. The experiment monitors switched the treatment at the top of every hour.

Steps in the experiment

Figure 2 summarizes the six key steps in the experiment. In Step 1, after prospective participants indicated interest, we asked them to read and sign consent forms after which we gave them experimental packets.[10] In Step 2, we explained the BDM auction mechanism and answered any questions from participants. In Step 3, we conducted a practice round using two candy bars. This practice round demonstrated to participants that it was truly in their best interests to bid only their true value for a good in the auction—no more and no less. We also explained that, when participants bid on multiple products, only one product's bid would be recognized as binding (valid) in order to avoid the possibility of participants obtaining multiple products that are similar.[11] We further explained that the recognized bid would be selected randomly. When the bidding for the candy bars ended, we determined whether the participant would purchase the candy bar and at what price.

[10] All experimental materials can be obtained from the authors upon request.
[11] In such a way we can avoid potential, albeit likely small, substitution and income effects.

Following the practice round, we started Step 4, the cigarette auctions. First, we had participants indicate the brand of cigarettes they normally smoke (henceforth referred to as their "regular brand").[12] A package of each participant's regular brand of cigarettes was immediately purchased (if their specific brand was not already on hand) and displayed with the three packages of Quest cigarettes (low nicotine, extra-low nicotine, and nicotine-free) for bidding. We then asked the participants to rank the four packs before them from most to least preferred. Once the consumers ranked the cigarettes, we asked them to place a bid for each of the four packs of cigarettes. Before they placed their bids, however, we reiterated that, similar to the candy bar rounds, only one of the four packs of cigarettes before them would be chosen at random for inclusion in the auction.

In Step 5, the binding (valid) round was determined, as well as the market-clearing price. In Step 6, participants completed a short post-auction questionnaire and were paid $10 for their participation. The experiment concluded with those who won the auction purchasing cigarettes at the selected market-clearing price.

Although we followed standard experimental auction valuation procedures (see Shogren et al., 1994; Fox, Hayes, and Shogren, 2002), we made four refinements to our design in order to better reflect consumer purchases. First, subjects submitted one bid per product. This limitation on bidding is a departure from the practice of using multiple rounds of bidding, which can cause a "posted-price effect" (see List and Shogren, 1999;

[12] Recall that some participants bid on the Quest cigarettes with GE labels on them. Because the regular brands of cigarettes were not genetically engineered, we did not place a GE label on these cigarettes.

Corrigan and Rousu, 2003a). Second, we did not endow participants with a product and then ask them to "upgrade" to another product (e.g., Hayes et al., 1995). Instead, participants bid on different cigarettes in each trial. This practice avoids the risk of an in-kind endowment effect distorting the bidding behavior (see Corrigan and Rousu, 2003b). Third, we randomly assigned treatments to the participants, so the estimation of the treatment effect is the difference in means across treatments (Wooldridge, 2002). Fourth, by using adults in a field experiment, we obtained a more heterogeneous group of auction participants than if we had used college students in a laboratory experiment. Table 1 summarizes the demographic characteristics of the auction participants.

Results

We will examine unconditional summary statistics as well as conditional results based on regression analysis. First consider the unconditional results. Table 2 shows the mean bids for the various packs of cigarettes. As would be expected, the highest mean bid, $2.69, is for the participants' regular brands, and this bid is roughly the average price of a pack of name brand cigarettes in the area. The mean bids for the Quest Low Nicotine, Quest Extra-Low Nicotine, and Quest Nicotine-Free cigarettes were $1.66, $1.59, and $1.45, respectively. We created a variable that we call "most-preferred Quest cigarettes," because different participants had different preferences for the reduced-nicotine cigarettes (e.g., some participants preferred nicotine-free cigarettes to low-nicotine cigarettes, whereas others had the opposite preference). This variable allows us to compare the bids for the participants' regular brands to the brand of Quest that participants most preferred. The mean bid for the most preferred brand of Quest

cigarettes was $1.84, which was considerably less than the bids for the participants' regular brand.

Table 3 shows the mean bids for the cigarettes under the two different labeling treatments. The bids for the consumers' regular brands of cigarettes are similar—only a 3-cent difference—which is not statistically significant. This similarity makes sense, because the participants' regular brands are not genetically engineered and should be unaffected by the presence of GE labels on the Quest cigarettes. This similarity also provides evidence that the cigarette preferences of our sample are fairly uniform across the treatments. Alternatively, the presence of a GE label on the Quest cigarette packaging affected consumer bids. The mean bids for the Quest cigarettes with a GE label are 14 percent lower, and these differences are statistically significant at the 10-percent level. We reject Hypothesis 1 in favor of the alternative: overall bids for GE-labeled cigarettes were less than the non-GE-labeled cigarettes. Some researchers have hypothesized that when GE products with clearer consumer benefits became available, consumer acceptance of GE products would increase (Hoban, 1998). Our auction results do not support this view.

Next, we compare the differences in bids between the GE-labeled and plain-labeled cigarettes when consumers did not receive marketing information. Table 4 shows the mean bids for participants segregated by each of the four treatments. Part A shows the bids from participants who did not receive the marketing information. In these treatments, the bids for Quest cigarettes when GE labels were present are lower than the bids for Quest cigarettes when GE labels were not present, and the differences are

statistically significant at the 1-percent level. We reject Hypothesis 2, because we find evidence that, in the absence of marketing information, consumer bids for GE-labeled cigarettes are lower than bids for non-GE-labeled cigarettes.

We next examine how marketing information that describes a product's attributes—when provided by the product's manufacturer for its consumer—affects consumer demand, in this instance for GE-labeled versus non-GE-labeled cigarettes. Part B of Table 4 shows the bids from participants who were given marketing information on Quest cigarettes. Among the consumers who were given manufacturer-provided marketing information on specific product attributes, those who also saw the GE labels bid *more* for Quest cigarettes than those who were asked to bid on non-GE-labeled cigarettes. We caution against a broad interpretation of this result, however, as the results are marginally statistically significant using a Wilcoxon rank sum test (p-values for two-sided tests range between .11 to .15 for the three brands of cigarettes) and not statistically significant at any conventional level using a t-test. The bulk of the evidence indicates we cannot reject Hypothesis 3, which states that bids for GE-labeled cigarettes and non-GE-labeled cigarettes are identical. The fact that, at a minimum, we find no evidence that consumers will bid less for the GE-labeled cigarettes when presented with marketing information is important. This result suggests that marketing information concerning product attributes may be a useful tool for companies that are considering using genetic engineering to create new second-generation GE products. One explanation for these findings is that consumers may have been skeptical that the cigarettes were really low-nicotine (or nicotine-free). Further, if the cigarettes were low-nicotine (nicotine-free),

consumers may have been skeptical that these new cigarettes tasted the same as cigarettes that have nicotine. The label indicating the product was genetically engineered may have added credibility to the product by explaining to consumers how the product came to be nicotine free.[13]

We now consider the conditional results based on regression analysis. Following Huffman et al. (2003a), the dependent variable is the difference in bid prices for the regular-brand cigarettes and the most preferred Quest cigarettes for each participant. We derive this price difference by subtracting one inverse-demand equation for a commodity from the other for the two products. The inverse-demand equations for the most preferred Quest and regular brand are shown in equations (1) and (2):

$$(1) \qquad P_j^{Quest} = \beta_1^{Quest} + \beta_2^{Quest} X_{j2} + \mu_j^{Quest}$$

$$(2) \qquad P_j^{regular} = \beta_1^{regular} + \beta_2^{regular} X_{j2} + \mu_j^{regular},$$

where P_j is the price consumer j bid for a product, β_1 is an intercept coefficient, β_2 is a vector of coefficients that is multiplied by a vector of exogenous characteristics X_{j2}, and a random error term μ_j. Differencing equations (1) and (2) we derive:

$$(3) \qquad P_j^{regular} - P_j^{Quest} = \beta_1^{regular} - \beta_1^{Quest} + \left(\beta_2^{regular} - \beta_2^{Quest}\right) X_{j2} + \mu_j^{regular} - \mu_j^{Quest}$$

The coefficients and error terms can be condensed and rewritten as:

$$(3a) \qquad P_j^{regular} - P_j^{Quest} = \beta_1^{*} + \beta_2^{*} X_{j2} + \mu_j^{*}.$$

[13] Using GE as a method to reduce the level of nicotine in tobacco should result in a more desirable product—at least from a smoking-enjoyment viewpoint—than conventional means to reduce nicotine levels such as chemicals and bleaching.

The difference in participant *j*'s bid prices for regular and Quest cigarettes, $P_j^{regular}$ and P_j^{Quest}, is explained by an intercept term β_1^*, a vector of coefficients β_2^* that is multiplied by a vector of exogenous characteristics X_{j2}, and a random error term μ_j^*. Differencing the data before model estimation allows us to remove any linear time-invariant, individual-specific unobserved effect, and this method leads to unbiased and consistent estimates of information-treatment effects on the demand for GE-labeled cigarettes (Wooldridge, 2002).[14]

Using additional data obtained from the auction participants on the post-auction questionnaire, we ran regressions examining what characteristics influenced bids for the Quest cigarettes. Table 5 presents the results of these regressions. The intercept is large, positive, and statistically significant in all specifications, indicating that, after controlling for independent variables, participants discount Quest cigarettes relative to their usual brand. To test for treatment effects, we included dummy variables for the following three different treatments: 1) those who bid on GE cigarettes and received marketing information, 2) those who bid on non-GE cigarettes and received marketing information, and 3) those who bid on non-GE cigarettes and did not receive marketing information. The dummy variable for those who bid on GE-labeled products without receiving the marketing information is the excluded variable.

The negative (and statistically different from zero) coefficient for the first of these dummy variables implies that those who bid on GE cigarettes and also received

[14] We ran these regressions using OLS. Censored regressions were also run, yielding similar results, which makes sense since no participants bid zero for their regular brand of cigarettes and only 3 of the 112 participants bid zero for any of the Quest cigarettes. The results are available from the authors on request.

information were willing to pay more (or had a smaller discount) for the quest cigarettes relative to those who only bid on the GE-labeled cigarettes. Thus, marketing information increased bid prices. This conclusion allows us to reject Hypothesis 4, that those who receive marketing information bid more for GE-labeled cigarettes. The dummy variables for the second treatment imply that consumers who were not exposed to the GE label and received marketing information were willing to pay more for the Quest brand of cigarettes than those exposed to the GE label without receiving the marketing information. The negative coefficient for the third treatment's dummy variable implies that, in the absence of marketing information, participants bid less for GE-labeled cigarettes than for plain-labeled cigarettes. The general results from the model estimated in the first column (1) in Table 5 were found to also hold when we controlled for other factors such as age, whether the participant had recently tried to quit smoking, if the participant was a college student, and the participant's income level.

Conclusion and Discussion

Using data from field experimental auctions, we examined consumer demand for the solitary second-generation GE product on the U.S. market: cigarettes genetically engineered to reduce nicotine levels. In the absence of marketing information, we found that consumers bid less for GE-labeled cigarettes relative to bids for the exact same cigarettes without a GE label. This finding confirms a general result observed in studies that have examined first-generation GE foods. When a label indicates that a food product was produced with GE, there is a general decline in preference towards that good. This result is intriguing when one considers that people who smoke are less likely to be health-

conscious (in a general sense) and are likely turned off by an aversion to the process of genetic engineering rather than any perceived health risk. Regardless of exactly why consumers bid less, our evidence does not support the hypothesis that when GE foods have clearer benefits, genetic engineering will be more readily accepted.

When consumers received marketing information, however, GE-labeling did not decrease demand. In fact, GE-labeled cigarettes got higher bids from consumers who received marketing information than from those who did not. The GE label seemed to reassure consumers that the process of removing nicotine was legitimate, perhaps lending credence to the claim that the cigarettes "taste the same" as conventional cigarettes. These results, while preliminary given our limited sample, raise an interesting question for companies considering the production of second-generation GE food products: should companies voluntarily label their products as GE? The answer could depend on the level of marketing. We find strong evidence that consumers who did not receive marketing information decreased their demand with a GE-label, whereas we find mild evidence that consumers who received marketing information increased demand. If a company decides to market a new, second-generation GE product, that company should not ignore the possibility that labeling its product "genetically engineered" might increase demand.

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Figure 1. Experimental Treatments

Treatment	Number of participants	Quest Cigarettes possessed a GE label	Participants received marketing information on Quest cigarettes before bidding
1	29	No	No
2	29	Yes	No
3	30	No	Yes
4	24	Yes	Yes

Figure 2. Steps in the Experiment

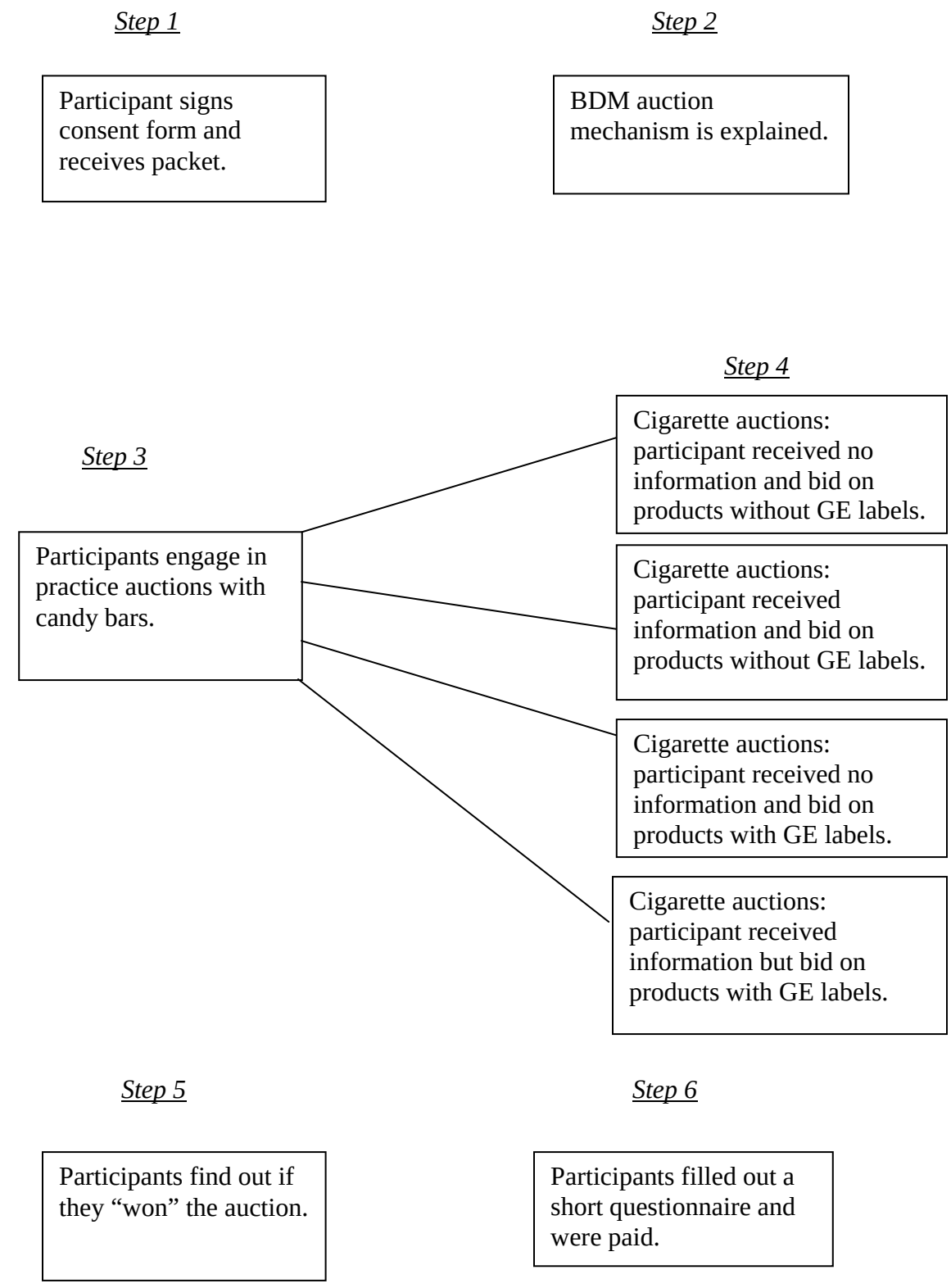

Table 1. Characteristics of the Auction Participants

Variable	Definition	Mean	St. Dev.
Gender	1 if female	0.38	0.49
Age	The participant's age	28.9	12.1
College-now	The participant is currently enrolled in college	0.43	0.50
Income	The household's income level (in thousands)	25.9	26.5
Quit recently	The participant is either currently trying to quit smoking, or has attempted to quit smoking within the past 6 months	0.38	0.49
Light	1 if the participant's usual brand of cigarettes is a light brand of cigarettes	0.51	0.50
Marlboro	1 if the participant smoked Marlboro cigarettes	0.72	0.45

Table 2. Mean Bids for Cigarettes (N = 112)

	Mean	**Median**	**Std. Deviation**	**Minimum**	**Maximum**
Name-Brand Cigarettes	2.69	2.75	0.85	0.50	5.00
Quest Low Nicotine	1.66	1.75	0.77	0	4.00
Quest Extra-Low Nicotine	1.59	1.50	0.80	0	4.00
Quest Nicotine-Free	1.45	1.50	1.11	0	6.00
Most Preferred Quest Cigarette	1.84	1.85	1.01	0	6.00

Table 3. How Did Mean Bids Differ When GE Labels Were Presented? (Standard deviations in parenthesis)

	Bids from consumers who saw Quest cigarettes that did not have a GE label (N = 59)	Bids from consumers who saw Quest cigarettes that had a GE label (N = 53)
Name Brand Cigarettes	2.68	2.71
	(0.69)	(1.01)
Quest Low Nicotine *	1.77	1.54
	(0.73)	(0.80)
Quest Extra-Low Nicotine	1.65	1.53
	(0.76)	(0.83)
Quest Nicotine-Free	1.52	1.37
	(1.20)	(1.02)
Most Preferred Quest Cigarette *	1.97	1.70
	(1.01)	(1.00)

*Differences in bids are statistically significant at the 10-percent level between those who bid on GE-labeled and non-GE-labeled versions of these cigarettes.

Table 4. How Did Bids Differ in Each of the Four Information Treatments? (Standard deviations in parenthesis)

Part A: Bids for Those Who Did Not Receive Marketing Information on Quest Cigarettes

	Bid on cigarettes with GE labels (N = 29)	Bid on cigarettes without GE labels (N = 29)
Name-Brand Cigarettes	2.57	2.71
	(1.11)	(0.61)
Quest Low Nicotine	1.21 ***	1.83
	(0.84)	(0.80)
Quest Extra-Low Nicotine	1.22 ***	1.66
	(0.85)	(0.74)
Quest Nicotine-Free	0.99 ***	1.58
	(0.86)	(1.07)
Most Preferred Quest Cigarette	1.32 ***	2.01
	(0.90)	(0.93)

Part B: Bids of Participants Who Received the Marketing Information on Quest Cigarettes

	Bid on cigarettes with GE labels (N = 24)	Bid on cigarettes without GE labels (N = 30)
Name-Brand Cigarettes	2.88	2.65
	(0.86)	(0.76)
Quest Low Nicotine	1.94	1.71
	(0.52)	(0.67)
Quest Extra-Low Nicotine	1.89	1.63
	(0.66)	(0.80)
Quest Nicotine-Free	1.84	1.46
	(1.01)	(1.33)
Most Preferred Quest Cigarette	2.17	1.94
	(0.92)	(1.09)

***Difference between these bids and corresponding bids in the other treatments are statistically significant at the 1-percent level.

Table 5. Regression Model Explaining the Difference between the Participants' Regular Brand of Cigarettes and Their Most Preferred Brand of Quest Cigarettes (N = 112)

Regressors	(1)	(2)	(3)	(4)	(5)
Intercept	1.25***	1.45 ***	1.37 ***	1.39 ***	1.36 ***
	(0.20)	(0.18)	(0.21)	(0.24)	(0.22)
GE label and received information	-0.54 *	-0.52 *	-0.56 *	-0.56 *	-0.56 *
	(0.29)	(0.29)	(0.28)	(0.29)	(0.29)
No GE label and received information	-0.54 *	-0.64 **	-0.73 ***	-0.73 ***	-0.73 ***
	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)
No GE label and received no information	-0.55 *	-0.52 *	-0.64 **	-0.64 **	-0.65 **
	(0.28)	(0.27)	(0.28)	(0.28)	(0.28)
Quit recently		-0.47 **	-0.55 ***	-0.55 ***	-0.55 ***
		(0.21)	(0.21)	(0.21)	(0.21)
College now			0.40 *	0.40 *	0.40 *
			(0.21)	(0.21)	(0.21)
Female				0.05	
				(0.21)	
Income					-0.00
					(0.00)
R squared	0.05	0.09	0.12	0.13	0.13

***Coefficient is statistically significant at the 1-percent level.

**Coefficient is statistically significant at the 5-percent level.

*Coefficient is statistically significant at the 10-percent level.

Appendix A (for reviewers only). The Information on Quest Cigarettes Disseminated to Select Participants

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Quest

Information about
a new brand of cigarettes

- **Quest** is a brand of cigarettes with **low** or **no nicotine**.
- Although Quest cigarettes have less nicotine, **they look, smoke, and burn the same** as conventional cigarettes and offer the same smoking enjoyment.