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Using Experimental Auctions for Marketing Applications: A Discussion

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The present article discusses general issues associated with experimental auctions and their relative advantages and disadvantages over other marketing research techniques. Experimental auctions create an active market environment with feedback where subjects exchange real goods and real money, which is not generally the case with other methods. The article also discusses four experimental design issues associated with experimental auctions: auction mechanism, market feedback and bidder affiliation, demand reduction and wealth effects, and multiple attribute valuation. Each of these experimental design issues, if not properly controlled, have the potential to create serious flaws in marketing recommendations.

Key Words: auctions, experimental economics, marketing, valuation, willingness-to-pay

JEL Classifications: D44, C92, Q13, M31

Agricultural markets have historically been dominated by the production and sales of generic commodities. However, in recent years, a pronounced trend has developed toward a more demand-driven marketplace in which agricultural producers must give considerable thought into consumer demand for specific food and fiber attributes prior to making production decisions. The shift in agricultural marketing and production can be noted by observing the increase in quality differentiated foods and fibers in the marketplace such as non–genetically modified foods, organic foods, organic clothes, "natural" meat, irradiated meat, ready-to-eat meat, etc. This shift has also generated a large number of policy issues, including appropriate labeling polices for genetically modified, organic, and "natural" foods; determining optimal levels of food safety regulation; and assessing the impact of these consumer-driven policies on agricultural producers. In an effort to assist agricultural producers and agribusinesses in determining potential profitability of selling new goods or modifying existing products, researchers are increasingly using market-research techniques. In that regard, experimental auctions (EA) are becoming an increasingly popular market-research technique among agricultural economists (e.g., Buhr et al.; Buzby et al.; Dickinson and Bailey; Fox; Fox et al.; Hayes et al.; Hoffman et al.; Lusk et al., 2001a, 2001b; Melton et al.; Menkhaus et al.; Roosen et al.; Shogren, List, and Hayes; Umberger et al.).[1]

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[1] Many of these studies actually focused on policy rather than marketing issues. Nevertheless, results from

However, it is interesting to note that using EA for the purpose of making marketing recommendations has been generally limited to the agricultural economics literature. Only a couple of studies have used EA in general marketing literature (e.g., Hoffman et al.; Wertenbroch and Skiera), and the use of EA in the general economics professions has been generally limited to induced-value studies (e.g., Coppinger, Smith, and Titus; Kagel, Harstad, and Levin) or to theory testing (e.g., List and Lucking-Reiley). Thus, as a profession, we appear to be the "bearer of the torch" in using EA for marketing applications. The present article focuses on addressing two primary questions. First, why are we as a profession the only to use EA for marketing applications, and are we justified in doing so? Second, given that EA have a place in making marketing recommendations, what aspects of experimental design should practitioners consider when designing an EA?

Experimental Auctions

Agricultural economists have been using EA with marketing implications since at least the beef marketing studies of Menkhaus et al., Hoffman et al., and the food safety studies of Shogren et al., (1994a,b) and Hayes et al. Using EA to elicit applied valuations grew out of the general experimental economics literature that had, for the most part, primarily focused on induced-value experiments in which subjects were given values by the experimenter rather than the experimenter eliciting a subject's "homegrown" value for a good. Using auctions for the purpose of eliciting values for foods safety or quality was a natural fit for agricultural economists because of our interest in applied issues and our concern with using methods consistent with economic theory. Despite the increased use of EA in the agricultural economics literature, EA are only one of many tools available to carry out marketing research. In the following, the advantages and disadvantages of EA over two other widely used marketing research techniques, contingent valuation (CV) and conjoint analysis (CA), are discussed in an effort to assess the relative merits of EA.[2]

In a typical CV question, a new product is described, and subjects are asked, hypothetically, either how much they would pay for the new good or whether they would purchase the good at a particular price level (e.g., Lusk). The CV method is extensively used in the environmental valuation literature, primarily because most environmental goods are public and undeliverable (e.g., clean air). The hypothetical nature of CV has some merits. First, in a hypothetical CV, virtually any new product can be described and valued without actually having to develop or deliver the good. Second, in a CV exercise, subjects can be asked how they would behave in a grocery store, for example, whereas, values elicited in an EA are contingent on tastes and preferences at the time and location of the experiment. Despite the advantages of CV, a great deal of research has shown that subjects overstate the amount they are willing to pay for a good in a hypothetical setting as opposed to when actual payment is required (e.g., Cummings, Harrison, and Rutström; Fox et al.; List and Shogren 1998). The advantage of EA over CV is that EA are incentive compatible and are conducted in a nonhypothetical context that involves real goods and real money. EA also have advantages over CV methods because EA put subjects in an active market environment where they can incorporate market feedback and be held accountable for their behavior. Furthermore, EA might be preferred over most generally accepted CV methods (such as the dichotomous choice question) because individual willingness-to-pay values are elicited from each individual, whereas only ranges on individuals' willingness to pay are observed with a dichotomous choice CV question.

these studies have food marketing implications in addition to any policy implications that were presented in the papers.

[2] Clearly, there a wide variety of other tools used in marketing research such as structural equations modeling, LISREL, multidimensional scaling, cluster analysis, etc. This discussion focuses on a few marketing tools used to determine product pricing, which is likely of greater interest to economists.

In CA, subjects are shown several different product scenarios or profiles, where the attributes of a good (such as price, packaging, brand, etc.) are varied across scenario. Subjects are asked to rank or rate the scenarios or are asked to choose which scenario or product profile is most desired. For the remainder of the present article, the term CA will be used to refer to the method of choosing the one product that is most preferred.[3] Most CA applications are done in a hypothetical context and, as such, can be viewed as a type of CV; however, CA can be readily used in a nonhypothetical context to mitigate problems with hypothetical bias (e.g., Lusk and Schroeder). CA has been widely used in the marketing literature, and its advantages over EA include (a) CA elicits responses in a manner that closely mimics actual shopping behavior, whereas EA require subjects to formulate bids in a manner that is unfamiliar to most subjects; and (b) with CA it is straightforward to estimate substitutability between multiple goods and attributes, which can be difficult or impossible with EA. Advantages of EA over CA include (a) EA elicit willingness-to-pay values for each individual, whereas willingness to pay must be indirectly inferred in CA from estimated utility functions with particular functional forms; (b) some studies have suggested that individuals' behavior in CA can be inconsistent or contingent on design parameters (e.g., DeShazo and Fermo; Swait and Adamowicz); and (c) it is relatively easy to model determinants of willingness to pay from EA, but this task can be quite difficult with CA.

A few of studies have compared willingness-to-pay values from CV, CA, and EA. Balistreri et al. found that bids from an English auction were significantly lower than those from both a hypothetical open-ended CV question and a hypothetical dichotomous choice CV question, which supports the extant literature on hypothetical bias. Frykblom and Shogren compared responses to a nonhypothetical dichotomous choice question to bids from a Vickrey second-price auction. They could not reject the hypothesis that willingness to pay elicited via the dichotomous choice question was equal to willingness to pay from the second-price auction. Lusk and Schroeder compared results from several EA with those from a CA. They found that bids from the EA were significantly lower than those implied from the CA. They also found that that the EA predicted much lower market shares for purchased goods that those observed in the CA.

In sum, EA are simply a tool that can be used to assist firms with product adoption and pricing decisions. EA are especially useful in situations in which one is interested in modeling determinants of valuations. EA are also noteworthy because of their reliance on an active market environment that is absent from most other marketing research techniques. Whether EA should be used for a particular application depends on the particular research objectives, and no doubt EA are not the best method to use for every problem. For example, if one needs to estimate valuation estimates that can be generalized to a national sample, conducting enough EA to generate national representativeness may be infeasible relative to a hypothetical CV survey. That said, EA have some distinct advantages over other marketing research methods, and agricultural economists interested in nonmarket valuation would be well served to become knowledgeable about EA.

Experimental Design Issues

Given that the agricultural economics discipline appears to be "leading the way" in terms of using EA for marketing applications, it is important that we, as a discipline, give careful thought to a number of experimental design issue before an experiment is implemented. Four experimental design issues are discussed in this section: auction mechanism, market feedback and bidder affiliation, demand reduction and wealth effects, and multiple attribute valuation.

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[3] Attention is given to "choice-based-conjoint-analysis" because it is consistent with economic theory and more closely mirrors actual shopping behavior. See Louviere, Hensher, and Swait for an excellent book on this method.

Auction Mechanism

There are a wide variety of mechanisms that can be usd to elicit values. Clearly, it is important that the chosen elicitation mechanism is incentive compatible—i.e., a subject's dominant strategy is to truthfully reveal their value for a good. Unfortunately, a number of mechanisms meet this criteria, and theory gives little guidance as to which incentive compatible auction should be preferred over another. Thus, the choice of auction mechanism often boils down to pragmatic considerations and to properties of auctions that have been determined through empirical research. In the following, four value elicitation mechanisms, all of which are theoretically incentive compatible, are discussed: the English auction, the *N*th price auction, the Becker-Degroot-Marschak (BDM) mechanism, and the random *N*th price auction.[4]

In an English auction, subjects offer ascending bids until only one participant is left in the auction. This individual wins the auction and purchases the auctioned good at the last offered bid amount. In an *N*th price auction, subjects submit sealed bids for a good, and the $(n - 1)$ highest bidders win the auction and pay the *N*th highest bid amount. Perhaps the most commonly used *N*th price auction is the second-price auction, which was introduced by Vickrey. Another popular elicitation mechanism is the BDM mechanism. The BDM is not an auction per se, because subjects do not bid against one another in a market environment, but the structure is nonetheless very similar. With the BDM, an individual submits a sealed bid and purchases the good if their bid is greater than a randomly drawn price.

In multiple-round auctions, subjects with relatively low values can become disinterested in second-price auctions, because they quickly learn that they will not win the auction and either drop out of the auction by bidding zero or have poor incentives to behave as economic theory would predict. With a BDM mechanism, every subject has a chance to "win," but there is no active market such that participants can incorporate market feedback. Shogren et al. (2001a) formally introduced the random *N*th price auction to incorporate the best features of the second-price auction (active market environment with feedback) and BDM mechanism (engaging every bidder). In a random *N*th price auction, subjects submit sealed bids for a good, a random bid (N) is drawn from the sample, and the $(N - 1)$ highest bidders win the auction and pay the *N*th highest bid amount.

Although bids from each of these auctions are theoretically equivalent, some differences have been noted in empirical applications. Findings from previous research suggest the following.

- Although evidence is mixed, there is strong support for the notion that subjects "over bid" in second-price auctions (Kagel, Harstad, and Levin; Lusk, Feldkamp, and Schroeder; Rutström).
- Shogren et al. (1994a) found that second- and random *N*th price auctions generated equivalent results in an empirical application, but Lusk, Feldkamp, and Schroeder found that second-price auction bids were significantly greater than random *N*th price auction bids.
- The second-price auction tends to work better for subjects with relatively high valuations (on-margin), whereas the random *N*th price auction tends to work better for subjects with relatively low valuations (off-margin) (Shogren et al., 2001a).
- The English auction and the BDM mechanism generate similar results (Lusk, Feldkamp, and Schroeder; Rutström).

Because these four elicitation mechanisms are theoretically equivalent, there are a number of pragmatic factors practitioners might consider when choosing which mechanism to use for a given application. Table 1 lists a few practical advantages and disadvantages of using each of the mechanisms. The English auc-

[4] This is by no means an exhaustive list of incentive compatible elicitation mechanisms. The discussion of elicitation mechanisms is limited to those frequently appearing in the literature.

Table 1. Practical Advantages and Disadvantages to Utilizing English, Second-Price, BDM, and Random *N*th Price Elicitation Mechanisms for Marketing Applications

English	Second-Price	BDM	Random *N*th Price
Advantages			
Familiar to most people and relatively easy to explain to participants	Relatively easy to explain to subjects and relatively easy to implement	Can use with individual subjects in settings like grocery stores	Keeps all bidders engaged in multiple bidding rounds
Open market with large amounts of feedback	Only one unit of good is sold, easing experiment preparation	Values can be elicited relatively quickly	Relatively high degree of market feedback if desired
Disadvantages			
Difficult to implement with multiple goods	Some evidence that subjects overbid	No active market	Difficult to explain to participants
Difficult to control market feedback	Subjects with low values become disinterested in multiple bidding rounds	No market feedback	Determining market price can be time intensive if session sizes are large

tion is one with which most people are at least somewhat familiar. As a result, experimental procedures can be relatively easy to convey to subjects. The English auction is also an "open" auction, in that every subject knows the bids of every other subject. This can be an advantage in the sense that subjects can quickly incorporate market information into their valuations, but it can also be a disadvantage if subjects are unduly influenced by other bidders or if bidder affiliation (discussed in a latter section) is a major concern. The second-price auction is also relatively easy to explain to subjects and is relatively easy to implement. Nevertheless, as was already suggested, there is evidence that subjects might over bid in this auction, and there is strong potential for low-valued subjects to "misbehave" in multiple bidding rounds. The BDM mechanism is the only one that can be used on an individual basis that does not require a group of subjects. As such, the mechanism has proved useful for eliciting values in field settings such as grocery stores (Lusk et al., 2001b). Lusk and Fox found that the elicitation environment (store vs. lab) has the potential to significantly influence elicited values, highlighting another potential advantage of the BDM. The strength of the BDM is also its weakness. Because subjects participate individually with the BDM, no active market is present. Shogren contends that an active market environment is important in inducing economic rationality, and Shogren et al. (2001b) found that certain economic anomalies, such as the willingness-to-pay/willingness-to-accept disparity, are still present with the BDM but disappear in active market environments such as the second- or random *N*th price auctions. An advantage of the random *N*th price auction is that it potentially keeps bidders with relatively low values engaged in the auction. It also provides a relatively high degree of market feedback if used over multiple bidding rounds with posted prices. However, the random *N*th price auction can be difficult to explain to experimental participants and can be difficult to manage for the experimental monitor.

Market Feedback and Bidder Affiliation

As was discussed in the previous subsection, there are some potential advantages to allowing subjects to incorporate market feedback into their valuations. Specifically, a number of studies have emphasized the importance of an active market environment at generating rational behavior consistent with economic theory (e.g., Cherry, Crocker, and Shogren; Shogren; Shogren et al., 2001b). For marketing applications, the intuition is that subjects routinely use market information, such as market prices, in the "real world," and laboratory experiments should be designed with this fact in mind. With the second-price and random *N*th price auctions, subjects can be provided market feedback by conducting multiple bidding rounds and posting market prices at the conclusion of each round. The English auction, by construction, permits feedback, not just about the final market price, but about all subjects' bids.

Despite the advantages of allowing market feedback with auction mechanisms, there is one potentially serious drawback. When subjects are allowed market feedback through posted prices, there is the potential for bidder's values to become affiliated (Milgrom and Webber). Bidder affiliation refers to the situation when a relatively high value for one subject implies high values for other subjects. The incentive capability property of the aforementioned auctions rests on the assumption that bidders' values are independently distributed. This assumption is clearly violated if values become affiliated. Thus, bidder affiliation has the potential to degrade the incentive compatibility of the aforementioned auctions.

List and Shogren (1999) directly tested whether bidder affiliation, caused by posting market prices, significantly influenced bidder behavior in the types of auctions commonly used in marketing applications. They found that bidder affiliation only had a very small impact on bids—posted prices increased median willingness-to-pay bids by 1%. They also found that bidder affiliation only existed for novel, but not familiar, goods. Another interesting observation in this regard is that Lusk, Feldkamp, and Schroeder and Rutström both found that BDM and English auctions generated statistically equivalent results. This finding is fascinating, because the English auction permits the greatest possible amount of market feedback (and thus has the greatest potential for bidder affiliation), whereas the BDM permits no market feedback (and thus has no bidder affiliation). On the surface, these results suggest that potential problems with bidder affiliation are likely outweighed by the potential advantages of market feedback ceteris paribus. Of course, this conclusion is not universal, and more theoretically minded experimentalists have reached the opposite conclusion (Harrison, Harstad, and Rutström).

Even if bidders' values do become affiliated over multiple bidding rounds, one interesting area of investigation that has received little, if no, attention is in determining why and how values become affiliated. For example, Lusk et al. (2002) recently conducted fifth-price auctions in a number of US and European locations, where they elicited the minimum amount of compensation subjects demanded to consume a genetically modified food. These values were elicited over 10 bidding rounds, with one of the rounds randomly selected to be binding. As is commonly the case in willingness-to-accept auctions, they found that median bids were relatively high in the first bidding round and generally trended downward as the experiment progressed. Certainly this behavior implies something about the relative importance of market prices and individuals' concern for biotechnology. That subjects demanded less compensation to consume a genetically modified food when they were informed of the market price might indicate that a portion of an individuals acceptance/rejection of biotechnology is a function of individuals' perception of acceptance in the market. In this and other similar situations, subject response to the posting of market prices might have meaningful interpretation beyond theoretical concerns with affiliation.

Demand Reduction and Wealth Effects

One potentially fatal flaw of many EA studies is that the experimental designs do not control for demand reduction or wealth effects. Demand reduction and wealth effects confound a study's results if experimental subjects are asked to purchase several different goods or if they are asked to purchase multiple units of a single good. These situations frequently arise in EA, because subjects often participate in multiple bidding rounds with price feedback and/or because subjects bid for several goods with slightly different quality attributes.

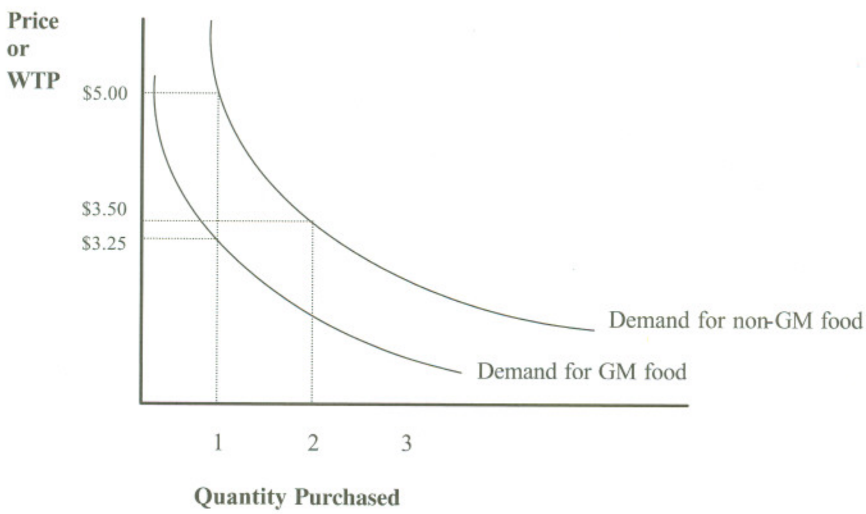

Figure 1. Impact of Demand Reduction on Bids in an EA

To illustrate problems that demand reduction might cause, consider an application where a subject bids on two otherwise identical foods: one that is genetically modified (GM) and one that is not (non-GM). Assume that the experimental design did not control for demand reduction, such that individuals could potentially win both goods (GM and non-GM) and individuals participated in several bidding rounds. Such a procedure would result in winning participants lowering their bid each subsequent round and/or cause bids for both goods to be lowered in each round. To illustrate the potential problem of this design, consider a participant who won the non-GM food but did not win a GM food in bidding round 1. This would reduce the subject's demand for the non-GM food but potentially leave demand for the GM food unchanged. Therefore, in round 2, the value of non-GM versus GM food has changed because of a movement down the non-GM demand curve, not necessarily because of an inherent difference in the value of GM. In fact, if the demand curves are steep enough, it is possible for a non-GM–preferring individual in round 1 to become a GM-preferring individual in round 2. Figure 1 presents a graphical illustration of this problem. For the first unit sold, the difference between in willingness to pay for GM and non-GM is $5.00 − $3.25 = $1.75. However, in round 2, the individual now values the non-GM food at $3.50 (because it is the second non-GM food) and the GM food at $3.25 (because they still have not purchased a GM food), and the difference in value between GM and non-GM foods is now only $0.25.[5] If nonlinear demand curves exist, then the relative value of two goods will change if multiple units are sold. Even if linear demand curves exist, demand for one good may be more inelastic than another, which would also cause problems if subjects were allowed to participate in multiple binding rounds. Figure 2 illustrates the case where demand for the non-GM food is more inelastic than the demand for the GM food. In round 1, the subject is willing to pay $5.00 for the non-GM and $4.25 for the GM food. Thus, in round 1, the individual is "non-GM preferring." However, if a subject purchases both goods in round 1, then in round 2 the individual would be willing to pay $4.00 for the GM food and $3.00 for the non-GM food. The individual now becomes "GM preferring" in round 2.

Obviously, these scenarios only represent very simplistic predictions of what might happen when an experimental design allows sub-

[5] Obviously, Figure 1 is a simplistic illustration. The demand for GM food is not likely to remain constant if a participant bought a non-GM food in round 1 but not a GM food. Because the goods are substitutes, the demand for the GM food is likely to shift downward by some amount in round 2.

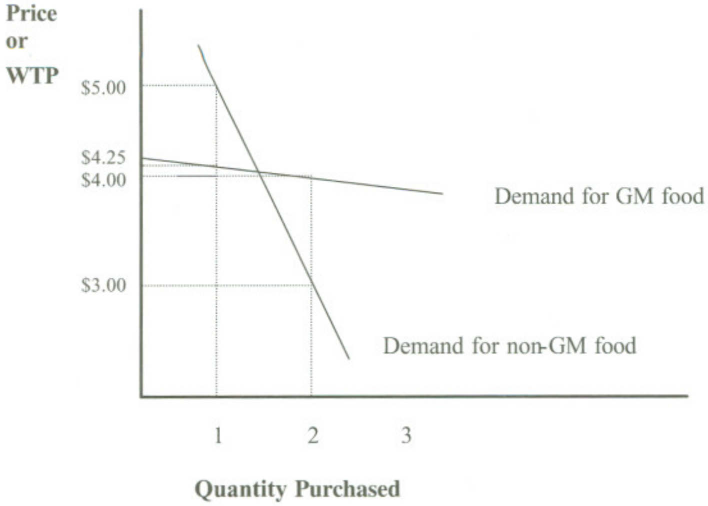

Figure 2. Impact of Demand Reduction on Bids in an EA

jects to purchase multiple goods in multiple bidding rounds. If the problems were as simple as that outlined in Figures 1 and 2, it would be relatively straightforward to sort them out. Unfortunately, life is more complex, and the primary problem arises because demand curves will be shifted downward if subjects know they have the chance to win multiple goods. As such, the researcher can only guess at the extent to which demand is reduced and how patterns of substitutability might influence the degree of demand reduction and the relative value between goods. The key issue here is that research results might be an artifact of poor experimental design instead of a reflection of true preferences that would be observed in the marketplace.

So how might one handle this problem? One solution is to only auction a single good or attribute in a single bidding round (e.g., Lusk et al., 2001b). However, this solution is overly restrictive, in that it eliminates within-subject comparisons and does not allow the researcher to easily examine the value of multiple product attributes. The easiest way to handle this problem is to use random drawings to determine a binding bidding round and/or a binding good. For example, Hayes et al. had subjects participate in 20 bidding rounds in which only one was drawn as binding, and Lusk, Feldkamp, and Schroeder auctioned five different types of steaks and randomly drew only one of the steak types as binding. Under the assumption that a subject's expected utility is linear in probabilities, randomly drawing a binding auction should produce the same results as conducting a single independent auction. Roosen et al. and Lusk, Feldkamp, and Schroeder provide results to suggest that individuals' behavior in these sorts of applications is consistent with this assumption.

Multiple Attribute Valuation[6]

Many researchers use EA because they are interested in a particular product characteristic or attribute. For example, one might be interested in the relative value of an organic tomato versus traditional tomato, the relative value of a tender versus tough steak, the relative value of a bag of non-GM versus GM corn chips, etc. As such, EA are often constructed to estimate the value of a single product characteristic. However, it is important to recognize that foods are composed of numerous attributes *in addition to* the one attribute that may be of research interest. Thus, there may be a number of potential problems with the approach of valuing single product attributes.

First, the product attribute of interest may have a number of substitutes. If not properly

[6] This section has greatly benefited from discussions with Bailey Norwood.

accounted for, this substitutability can create incorrect inferences about the valuations one is attempting to measure. For the sake of discussion, assume that an EA was conducted to estimate the value of GM versus non-GM corn chips. Using Lancaster's approach of specifying utility for a good as a function of its attributes (see also Louviere, Hensher, and Swait), assume that an individual's utility for a bag of corn chips can be given by the following:

$$(1) \qquad V = \beta_0 + \beta_1\text{PRICE} + \beta_2\text{GM} + \beta_3\text{BRAND} + \beta_4(\text{GM} \times \text{BRAND}),$$

where PRICE is the price of the bag of corn chips, GM is a dummy variable that takes the value of 1 if corn chips are genetically modified and 0 if the corn chips are not genetically modified, BRAND is a dummy variable that takes the value of 1 for some well-known brand name such as Tostitos and 0 for some lesser-known brand or generic bag of chips, and β represents the marginal utility of each of the chip attributes. With this formulation, it is straightforward to show that the individuals' willingness to pay for GM over non-GM corn chips is $-\beta_2/\beta_1$ if BRAND = 0 and $-(\beta_2 + \beta_4)/\beta_1$ if BRAND = 1.

Now, suppose an EA was conducted in which chips were taken out of their original packages and repackaged in generic bags, such that the subjects could not identify the brand of the chips. Because subjects do not know the brand of the chips, they must make some assumption about the brand name, but, unfortunately, the researcher cannot ex post determine what assumption was made. Because different subjects likely made different assumptions about the brand of the chips, we end up with a classical omitted-variable bias problem.

Even if the EA was structured such that brand was identified, what is the relevant willingness-to-pay measure? Most studies estimate demand for a product attribute in absence of any other attributes—i.e., we only estimate the value of GM versus non-GM for generic chips and elicit $-\beta_2/\beta_1$ as *the* measure of willingness to pay. This measurement of willingness to pay is not incorrect per se, because it measures the value of GM versus non-GM with no brand or when BRAND = 0 (or under the assumption of no interaction, $\beta_1 = 0$). However, this value estimate is then (inappropriately) extrapolated to the "real world," in which brands are actually present and the "true" value of GM versus non-GM is $-(\beta_2 + \beta_4)/\beta_1$. Thus, in this case, the experiment has inaccurately predicted the value of GM versus non-GM in the "real world" by β_4/β_1. The larger the substitutability (or complimentarity) between attributes, the larger β_4 becomes and the more erroneous predictions from a standard EA become. One may be tempted to dismiss such effects as too small to matter, but Louviere, Hensher, and Swait, in an extensive review of attribute-basted studies, stated (pg. 88), ". . . there is ample evidence that interactions exist in many decision rules. Hence, assuming strictly additive utility functions is likely to be very naïve and quite ill-advised. . ." Support for such interactions can also be found in Dickinson and Bailey, who found that the sum of subjects' willingness to pay for three product attributes (each attribute was valued separately) was significantly less than subjects' willingness to pay for all three attributes (all three attributes were valued jointly).

A second related issue in multiple-attribute valuation that should be considered is that of the potential of diminishing marginal utility for an additional product attribute. That is, aside from the issue of substitutability, most studies fail to take into account *when* an attribute is introduced relative to other preexisting attributes a good may already possess. For example, suppose that a beef steak is already advertised as being lean, non–hormone treated, antibiotic-free, farm-raised, and product of the United States. What is the marginal value of adding the attribute of guaranteed tender to this steak? Clearly, the answer depends on when the attribute was added to the steak. If guaranteed tender were the only attribute, then the its marginal value might be quite high. But, for our fictitious five-attribute steak, it is likely very low. Why? Intuition suggests that, just as we experience diminishing marginal utility from an extra unit of a good, we would also experience diminishing marginal utility from an extra attribute in a good. Furthermore, what might be the impact on the marginal utility of preexisting attributes when an additional attribute is introduced? These issues are also closely related to consumers' diminishing marginal ability (or patience) to read all advertised attributes on a product's label. In other words, how long do we expect consumers to examine labels before making purchase decisions? Supporting this notion, Noussair, Robin, and Ruffieux found in an EA that subjects placed the same value on GM and non-GM foods until they were explicitly told to the closely examine the food's label. Again, one might be tempted to dismiss this issue as unimportant, but even casual examination of almost any food in a grocery store reveals a plethora of preexisting attributes such as brand names, nutritional labels, low-fat claims, etc.

So how should researchers handle problems with multiple attribute valuation? Clearly, thought should be given (and perhaps pre-studies should be conducted) to identify whether there are attributes that are significant substitutes for the attribute of interest. If significant interactions between product attributes exist, experimental designs can easily be constructed to fully identify utility functions such as that in equation (1). And what of the diminishing marginal attribute hypothesis? First, some research should be conducted to determine whether and to what extent such a phenomenon may exist. If this conjecture holds, then the value of an attribute such as GM-free or guaranteed tender is only accurate and extendable to the "real world" when experimental procedures inform subjects of other attributes a good already possesses, such as brand names, nutritional labels, etc.

Conclusions

Given the increased emphasis in product differentiation at the retail level, there has been an increased interest in marketing research techniques such as experimental auctions. Given the increased interest in this area, the present article discussed general issues associated with EA and their relative advantages and disadvantages over other marketing research techniques. The relative advantage of EA over other methods is that they create an active market environment with feedback in which subjects exchange real goods and real money. The article also discussed four experimental design issues associated with EA: auction mechanism, market feedback and bidder affiliation, demand reduction and wealth effects, and multiple attribute valuation. The hope is that the quality and contribution of future EA studies will be enhanced by carefully considering each the experimental design issues.

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