AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Journal of Agricultural and Applied Economics, 43,4(November 2011):607–620
© 2011 Southern Agricultural Economics Association

Choosing a Cigarette Brand: Determining the Value of Countermarketing Information to Smokers Using Field Auctions

Matthew C. Rousu, James Nonnemaker, and Matthew Farrelly

Information about cigarettes can help smokers come to an informed decision about what cigarettes to purchase. Countermarketing information can help smokers make informed decisions, but little is known about the value of this information to smokers. In this article, we use data from experimental auctions to estimate the value of countermarketing information that counters industry claims about reduced-risk cigarettes. We find that this information has significant value to smokers who have been exposed to marketing information from tobacco companies touting reduced-risk cigarettes, but we find no evidence it provides value to smokers not exposed to this marketing information.

Key Words: experimental auctions, field experiments, value of information, cigarettes, marketing information, countermarketing information

JEL Classifications: C93, M31

Quitting smoking is difficult for many smokers. This is largely the result of the addictive nature of nicotine (Difranza, Ursprung, and Carson, 2010). Surveys of U.S. smokers suggest that although 70% of smokers say they want to quit and 34% of smokers try to quit each year, only 10% succeed in remaining tobacco free for at least a year (Institute of Medicine [IOM], 2001). These facts indicate that a significant population will remain at risk for the negative health effects of smoking, suggesting a role for harm reduction (i.e., a strategy to offer those smokers who cannot quit a "safer" alternative to cigarette smoking) (IOM, 2001).

Over the last decade, tobacco companies have tried to address smokers' concerns about the health risks of smoking by offering new types of tobacco products claiming reduced health risks. These products have become known as PREPs (potentially reduced exposure products) (see IOM, 2001). Tobacco companies are seeking the support of the public health, regulatory, and medical communities in this effort (Shiffman et al., 2004). Some of the claims for PREPs (e.g., advertising for Eclipse, a PREP offered by RJR Tobacco, states that Eclipse is "the next best choice" to quitting) (Shiffman et al., 2004) are reminiscent of claims made for light cigarettes (e.g., "Considering all I heard, I decided to either quit or smoke True®. I smoke True®.").

RJR Tobacco's Eclipse cigarette may be the best known of the alternative PREPs. Recent advertisements claimed that "there is no cigarette like [Eclipse]" (www.eclipse.rjrt.com) and

Matthew C. Rousu is an associate professor of economics, Susquehanna University, Selinsgrove, PA. James Nonnemaker is a research economist, RTI International, Research Triangle Park, NC. Matthew Farrelly is research director, RTI International, Research Triangle Park, NC.

We thank seminar participants at Penn State University and the AAEA annual meetings for helpful comments. We also thank the managers at the Weis Markets grocery stores that allowed us to use their facilities.

that the cigarette, which heats rather than burns tobacco, "may present less risk of certain smoking-related illnesses" (www.eclipse.rjrt.com). These include cancer, inflammation in the respiratory system, and development of cardiovascular disease (www.eclipse.rjrt.com; Slade, Connolly, and Lymperis, 2002). An independent study by the Massachusetts Tobacco Control Program, however, showed that Eclipse actually had higher levels of some carcinogens and reported that the Eclipse marketing campaign and claims were deceptive (Tomar, 2003).

Marketing Information

Efforts to produce lower-risk cigarettes have largely been driven by public opinion and by growing concerns about the health effects of smoking. Lowering the risk of tobacco products has been an option that tobacco companies have considered and pursued in an attempt to satisfy demand in a "highly competitive market for 'healthier' products" (Dunsby and Bero, 2004, p. 362). After the Surgeon General's report in 1964, which detailed the health risks of smoking, modifications were made to cigarettes so they appeared to limit "the cancer and other health risks being publicized" (Pollay and Dewhirts, 2002, p. i18). Consumer misunderstanding of the health risks of nicotine has even prompted tobacco companies to investigate development of a less addictive product if it were perceived to be healthier (Dunsby and Bero, 2004).

The health claims for light and low-tar cigarettes have reached a health-conscious public. Use of light or mild cigarettes has increased substantially (Ashley, Cohen, and Ferrence, 2001), and more than half of adult and adolescent smokers report smoking light cigarettes (Cummings and Giovino, 2004). The effectiveness of marketing efforts is also found when looking at beliefs about light cigarettes. Various studies have found smokers think light cigarettes are less dangerous than conventional cigarettes. This includes smokers who perceived that smoking light cigarettes made them "less likely to get lung cancer, have a heart attack, die from a smoking-related disease, get a bad cough, have trouble breathing, and get wrinkles" (Kropp and Halpern-Felsher, 2004, p. e445) and smokers who thought using light or ultralight cigarettes would improve their health and reduce their chances of getting cancer or heart disease (e.g., see Kropp and Halpern-Felsher, 2004). With the advent of alternative tobacco products (e.g., Advance, Quest, Eclipse), it is likely that much of the misconceptions associated with light and low-tar cigarettes will be transferred to these PREPs.

Hamilton et al. (2004) looked at smokers' responses to advertisements for regular and light cigarettes and PREPs (e.g., Advance, Eclipse, and Omni). After reviewing one actual advertisement for each type of cigarette, survey respondents were asked to rank the level of health risk and to identify the main messages of the advertisements. Smokers believed that PREPs were less risky than light cigarettes and that light cigarettes were safer than regular cigarettes. Although analyses of the advertisements concluded that none explicitly detailed health benefits, smokers believed that light and PREP advertisements "convey[ed] positive messages about health and safety" (p. s353) and that the advertisements indicated that PREPs would be helpful in quitting smoking.

Shiffman et al. (2004) also gauged reactions to PREP advertising with similar results. After hearing claims made by Eclipse in its advertising, smokers and exsmokers overwhelmingly believed that Eclipse was safer than regular cigarettes (91%), and nearly one-fourth "considered Eclipse to be completely safe" (p. 80). They concluded that smokers may reduce their readiness to quit based on interpretation of advertisements that implied some cigarettes were less risky.

O'Hegarty, Richter, and Pederson (2007) used focus groups to assess adult smokers' reactions to PREP print advertisements and promotional materials and found that these materials influenced participants' decisions to try PREPs. A study by O'Connor et al. (2007) found that advertising influences how college students view light and PREP cigarette brands.

Countermarketing Information

There is evidence that antismoking or countermarketing campaigns can be effective in targeting users who are increasingly interested in these new products. Countermarketing campaigns focused on adult smokers' use of these new products

can either 1) discourage all smoking or 2) inform smokers' of the risks of the new products (or both). For example, in the case of light cigarettes, such a campaign would inform smokers that light cigarettes are not safer than conventional cigarettes. Campaigns or messages focused on informing smokers of the risks of the new products without explicitly promoting smoking cessation could result in smokers simply not using or switching to light cigarettes. This is an intermediate goal in a sense because cessation from smoking is not the short-term outcome. Research has found this strategy has some merit, because there is evidence that smokers would be more likely to quit if they understood that using light cigarettes did not significantly reduce health risks (Ashley, Cohen, and Ferrence, 2001; Kozlowski et al., 1998; Shiffman et al. 2001a, 2001b).

This type of information strategy may be useful for PREPs as well. A recent study by Biener, Bogan, and Connolly (2007) examined smokers' beliefs about the toxicity and health risks associated with PREPs (Advance and Eclipse) and the effect of corrective health information on these beliefs. They reported that corrective health information had an effect on ratings of health risks and reduced perceptions that switching to a PREP would lower the risk of cancer. However, smokers' ratings of toxicity were not affected by the corrective health information.

In this study, we create an experimental auction to value countermarketing information that is designed to accurately inform participants about PREPs. In our design, the information is not intended to explicitly promote smoking cessation and we do not observe the subsequent cessation behavior of our participants. Our countermarketing messages are intended to simply provide smokers with more accurate information about PREPs relative to their base knowledge or the knowledge provided by the marketing information. Then, we observe the participants' preferences for the PREP expressed as a bid for the PREP. Thus, if our countermarketing information is effective, we would observe participants bidding less for PREPs and in some cases, this results in an apparent preference for regular cigarettes over PREPs. As noted previously, this is viewed as an intermediate step, which might then result in a smoker subsequently quitting rather than choosing the PREP as an alternative to quitting. We assess the value of countermarketing information by examining how more-informed smokers make a choice between regular cigarettes and the new supposedly reduced-risk cigarette (the PREP) by using experimental auctions.

Experimental Design

Experiments examining cigarette preferences date back at least 50 years (Pessemier, 1959). Recent studies have used auctions in experiments to examine smokers' demand for cigarettes (Monchuk et al., 2007; Thrasher et al., 2007). Experimental auctions have also been used to examine whether information has value to consumers on items such as genetically modified foods and choice of fish (Marette et al., 2008; Rousu et al., 2007).

We designed and conducted an experimental auction to examine the value of countermarketing information about PREPs to smokers. Because many smokers purchase cigarettes at grocery stores, we conducted our field experiment in grocery stores. (e.g., see Monchuk et al., 2007; Rousu et al., 2005). According to Harrison and List's (2004) taxonomy, this would be considered a "framed field experiment."

We posted signs inside the grocery store indicating that smokers could earn $15 for 10–15 minutes of their time on a research project. For legal and ethical reasons, we limited our sample to adults who were 18 years of age or older. The experiment monitors checked the participants' photo identification when the participant looked younger than 28 years old. In an attempt to ensure the participants in our experiment were end-users, we asked all potential participants if they were (currently) smokers and limited our sample to those individuals.

We conducted our field experiments in December 2006 and January 2007. Four hundred four[1] participants took part in this study in groups of either one at a time or six or fewer, depending on how many other people were

[1] Although 404 people participated, we collected incomplete bid information from nine of these participants, leaving us with a sample of 395 participants.

interested in participating at the same time. The experiments were conducted at grocery stores in four locations: Laurel, MD; Harrisburg, PA; Allentown, PA; and Selinsgrove, PA. We chose four locations for several reasons. First, using multiple locations helped us obtain a more diverse sample than if we had chosen one area. One store was in a rural area (Selinsgrove, population 5,300), two were in midsized cities (Harrisburg has a population of 49,000, whereas Allentown has a population of 106,000) and Laurel is a suburb of major metropolitan areas (Washington, DC, and Baltimore, MD). More importantly, by using multiple locations, we can be sure our results are not an artifact of the preferences of smokers in one geographic region. Table 1 summarizes the characteristics of our sample. Our study, which uses participants from four cities, is not going to provide a representative sample of the U.S. population. Furthermore, we only ran experiments in grocery stores, whereas some participants may buy cigarettes elsewhere, so we make no claims that we have a nationally representative sample. However, the characteristics of our sample match up relatively well with the demographic characteristics of the U.S. smoking population based on National Health Interview Survey data. We include the demographic characteristics of all U.S. smokers ages 25+ years in the Appendix.

The Auction Mechanism

For this study, we used the Becker-DeGroot-Marschak (BDM) (1964) mechanism, which is designed to encourage participants to truthfully identify a product's value. In the BDM mechanism, after each participant places a bid for a product, a market-clearing price from a uniform distribution is selected randomly from a fixed interval of prices. In this experiment, the possible market clearing prices ranged from \$0.10 to \$6.00 in increments of \$0.10. If a participant bids more than the randomly selected price, he or she purchases the product for the market-clearing price; a participant who bids less than the selected price does not purchase the product. The BDM mechanism is a "demand-revealing" mechanism, that is, each participant's best strategy is to place a bid that is equal to the amount he or she would pay for the cigarettes. It is in a participant's best interest to bid his or her true value for the product because a bid higher than the true value may

Table 1. Demographic and Background Information of Participants (N = 395)

Variable	Definitions	Mean	Standard Deviation
Selinsgrove	1 if the subject participated in Selinsgrove, PA	0.35	
Harrisburg	1 if the subject participated in Selinsgrove, PA	0.21	
Laurel	1 if the subject participated in Laurel, MD	0.25	
Allentown	1 if the subject participated in Allentown, PA	0.19	
Gender	1 if female	0.44	0.50
Age	The participant's age	38.6	16.3
Education	Years of schooling	13.05	2.41
Income	The households income level (in thousands)	35,627	26,498
White	1 if participant is white	0.79	
Black	1 if participant is black	0.14	
Hispanic/Latino	1 if the participant is Hispanic or Latino	0.09	
None	1 if the participant received neither marketing nor countermarketing information	0.195	
Marketing	1 if the participant received only marketing information	0.258	
Counter	1 if the participant received only countermarketing information	0.263	
Both	1 if the participant received both marketing and countermarketing information	0.284	

result in paying a higher price than what he or she was willing to pay, and a bid lower than the true value may result in not being able to purchase the good at a price he or she was willing to pay. For more on the properties of this mechanism, see Becker, DeGroot, and Marschak (1964).

The Cigarettes

Participants in our experiment bid on a name brand PREP pack of cigarettes. We had participants bid on both a regular and menthol version of this PREP, because some smokers in our sample preferred menthol cigarettes, whereas others preferred regular (nonmenthol) cigarettes. In addition to bidding on the two packs of the PREP cigarettes, participants indicated to us the brand of cigarettes they usually smoke (henceforth referred to as their "regular brand"). Participants placed three separate bids on each of the three packs of cigarettes (PREP regular, PREP menthol, and their regular brand). This allows us to compare participants' demand for the PREP cigarettes relative to their regular brand along with the ability to compare how information affects participants' preferences for the PREP cigarettes.

The Information Treatments

We wanted to estimate the value of countermarketing information both for consumers who received marketing information and for consumers who did not receive marketing information. With that in mind, we now summarize the information treatments. The full information statements given to consumers can be obtained from the authors on request.

There were two alternative types of both marketing and countermarketing information provided to participants. Both types of marketing information came from a major tobacco company's web site. One of these messages emphasized potential health benefits of PREP cigarettes in terms of reduced exposure to carcinogens (version A). The other message suggested PREP cigarettes as an alternative to quitting (version B). The two types of countermarketing information were designed to counter each of the specific marketing claims. Note that within treatments 2–7, participants only received one of the two types of marketing and/or countermarketing information. (For treatments 6–7, groups received the countermarketing information that was designed to counter the specific marketing claim.)

In total, there were seven possible information treatments participants could have received (see Table 2 for a summary). In treatment 1 (the control group), participants received no information before bidding on the cigarettes. In treatments 2 and 3, participants received (only) countermarketing information (about PREPs) before bidding on cigarettes. In treatments 4–5, participants received marketing information (about PREPs) before bidding on cigarettes. Finally, in treatments 6–7, participants received both marketing and countermarketing information about PREPs.

Steps in the Experiment

After prospective participants read and signed consent forms, we gave them experimental packets (which can be obtained by the authors on request) and explained the BDM auction mechanism and answered any questions from participants. We next conducted a practice round using the full bidding approach (e.g., see Lusk and Shogren [2007] or Yue, Alfnes, and Jensen [2009]) in which we collected separate bids for two candy bars. This practice round demonstrated to participants that it was truly in their best interests to bid only their true value for

Table 2. Summary of the Information Treatments

Treatment 1	No information
Treatment 2	Countermarketing information version A
Treatment 3	Countermarketing information version B
Treatment 4	Marketing information version A
Treatment 5	Marketing information version B
Treatment 6	Both Marketing and countermarketing information version A
Treatment 7	Both Marketing and countermarketing information version B

a good—no more and no less. We also explained that when participants bid on multiple products, only one product, chosen at random, would be auctioned. This avoids the possibility of participants purchasing multiple products that are similar and avoids any potential substitution effects. When the bidding for the candy bars ended, we determined whether the participant would purchase the randomly selected candy bar and at what price.

After the practice round, participants (who were not in the control group) were given information to read based on their treatment. The information they received was randomly determined based on the time they arrived. After participants read the information, bidding on the cigarettes began. Following Monchuk et al. (2007), we had participants indicate the brand of cigarettes they normally smoke (henceforth referred to as their "regular brand").[2] 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 two packages of PREP cigarettes, regular and menthol. We then asked the participants to rank the three packs before them from most to least preferred. Once the consumers ranked the cigarettes, we asked them to place a separate bid for each of the three packs of cigarettes. Before they placed their bids, however, we reiterated that, similar to the candy bar round, only one of the three packs of cigarettes, chosen at random, would be sold in the auction.

Next the pack of cigarettes to be sold was randomly determined as was the market-clearing price to determine whether a participant won the pack of cigarettes. Finally, participants completed a short postauction questionnaire, were paid $15 for their participation, and those who won the auction purchased cigarettes at the selected market-clearing price. Figure 1 contains a flow-chart representation of the steps in the experiment.

Although our experiment follows standard procedures (e.g., see Lusk et al. [2001] and Shogren et al. [1994]), we make several notable

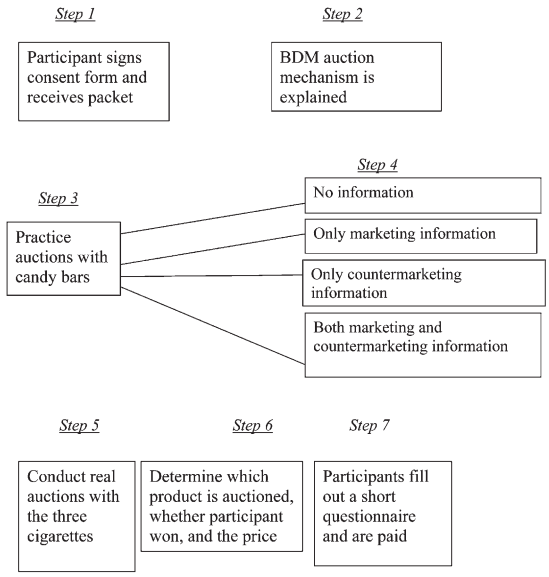

Figure 1. Steps in the Experiment

refinements. First, instead of a laboratory experiment, we conducted a "framed field experiment" (Harrison and List [2004]). Several recent experimental auctions have been conducted in a field setting (e.g., see Lusk et al., 2001; Rousu et al., 2005) because of the associated benefits. Chief among these is that the field environment is more familiar to participants. Second, we use adult consumers from four distinct geographic regions. This ensures our results are not an artifact of one geographic region. Finally, we chose not to endow participants with products and have them bid to upgrade to another product (e.g., see Alfnes and Rickertsen [2003] or Dickinson and Bailey [2005]). Instead, we used the full-bidding approach (Lusk and Shogren, 2007). Recent research has shown that there is an "endowment effect" that distorts bids when using the endowment approach (see Corrigan and Rousu [2006]).

Modeling the Value of Information

We now summarize the methodology used to estimate the value of countermarketing information. First, consider the empirical specification of the model leading to the public-good value of countermarketing information. Our approach is similar to the approach taken by Rousu et al. (2004, 2007) to value information using an experimental auction and to the nonauction approaches

[2] Note that it was feasible that a participant would indicate that his or her preferred brand was a potentially reduced exposure product, but this did not occur in our experiments.

to value information used in Foster and Just (1989), Marette et al. (2008), and Teisl, Bockstael, and Levy (2001). Information has value if an agent's observable behavior changes. For our case, information has social value if a participant/consumer changes his or her behavior as a result of receiving the information, i.e., they "switched products that they purchased"—from PREP cigarettes to regular cigarettes.[3]

Consider an example of a bidder for whom countermarketing information has value as estimated in our model. She purchases PREP cigarettes before receiving countermarketing information and switches to her regular brand after receiving the countermarketing information. In this case, this switch suggests the countermarketing information has value to the smoker in terms of pushing the smoker away from PREP (suggesting to the smoker that PREP cigarettes are not a safer alternative). However, it is unknown if this switch results in a public health benefit (i.e., a switch from PREP cigarettes to regular cigarettes does not itself represent a choice with obvious public health benefits unless it is an intermediate step toward eventual quitting).

The economist's task is to approximate the net welfare change for bidders who change their observed behavior after receiving countermarketing information. Because we are trying to assess the average value of information for cigarettes, we assume all bidders purchase either their regular brand of cigarettes (which differed across individuals) or the PREP cigarettes. The bidder's surplus is approximated by the difference between his or her willingness to pay (WTP) and the "market price" (i.e., the price consumers would pay for a product in a store) for the product he or she purchases. Bidder *j*'s consumer surplus from purchasing PREP cigarettes or their regular cigarettes is defined to be:

$$(1) \qquad surplus^{j}_{PREP} = WTP^{j}_{PREP} - MP^{j}_{PREP}$$

$$(2) \qquad surplus^{j}_{REG} = WTP^{j}_{REG} - MP^{j}_{REG}.$$

In Equations (1) and (2), the bidder's WTP is revealed in the experimental auctions; MP is the price the bidder faces for the product in the marketplace, the superscript j refers to bidder j, and the subscripts PREP and REG refer to the PREP and regular versions of cigarettes.[4] Note that the surplus can be (and often is) negative given that many bids for consumers should be censored at the market price if perfect information is available and there are no transaction costs (see theoretical and empirical work by Cherry et al. [2004], Coller and Williams [1999], Harrison, Harstad, and Rutström [2004], and Harrison, Lau, and Williams [2002]). In these cases, participants would pick the product that gives them the lower negative amount of surplus. Not all bids will be below the market price, however, as Corrigan and Rousu (2008) show that although bids on average are equal to the market price, some participants bid more than the market price (because of transaction costs of buying product at store, not knowing exact market price, or other reasons).

We assume a consumer is facing a decision in a market to purchase either the PREP cigarettes or their regular brand of cigarettes. Recall that we assume a participant purchases either the PREP or non-PREP cigarettes. The product that bidder j purchases is assumed to be the one that gives him or her the higher surplus.[5] Formally, if $surplus^{j}_{PREP} > surplus^{j}_{REG}$ then $buy_PREP^{j}_{I} = 1$

[3] Note that our model does not assume an auction market, but a conventional market. However, auctions are essential for this analysis because our auction market elicits the nonhypothetical willingness to pay under different information treatments that is not obtainable in a conventional market.

[4] To compute this value of countermarketing information, we need to estimate market prices for cigarettes. Each participant indicated his or her regular brand, and we used 2006 Nielsen data from the state in which the cigarettes were sold to estimate prices for the regular brand. For the potentially reduced exposure product (PREP) cigarettes, we used an estimated price of $3.75. We also used several alternative prices to examine the sensitivity of our results to the assumed price for PREP cigarettes, which are available on request.

[5] Note that the consumer surplus for both products will be negative for some participants. This should make sense because the auction bid for many will be at or below the market price (see Corrigan and Rousu, 2008). However, the assumption that the participant will purchase a product should still seem realistic if these participants regularly purchase cigarettes, because our model is examining the value of information per pack of cigarettes. Given these are all smokers, it is safe to assume they regularly purchase cigarettes.

and $buy_REG_I^j = 0$, and if $surplus_{REG}^j < surplus_{ECL}^j$ then $buy_PREP_I^j = 0$ and $buy_REG_I^j = 1$, where the subscript I refers to the information setting (whether or not the consumer has received countermarketing information). When a bidder purchases the product that gives him or her a higher surplus, we say they gain a premium of surplus above and beyond the consumer surplus they would gain from purchasing the other product. Those who purchase the PREP cigarettes gain a premium of:

$$(3) \quad PREMGAIN_{PREP}^j = surplus_{PREP}^j - surplus_{REG}^j.$$

Similarly, those who purchase the regular cigarettes after receiving countermarketing information gain:

$$(4) \quad PREMGAIN_{REG}^j = surplus_{REG}^j - surplus_{PREP}^j.$$

Although all bidders enjoy the premium gained by consuming one product instead of another, as shown in expressions (3) and (4), the premium gained represents the increase in welfare (i.e., the value of information) only for those who switch products.

We next discuss the method used to estimate the percentage of bidders who change purchases when information is introduced. First, the percentage of bidders who purchase PREP cigarettes is denoted:

$$(5) \quad percentbuyPREP_I = \frac{\sum_j buy_PREP_K^j}{N} * 100.$$

Equation (5) shows that this number can be represented as the summation across bidders that purchase the PREP cigarettes given the information treatment, I, divided by the total number of bidders. Therefore, the percentage of bidders who purchase the regular brand of cigarettes version is 1-$percentbuyPREP_I$.

Information causes a bidder to switch purchases if his or her consumer surplus for one version of the product (e.g., the regular cigarettes) is higher before receiving countermarketing information, but then after receiving information, consumer surplus is higher for the other version of the product (e.g., the PREP cigarettes). The net change in the percentage who purchase regular cigarettes resulting from the introduction of countermarketing information is the (absolute) difference between the "percentage who purchase PREP cigarettes when treated to countermarketing information" and the "percentage who purchase PREP cigarettes but do not receive the countermarketing information" given the other information they have received:

$$(6) \quad Percentswitch^K = |percentbuyPREP_{counter} - percentbuyPREP_{no-counter}|.$$

In equation (6), the percentage of bidders who switched purchases is estimated as the absolute value of the difference in the percentage that would purchase PREP cigarettes with and without countermarketing information. We will estimate the percentage of bidders who switched for two information settings: one in which participants have been treated to marketing information and one in which they have not. The superscript K represents either PREP cigarettes or regular cigarettes, depending on which product bidders are switching to.

Which smokers switch purchases once countermarketing information is introduced? Because bidders who receive different information treatments are in distinct experimental sessions, we do not know the specific persons who switch, but we can compute the percentage of the sample that switched after the introduction of countermarketing information. To do this, we assume that the bidders who switch have relative preferences for cigarettes that are uniformly distributed across the population that consumes the good that was abandoned. For example, we assume that bidders who switched to regular cigarettes after receiving countermarketing information had relative valuations of plain-labeled foods that were evenly distributed throughout the population of consumers who purchased the plain-labeled foods before information was introduced. Thus, without countermarketing information, treated and untreated participants have the same behavior.

We now compute the probability of a participant being a "switcher"—one who changes his or her behavior after countermarketing information is introduced:

$$(7) \quad prob_switch_{PREP}^j = \frac{Percentswitch^{PREP}}{percentbuyREG_{no-counter}}.$$

$$(8) \quad prob_switch^{j}_{REG} = \frac{Percentswitch^{REG}}{percentbuyPREP_{no-counter}}.$$

To determine the expected value of countermarketing information to a participant, we multiply his or her premium (PREMGAIN) by the probability that he or she switched products:

$$(9) \quad \begin{aligned} EVperson^{j} = {} & PREMGAIN^{j}_{PREP} \\ & * prob_switch^{j}_{PREP} + PREMGAIN^{j}_{REG} \cdot \\ & * prob_switch^{j}_{REG} \end{aligned}$$

In equation (9), $EVperson^{j}$ is the expected value of information to bidder j.[6] One can also think of this as the average value of countermarketing information across all bidders or participants. It is also important that we compute this value for both initial information treatments: the control treatment (receiving no other information) and the marketing treatment (receiving marketing information).

Next we need the expected value of information to a bidder who switches purchases. This is computed by dividing the expected value of countermarketing information per person by the percentage of bidders who switched purchases:

$$(10) \quad EVswitcher = \frac{EVperson^{j}}{percentswitch}.$$

In equation (10), *EVswitcher* is the average value of countermarketing information to a bidder who switches his or her purchase of cigarettes, either to PREP cigarettes from regular or vice versa.[7]

In summary, the experimental auction data collected for this study allow us to calculate the percentage of bidders who switch in each of the information settings: receiving no marketing information and receiving marketing information. We then estimate an expected value of countermarketing information per experiment participant/bidder.

[6] Note that because it is assumed that auction participants consume either potentially reduced exposure product or regular cigarettes, only one of the two PREMGAIN coefficients will be positive, whereas the other is zero. The PREMGAIN coefficients will also differ across participants.

[7] The SAS code used to estimate the value of information is available from the authors on request.

Results

Participant bids are presented in Table 3.[8] Bids are segregated to show the impact of countermarketing information on bids both when marketing information is not presented and when marketing information is presented to smokers. Recall that each participant bid on both menthol PREP and regular (nonmenthol) PREP cigarettes. We create a variable we call "preferred PREP," which simply takes the higher of the two bids. We do this because a participant will normally only purchase either menthol or nonmenthol cigarettes, but not both. The higher bid represents the pack of cigarettes the smoker would prefer. Several facts are worth noting. First, participants bid less for the preferred PREP brand than for their preferred brand of cigarettes. This seems logical, because participants' preferred brand is the brand they usually smoke and most smokers would have a greater demand for their usual brand of cigarettes. Second, the countermarketing information appears to decrease mean bids for PREP cigarettes, but it also seems to decrease bids for participants' preferred brand of cigarettes. This would indicate that countermarketing information about PREP cigarettes also has an effect at reducing demand for all cigarettes, not just PREPs.

Third, the mean difference in bids for PREP vs. non-PREP cigarettes is the same across all information treatments. However, although examining participant's bids can be instructive, it does not give us information on whether participants gain value from countermarketing information. To determine the value of information, we must compare bids with market prices and estimate the percentage of participants that would switch purchases when presented with countermarketing information. Table 4 presents the results for the percentage

[8] Recall that we presented participants with two types of marketing and countermarketing information. We present the combined results of the two marketing and countermarketing information sources. The reason is that for the important variables of interest in this article, comparing the number of people who would switch purchases and the value of information, we did not find a statistically significant difference between the two types of marketing information nor did we find a statistically significant difference between the two types of countermarketing information.

Table 3. Smokers' Bids for Cigarettes under Alternative Information Treatments

Mean and Median Bids When Marketing Information Is Not Given to Participants				
	Mean Bids		Median Bids	
	No Information (N = 77)	Only Countermarketing Information (N = 104)	No Information (N = 77)	Only Countermarketing Information (N = 104)
PREP regular	$2.12	$2.14	$2.25	$2.00
PREP menthol	$2.08	$1.83	$2.00	$2.00
Preferred PREP	$2.48	$2.37	$3.00	$2.50
Regular brand	$3.71	$3.61	$4.00	$3.50
Difference between preferred PREP and regular Brand	$1.22	$1.23	$1.00	$1.00

Mean and Median Bids When Marketing Information Is Given to Participants				
	Mean Bids		Median Bids	
	Only Marketing Information (N = 102)	Both Marketing and Countermarketing Information (N = 112)	Only Marketing Information (N = 102)	Both Marketing and Countermarketing Information (N = 112)
PREP regular	$1.82	$1.82	$2.00	$2.00
PREP menthol	$1.77	$1.51	$2.00	$1.50
Preferred PREP	$2.25	$2.09	$2.28	$2.00
Regular brand	$3.47	$3.23	$3.62	$3.55
Difference between preferred PREP and regular Brand	$1.22	$1.19	$1.00	$1.00

PREP, potentially reduced exposure product.

of participants that would purchase PREP cigarettes under alternative information treatments. When marketing information is absent, there is no statistically significant difference between the percentage of participants that would purchase PREP cigarettes vs. their regular brand.[9] This is consistent with research that indicates that some smokers are not receptive to countermarketing information presented to them (Davis et al., 2011). However, when marketing information is present, we find that 18.6% of participants would purchase PREP cigarettes when they are not presented with countermarketing information, whereas only 11.6% would purchase PREP cigarettes when presented with countermarketing information in conjunction with marketing information. Thus, we find evidence that countermarketing information is effective in persuading smokers not to use PREPs, but only for those smokers who have also been exposed to marketing information.[10]

[9] Although none of the participants indicated that their regular brand was a potentially reduced exposure product (PREP) cigarette, it is interesting that 10.4% would have purchased the PREP cigarette instead of their regular brand. We think there are two potential explanations for this; both occur when participants are somewhat unfamiliar with the product before the auction. First, participants could have seen the PREP cigarettes and thought they might be better than their initial brand so would have chosen these cigarettes. Another reason could be that some participants saw a value in trying out a "new" brand they had not tried before.

[10] We see this difference in the percentage that would purchase potentially reduced exposure product (PREP) cigarettes despite no change in mean bids. This provides evidence that although the mean bids do not change, some bidders placed a higher premium on PREP cigarettes and some a lower premium under the alternative information treatments.

Table 4. Percentage Who Would Buy PREP Cigarettes With and Without Countermarketing Information

Was the Participant Presented With Marketing Information?	Did the Participant Receive Countermarketing Information?	Percent Who Would Buy PREP Cigarettes	Percent Who Would Switch Away from PREP Cigarettes
No marketing information (N = 181)	No countermarketing information	10.4%[c]	–2.1%
	Received countermarketing Information	12.5%[c]	
Marketing information presented (N = 214)	No countermarketing information	18.6%[c]	7%[a]
	Received countermarketing Information	11.6%[c]	

[a] Statistically significant at the 10% level using a Wilcoxon signed rank test.
[b] Statistically significant at the 5% level using a Wilcoxon signed rank test.
[c] Statistically significant at the 1% level using a Wilcoxon signed rank test.
PREP, potentially reduced exposure product.

Although Table 4 shows us that some participants would switch away from PREP cigarettes when treated to countermarketing information, it does not show the value of countermarketing information. In Table 5 we quantify the value of countermarketing information to participants. For those who do not receive marketing information, the value of countermarketing information is very small. With so few participants switching, the average value per smoker/per pack is approximately one-tenth of a penny.

Participants who receive marketing information, however, gain a considerable amount from countermarketing information. Those who switch purchases gain an average value of $1.22 per pack resulting in an average value per smoker per pack of 8.5 cents. Considering there are billions of packs sold in the United States annually, this information has a large value to smokers. If there are additional benefits in that the information may prevent some people who would switch to a perceived "safer" cigarette to instead quit, the annual value could be considerably higher.

Discussion and Conclusion

Information about a product can shape consumers' beliefs and influence the decision to purchase or not (Kenkel and Chen, 2000). Numerous studies suggest that the marketing of supposedly safer cigarettes (e.g., light cigarettes) has influenced consumers' beliefs and demand for these cigarettes and recent studies suggest that the same is true of marketing of PREPs. The evidence clearly suggests smokers are willing to consider information presented to them about cigarettes and smoking but also that

Table 5. Value of Countermarketing Information to Smokers

	Value to a Smoker Who Switches	Average Value of Information to All Smokers
The value of information when no marketing information is presented	$0.05[a]	$0.001[a]
The value of countermarketing information when marketing information is presented	$1.22[a]	$0.085[a]

[a] Statistically significant at the 1% level using a Wilcoxon signed rank test.

smokers are often misinformed about the relative health risks of different tobacco products. Hence, accurate information about tobacco products and smoking could have substantial value to smokers.

We designed and implemented an experimental auction to assess the value of a specific type of countermarketing information intended to counter tobacco company claims about the health benefits of PREP cigarettes. We find no evidence suggesting that this type of countermarketing information has an effect on smokers' purchasing behavior when smokers do not receive marketing information. However, for smokers who are presented with both tobacco company information as well as countermarketing information about PREPs, we find that the countermarketing information has an average value per smoker of 8.5 cents per pack. This value is much larger for the subset of smokers who actually change their smoking behavior because of countermarketing information (i.e., those who switched from PREP cigarettes to conventional).

It is possible our estimates understate the value of this countermarketing information. If the information informs smokers on the risks of smoking in general and demand for all cigarettes drops (a result we found), there could be additional public good value from this information. Furthermore, because our estimate is only for smokers, we are not assessing the effect of this information on nonsmokers. If nonsmokers who might have otherwise thought PREP cigarettes were safe to smoke never start smoking because of this type of countermarketing information, it would have additional value. However, this value cannot be quantified through auction procedures. Future research to help determine these aspects of the public-good value of countermarketing information would be useful.

It is important to be cautious in interpreting these results. The effects of information are dependent on the type of information provided. It is possible that information provided in an experimental setting is interpreted differently than information received by consumers through usual channels. More elaborate experiments could test this impact. Also, as noted earlier, we do not observe and thus cannot value the effect of information on inducing smokers to quit. The change we observe and for which we derive an estimate of value is the switch away from PREP cigarettes (and in our experiment that means back to a preference for regular cigarettes). Thus, the information has value to the smoker, but it is unclear if this has value in a public health sense. If what we observe is an intermediate step toward quitting, i.e., the information prevented a smoker from seeing PREP cigarettes as an alternative to quitting, then the value we estimate does represent a public health benefit.

[Received May 2010; Accepted February 2011.]

References

Alfnes, F., and K. Rickertsen. "European Consumers' Willingness to Pay for U.S. Beef in Experimental Auction Markets." *American Journal of Agricultural Economics* 85(2003): 396–405.

Ashley, M.J., J. Cohen, and R. Ferrence. "'Light' and 'Mild' Cigarettes: Who Smokes Them? Are They Being Misled?" *Canadian Journal of Public Health* 92(2001):407–11.

Becker, G., M. DeGroot, and J. Marschak. "Measuring Utility by a Single-Response Sequential Method." *Behavioral Science* 9(1964): 226–32.

Biener, L., K. Bogan, and G. Connolly. "Impact of Corrective Health Information on Consumers' Perceptions of 'Reduced Exposure' Tobacco Products." *Tobacco Control* 16(2007): 306–11.

Cherry, T.L., P. Frykblom, J.F. Shogren, J.A. List, and M.B. Sullivan. "Laboratory Testbeds and Non-Market Valuation: The Case of Bidding Behavior in a Second-Price Auction with an Outside Option." *Environmental and Resource Economics* 29(2004):285–94.

Coller, M., and M.B. Williams. "Eliciting Individual Discount Rates." *Experimental Economics* 2(1999):107–27.

Corrigan, J., and M. Rousu. "The Effect of Initial Endowments in Experimental Auctions." *American Journal of Agricultural Economics* 87(2006):448–57.

Corrigan, J.R., and M.C. Rousu. "Testing Whether Field Auction Experiments Are Demand Revealing in Practice." *Journal of Agricultural and Resource Economics* 33(2008):290–301.

Cummings, K.M., and G.A. Giovino. "Selling the 'Quit' Brand to Young Adult Smokers." *Journal of General Internal Medicine* 19(2004):481–82.

Davis, K.C., J.M. Nonnemaker, M.C. Farrelly, and J. Niederdeppe. "Exploring Differences in Smokers' Perceptions of the Effectiveness of Cessation Media Messages." *Tobacco Control* 20(2011):26–33.

Dickinson, D.L., and D. Bailey. "Experimental Evidence on Willingness to Pay for Red Meat Traceability in the United States, Canada, the United Kingdom, and Japan." *Journal of Agricultural and Applied Economics* 37(2005): 537–48.

Difranza, J.R., W.W. Ursprung, and A. Carson. "New Insights into the Compulsion to Use Tobacco from an Adolescent Case-Series." *Journal of Adolescence* 33(2010):209–14.

Dunsby, J., and L. Bero. "A Nicotine Delivery Device without the Nicotine? Tobacco Industry Development of Low Nicotine Cigarettes." *Tobacco Control* 13(2004):362–69.

Foster, W., and R.E. Just. "Measuring Welfare Effects of Product Contamination with Consumer Uncertainty." *Journal of Environmental Economics and Management* 17(1989):266–83.

Hamilton, W.L., G.D. Norton, T.K. Ouellete, W.M. Rhodes, R. Kling, and G.N. Connolly. "Smokers' Responses to Advertisements for Regular and Light Cigarettes and Potential Reduced-Exposure Tobacco Products." *Nicotine & Tobacco Research* 6,Suppl 3(2004):s353–62.

Harrison, G., and J. List. "Field Experiments." *Journal of Economic Literature* 42(2004):1013–59.

Harrison, G.W., R.M. Harstad, and E.E. Rutström. "Experimental Methods and Elicitation of Values." *Experimental Economics* 7(2004):123–40.

Harrison, G.W., M.I. Lau, and M.B. Williams. "Estimating Individual Discount Rates in Denmark: A Field Experiment." *The American Economic Review* 92(2002):1606–17.

Institute of Medicine (IOM). Executive Summary. Internet site: www.nap.edu/catalog/10029.html (Accessed July 15, 2004).

Kenkel, D., and L. Chen. "Consumer Information and Tobacco Use." *Tobacco Control in Developing Countries*. Prabhat Jha and Frank Chaloupka, eds., pp. 177–214. New York: Oxford University Press, 2000.

Kozlowski, L.T., M.E. Goldberg, B.A. Yost, E.L. White, C.S. Sweeney, and J.L. Pillitteri. "Smokers' Misperceptions of Light and Ultra-Light Cigarettes May Keep Them Smoking." *American Journal of Preventive Medicine* 15(1998):9–16.

Kropp, R.Y., and B.L. Halpern-Felsher. "Adolescents' Beliefs about the Risks Involved in Smoking "Light" Cigarettes." *Pediatrics* 114(2004): e445–51.

Lusk, J.L., J.A. Fox, T.C. Schroeder, J. Mintert, and M. Koohmaraie. "In-Store Valuation of Steak Tenderness." *American Journal of Agricultural Economics* 83(2001):539–50.

Lusk, J.L., and J.F. Shogren. *Experimental Auctions: Methods and Applications in Economic and Marketing Research*. Cambridge: Cambridge University Press, 2007.

Marette, S., J. Roosen, S. Blanchemanche, and P. Verger. "The Choice of Fish Species: An Experiment Measuring the Impact of Risk and Benefit Information." *Journal of Agricultural and Resource Economics* 1(2008):1–18.

Monchuk, D., M. Rousu, J. Shogren, J. Nonnemaker, and K. Kosa. "Decomposing the Value of Cigarettes Using Experimental Auctions." *Nicotine & Tobacco Research* 9(2007):93–99.

O'Connor, R.J., F.L. Ashare, B.V. Fix, L.W. Hawk, K.M. Cummings, and W.C. Schmidt. "College Students' Expectancies for Light Cigarettes and Potential Reduced Exposure Products." *American Journal of Health Behavior* 31(2007):402–410.

O'Hegarty, M., P. Richter, and L.L. Pederson. "What Do Adult Smokers Think about Ads and Promotional Materials for PREPs?" *American Journal of Health Behavior* 31(2007):526–34.

Pessemier, E.A. "A New Way to Determine Buying Decisions." *Journal of Marketing* 2(1959):41–46.

Pollay, R.W., and T. Dewhirts. "The Dark Side of Marketing Seemingly 'Light' Cigarettes: Successful Images and Failed Fact." *Tobacco Control* 11,Suppl 1(2002):i5–i17.

Rousu, M., W.E. Huffman, J.F. Shogren, and A. Tegene. "Estimating the Public Value of Conflicting Information: The Case of Genetically Modified Foods." *Land Economics* 80(2004): 125–135.

———. "Effects and Value of Verifiable Information in a Controversial Market: Evidence from Lab Auctions of Genetically Modified Food." *Economic Inquiry* 45(2007):409–32.

Rousu, M., D. Monchuk, J. Shogren, and K. Kosa. "Consumer Perceptions of Labels and the Willingness to Pay for 'Second-Generation' Genetically Modified Products." *Journal of Agricultural and Applied Economics* 37(2005): 647–57.

Shiffman, S., J.L. Pillitteri, S.L. Burton, J.M. Rohay, and J.G. Gitchell. "Smokers' Beliefs

about 'Light' and 'Ultra Light' Cigarettes." *Tobacco Control* 10,Suppl 1(2001a):i17–i23.

Shiffman, S., S.L. Burton, J.L. Pillitteri, J.G. Gitchell, M.E. Di Marino, C.T. Sweeney, P.A. Wardle, and G.L. Koehler. "Test of 'Light' Cigarette Counter-Advertising Using a Standard Test of Advertising Effectiveness." *Tobacco Control* 10,Suppl. 1(2001b):i33–40.

Shiffman, S., J.L. Pillitteri, S.L. Burton, and M.E. Di Marino. "Smoker and Ex-Smoker Reactions to Cigarettes Claiming Reduced Risk." *Tobacco Control* 13(2004):78–84.

Shogren, J., S. Shin, D. Hayes, and J. Kliebenstein. "Resolving Differences in Willingness to Pay and Willingness to Accept." *The American Economic Review* 84(1994):255–70.

Slade, J., G.N. Connolly, and D. Lymperis. "Eclipse: Does It Live Up to Its Health Claims?" *Tobacco Control* 11,Suppl 2(2002):ii64–70.

Teisl, M.F., N.E. Bockstael, and A. Levy. "Measuring the Welfare Effects of Nutrition Information." *American Journal of Agricultural Economics* 83(2001):133–49.

Thrasher, J.F., M. Rousu, R. Ocampo-Anaya, L.M. Reynales-Shigematsu, B. Allen, E. Arillo-Santillán, and M. Hernández-Ávila. "Estimating the Impact of Graphic Warning Labels on Cigarette Packs: The Auction Method." *Addictive Behaviors* 32(2007):2916–25.

Tomar, S. *Can Tobacco Cure Smoking? A Review of Tobacco Harm Reduction: Hearings Before the Committee on Energy and Commerce*. Testimony before the 108th Congress, 1st session. 2003.

Yue, C., F. Alfnes, and H.J. Jensen. "Discounting Spotted Apples: Investigating Consumers' Willingness to Accept Cosmetic Damage in an Organic Market." *Journal of Agricultural and Applied Economics* 41(2009):29–46.

Appendix. Demographic Distributions of Adult Smokers Ages 25 and Older Using 2009 National Health Interview Survey Data

Variable	Point Estimate	Standard Error	95% Lower Confidence Limit	95% Upper Confidence Limit
Gender				
Male	53.50%	0.90%	51.90%	55.20%
Female	46.50%	0.90%	44.80%	48.10%
Race/ethnicity				
White Non-Hispanic	74.20%	0.90%	72.50%	75.90%
Black Non-Hispanic	12.50%	0.60%	11.40%	13.70%
Hispanic	9.40%	0.50%	8.40%	10.40%
Other non-Hispanic	3.90%	0.40%	3.20%	4.60%
Education[a]				
Less than high school	4.80%	0.40%	4.00%	5.60%
Some high school (dropout)	13.70%	0.60%	12.40%	15.00%
High school graduate	36.90%	0.90%	35.20%	38.60%
Some college	30.80%	0.80%	29.20%	32.40%
College graduate	10.30%	0.50%	9.20%	11.40%
Postgraduate	2.80%	0.30%	2.30%	3.30%

[a] Category does not add up to 100% as a result of missing observations for educational status.