

Fifteen Years of Experimental Auctions of GM Foods: What Have We Learned about Policy, Preferences, and Auction Design?

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It was a coincidence that GM foods became ubiquitous at the same time that researchers started using experimental auctions to study consumer preferences for food products. We explore the history of experimental auctions used to study GM food products and how the insights gained have been useful to policy makers. We also examine how experimental auctions of GM food products helped researchers gain insight both into consumer behavior and into best practices for experimental auctions.

Key words: experimental auctions, GM foods.

Introduction

In 1992, the United States issued regulations saying that genetically modified (GM) food products did not have to be labeled if the food product had the same characteristics as their non-GM counterparts (US Food and Drug Administration, 1992). The US policy of not requiring GM foods to be labeled has remained in place while dozens of countries worldwide have required GM foods to be labeled as such. Since then, GM foods have become ubiquitous in the United States and cemented in controversy globally.

Coincidentally, the use of experimental auctions in agricultural economics became popular at the same time as GM foods, as several scholarly papers that used experimental auctions were published in the early 1990s. These papers used experimental auctions to examine preferences for foods that used growth hormones, for safer food products, and more.¹ Several years after the initial papers using experimental auctions were published, researchers started using experimental auctions to examine consumer preferences for GM foods. Since then dozens of papers have been published using experimental auctions of GM food products.

In this article, we provide an overview of the initial studies that used experimental auctions to study preferences for food attributes along with the initial studies that used experimental auctions to study GM foods. We then examine the insights that have been gained regarding consumer preferences for GM foods and examine how experiments on GM foods have helped researchers develop a set of best practices for conducting experimental auctions. Finally, we will examine some future

research opportunities involving experimental auctions and GM food products. We begin by explaining some of the benefits of using experimental auctions and how they have prompted researchers to employ this method.

What Is An Experimental Auction and Why Is It Useful?

Economic experiments are similar to laboratory experiments common to the physical sciences in that people are in a controlled environment and the researcher can provide different treatments to see the impact of the treatment on consumer behavior. Thousands of economic experiments have been conducted in recent years.² The researcher alters an element of the environment across consumers (called a treatment or intervention). The researcher can then evaluate the effectiveness of specific treatments by examining the magnitude of the differences in the outcome measures (e.g., prices people are willing to pay for a product) between or among the persons who did or did not receive the treatment.

Although the first use of an economic experiment can be traced to around 1930 (Thurstone, 1931), economic experiments were not common until the early 1960s when Vernon Smith began conducting experiments to look at a range of issues. He tested the effectiveness of alternative market designs—including auctions—to encourage participants to reveal their true valuation for specific products (Smith, 1962, 1964). In 2002, Smith won the Nobel Prize in Economics for his efforts.

1. See Buhr Hayes, Shogren, and Kliebenstein (1993), Fox, Buhr, Shogren, Kliebenstein, and Hayes (1995), Hoffman, Menkhaus, Chakravarti, Field, and Whipple (1993), and Melton, Huffman, Shogren, and Fox (1996).

2. As of January 2016, a search for the term 'experimental economics' in Google Scholar brings up more than 2.9 million results.

Experimental auctions have significant advantages over other methods to assess consumer preferences for products. Participants in a properly designed experimental auction have an incentive to represent their true value when bidding. Someone who bids higher than his/her true value for the product could end up paying more than he/she is willing to pay for a product. Someone who bids lower than his/her true value may miss out on a profitable purchase. Unlike surveys and focus groups, participants in the experimental auction make decisions that have true financial impacts (Gallet & List, 2003). Auction winners pay for and receive the product, just as they would in the marketplace.

Auctions to Assess Preferences for Food Products: The Early History

While popular now, experimental auctions as a tool to measure preferences are still rather new. They began to become popular in the 1990s when economists started running experimental auctions to assess preferences for various agricultural products. Using a 5th-price auction, Menkhaus, Borden, Whipple, Hoffman, and Field (1992) used experimental auctions to examine the preferences for beef products and found that physical appearance, fat content of beef, and the shape of beef influenced bids. Hoffman et al. (1993) expanded the analysis of those experiments, finding that bidders in Los Angeles bid more than participants in Denver and that participants bid more for vacuum-skin packaging than for a wrapped Styrofoam tray. Hayes, Shogren, Shin, and Kliebenstein (1995) examined consumer willingness to pay for food products when consumers were informed of the (differing) probabilities of contracting a foodborne illness if consumed. They found that consumers were willing to pay between \$0.30 and \$0.70 more per meal for safer meals, although consumer willingness to pay for safer food did not vary much based on the likelihood of contracting the foodborne illness. Melton et al. (1996) used experimental auctions and found that consumers were able to assess and value different attributes of pork chops. They found that pictures of pork chops were less effective at indicating quality to consumers' examinations of the pork chops, and that examinations were less effective than taste tests.

The first paper that was published using experimental auctions to assess preferences for GM foods was Buhr et al. (1993). They examined college students' willingness to pay to purchase meat from animals that were treated with a genetically engineered growth enhancer. They found that students were willing to pay a

premium for meat that was leaner because of the growth enhancer. While the directions in the study told students the animals were treated with a "growth enhancer," the participants in the study were never told the product was produced using biotechnology, genetic modification, or genetic engineering. Another paper by Fox et al. (1995) found that a majority of consumers were willing to purchase milk from cows treated with bST. However, consumers who were exposed to anti-bST information but not scientific information were more reluctant to purchase bST milk.

The first paper that appeared in a scholarly journal to examine preferences for GM foods with participants that were informed that the product was genetically modified was Lusk, Daniel, Mark, and Lusk (2001). They used a sample of college students in the year 2000 to examine the percentage that were willing to pay a premium to exchange GM corn chips for non-GM corn chips. Lusk et al. (2001), in the same paper, also examined differences in bidding behavior between participants who were in a first-price auction versus a second-price auction.

While published after Lusk et al. (2001), Noussair, Robin, and Ruffieux (2002) actually conducted their experiments earlier—in 1999—with a more-random sample of consumers. They examined preferences for GM foods and whether the position of the label on the product influenced willingness to pay. Noussair et al. (2002) used what they described as a 'demographically representative sample of consumers' from Grenoble, France.

The use of GM experiments with non-college-student samples expanded dramatically in the years that followed. Huffman, Shogren, Rousu, and Tegene (2003) and Rousu, Huffman, Shogren, and Tegene (2004) used a total of 318 adults recruited from a phonebook sample to examine several issues, including the impact of information on preferences for GM foods, the value of objective information on GM foods, which organizations consumers most trusted to provide information on GM foods, and more. Other sets of experiments on GM foods examined the preferences for GM foods across countries and the impact of different types of information (House et al., 2005; Lusk, Jamal, Kurlander, Roucan, & Taulman, 2005), consumer preferences for transgenic versus intragenic GM foods (Colson, Huffman, & Rousu, 2011), and how income affects preferences for GM foods (Kikulwe, Birol, Wesseler, & Falck-Zepeda, 2011).

What Insights Were Gained Into Preferences for GM Foods From Experimental Auctions?

We will only provide a brief overview of some insights gained into preferences for GM foods from auctions. For a more thorough overview of the research on consumer preferences for GM foods, we recommend the meta-analyses by Lusk et al. (2005) and Dannenberg (2009), along with the review article by Colson and Rousu (2013).

Experimental auctions with GM foods have consistently shown that consumers prefer non-GM foods to GM foods (Colson & Rousu, 2013). However, several factors influence consumers' preferences. First, preferences are not homogeneous across countries. Researchers ran experimental auctions with GM foods in the United States, France, and England to examine preference differences across countries (House et al., 2005; Jaeger et al., 2004; Lusk, House, et al., 2004). This research resulted in several discoveries. One finding was that US consumers were more accepting of GM foods than French or English consumers (Jaeger et al., 2004). Another finding was that while no differences in objective knowledge of GM foods was discovered across countries, French consumers viewed themselves as more knowledgeable about GM foods than English or US consumers (House et al., 2005). The authors also found that bids for GM foods differed dramatically based on the information consumers received (Lusk, House, et al., 2004); this result was consistent with the findings in Rousu et al. (2007).

The type and amount of GM content matters also affects willingness to pay. Colson et al. (2011) examined the preferences for transgenic GM food products relative to intragenic GM food products. Transgenic methods take genes from one species and transfer them into a different species, while intragenic methods only transfer genes from within the same species. Colson et al. (2011) found that consumers were less accepting of transgenic GM food products than intragenic GM food products. Rousu et al. (2004) found that while consumers paid less for GM foods, they found no evidence that consumers placed different values on foods that allowed small but different amounts of GM material (tolerance levels). They found consumers' WTP did not differ between food products that allowed 1% and 5% GM content.

Huffman, Rousu, Shogren, and Tegene (2004) explicitly examined the policy issue of whether the United States should require mandatory labeling of GM foods. Given higher food costs (for segregating, testing)

if mandatory labeling be set in place, the authors argued that a policy should be put in place only if a voluntary policy was inferior at informing consumers to a mandatory policy, i.e., a "does not contain GMO" label was less informative than a "contains GMO" label. The authors then conducted experiments and found consumers had the same discounts for GM foods regardless of the labeling scheme, concluding that for US consumers, a voluntary labeling policy was as good as a mandatory policy.

The extent to which results have guided policy towards GM foods is debatable. In the United States, at a national level, labeling of GM content is voluntary. In practice, firms indicate that a food is not GM by labeling it as organic. But some people in individual states have put the question of whether to label GM foods as such on ballot initiatives. They often will accompany this by saying consumers have a "right to know" and with claims that many consumers would choose not to consume GM foods if they were labeled as such. These opinions may have been guided in part from experimental auction research.

How Did Research on GM Foods Help Experimental Auction Methods?

The use of experimental auctions helped researchers and policy makers gain insights into genetically modified foods. Those auctions, however, also helped researchers gain significant insights into developing best practices for those who conduct experimental auctions. Further, some differences in methods across researchers have been at the heart of several controversial issues. We will briefly examine some of the issues and insights gained here.

How Could We Value Information Using Experimental Auctions?

Rousu et al. (2007) used experimental auctions of genetically modified foods to assess the value of objective information. This was different than other research assessing information, as the research set out to find the change in consumer surplus received and not the change in demand. The authors did this by first assuming the post-information bid is "correct" and examining if the consumer would have purchased a different product in the absence of information. If the lack of information caused the consumer to buy a different bundle than the fully-informed consumer, the consumer suffered a cost-of-ignorance. The value of the information was assessed

by measuring the cost of ignorance that was eliminated by more-complete information.

This initial work on valuing information has since been extended. One drawback of the initial value-of-information method is that it assumed consumers either purchase non-GM or GM products, but never would buy both. In subsequent work, researchers refined the methodology and combined experimental auction data with field data to improve welfare estimates. Marette and Lusk (2014) combined market elasticity and consumption data with experimental auction estimates. This improves upon initial studies that used only a binomial consideration of whether a consumer purchased or did not purchase a product. The updated method allows for decreases or increases in consumption and is not an “all-or-nothing” approach like the first studies. It should also be noted that this study did not use GM foods, but the origins of the analysis come from work studying preferences for GM food products.

Should Participants be Given One Product, Then Bid To “Upgrade” To Another?

What is the proper way to have participants bid on products? The initial approach in experimental auctions, when they first began being published, was to first endow participants with one unit of a product (e.g., see Shogren, Shin, Hayes, & Kliebenstein, 1994). Participants then bid to exchange that product with another product. Some of the early studies examining issues with genetically modified foods also used this method, including Lusk et al. (2001) and Lusk, Feldcamp, and Schroeder (2004). Lusk et al. (2001) endowed participants with a GM-product and had them bid to upgrade to a non-GM version of the product. Lusk, House, et al. (2004) was similar, except the endowed product was a non-GM version of the product and the bid was for how much money the participant would need to be paid to exchange (downgrade) to a GM-labeled version of the product.

Other early experimental auction studies involving GM foods—including Noussair et al. (2004) and Huffman et al. (2003)—used an alternative approach. They had participants bid on both GM and non-GM labeled versions of products. They then examined the differences in bids across products to assess the preferences for GM foods.

At first glance, both approaches have their advantages and disadvantages. The advantages of the approach used by Lusk et al. (2001) and Lusk, House, et al. (2004) is the ease of implementation and that partici-

pants need only to place one bid, not two. The big drawback, however, comes if there is any sort of endowment effect. The endowment effect, loosely defined, occurs if participants place a different value on a product when they are endowed with it. Many researchers have attributed the endowment effect to loss aversion (Kahneman, Knetsch, & Thaler, 1991). If the process of being endowed with a product affects bids, then the endow-and-upgrade approach is problematic. If it does not affect bids, however, then either method should be acceptable. The fact that different auction studies of GM food products took diverging approaches helped lead to research on the impact of the endowment effect.

Corrigan and Rousu (2006b) studied the impact of endowments in experimental auctions. They examined bids for one unit of a product and two units of a product in separate bidding rounds. They also examined the impact of endowing participants with one unit of a product and having them bid to obtain a second unit of a product. They found an endowment effect—bids were higher when participants were endowed first with a product. Lusk, House, et al. (2004) examined the impact of product endowments and found that endowing participants led to greater bids with a 2nd-price auction, but lower bids with a random nth-price auction.

More recent work has also explored this topic. Alfnes (2009) used a theoretical model to examine optimal bids and found problems with the endowment approach. He explained that outside options matter, which indicates the endowment approach can cause subtle biases. His paper concludes (p. 147) that

“even when the endowment approach yields true values, interpreting the results is often a problem ... In the endowment approach, [a zero bid] can indicate that the participant is either indifferent between the products, prefers the endowed product to the non-endowed ..., or is not willing to pay anything for the product at the time of the experiment.”

Other insights include finding that the number of units participants would have to give up influences the impact of the endowment effect (Akaichi, Nayga Jr., & Gil, 2012), and the endowment effect stems from owning the product and not the fear of giving up the product (Morewedge, Shu, Gilbert, & Wilson, 2009). The bulk of the evidence has suggested that it is best not to endow participants with products and experimental auction researchers mostly have abandoned the endow-and-upgrade approach.

Should Repeated Trials With Posted Prices be Used?

The first auctions using GM foods by Buhr et al. (1993) had 20 rounds of bidding on the same product. After each round of bidding, the market price was shown. Some studies examining preferences for GM foods have also collected multiple bids (often 10-20) on the same product (e.g., see Lusk et al., 2001). Instead of collecting multiple bids on the product, some other early studies of GM foods, including Huffman et al. (2003) and Noussair et al. (2002), only had one round of bidding for each unique product or label sold. The published papers studying GM foods led to a debate among experimental economists that later studies attempted to resolve.

Corrigan and Rousu (2006a) examined the impact of high bidders in repeated trial auctions. They planted confederate bidders who were instructed to bid large amounts for products in some treatments, but not in others. They found that over the course of repeated rounds, having some bidders bid large amounts resulted in other bidders increasing their bids relative to the groups without the high bidders. In the conclusion they stated:

“Based on the results presented here and in other studies suggesting that posted prices may influence bids submitted in subsequent rounds, we think that researchers should abandon repeated-trial Vickrey auctions. Instead, to avoid bid affiliation we suggest that researchers use just one round of bidding for any given good or bundle of goods” (Corrigan & Rousu, 2006a, p. 1088).

Corrigan and Rousu’s (2006a) findings contrasted with results from other researchers, including List and Shogren (1999), who found that bids increased over repeated rounds with posted prices for familiar goods, but not unfamiliar goods. In their book on experimental auctions, Lusk and Shogren (2007) included twelve pages discussing the issues with having repeated rounds of bidding while posting prices after each round. They concluded by saying that the “jury was still out regarding the appropriateness of using repeated rounds with price feedback” (Lusk & Shogren, p. 92).

Some resolution to this issue was reached in the adversarial collaboration undertaken by Corrigan, Drichoutis, Lusk, Nayga, and Rousu (2011). The researchers who collaborated came into the project with different views (based on the research) of what was appropriate and decided to conduct experiments that would help allow them to resolve their differences of

opinions. They ran several sets of experiments and concluded that repeated rounds while NOT posting prices led to more-efficient bidding behavior.

Discussion and Conclusion

It was a historical coincidence that agricultural economists began using experimental auctions at the same time that GM foods hit markets. Because of this timing, it is understandable that several researchers looking to assess preferences for GM foods turned to experimental auctions. The result was a flurry of insight into preferences for GM foods.

These findings were widespread and diverse. In general, consumers pay less for GM foods. However, much of the early work with auctions found that the discount for GM foods varied depending on where the label was placed; whether the consumer received positive, negative, or objective information; and the type of genetically modified product upon which consumers were bidding. Other insights showed that information had value to consumers, that there were large differences in preferences across countries, and that a voluntary label system is preferable to a mandatory labeling system when consumers can accurately interpret labels.

While these findings could not have necessarily been predicted ahead of time, in hindsight we should not be surprised that there were significant findings advancing understanding of consumer preferences of GM foods from experimental auctions. Several researchers put thousands of hours of effort into exploring this issue. What is more of a surprise, however, is how much the research on genetically modified foods helped advance researchers’ understanding of best practices in experimental auctions. Issues that were clarified include how to value information using experimental auctions, the importance of allowing (or not having) repeated rounds of bidding on the same product, and the drawbacks of endowing participants with a product and having them bid to upgrade instead of bidding on separate products.

That said, there is still plenty of research that could be conducted in both areas. Regarding GM foods, new methods could bring new traits. Understanding consumer preferences for these traits will be important, and experimental auctions could again play a role. Given many people across the United States are attempting to implement mandatory GM labeling, it will be useful to understand how the specific labels will affect consumer demand for GM foods. Additionally, policy makers who focus on public health should know if mandatory GM food labeling will take consumers’ attention away from

nutrition attributes, thus potentially resulting in less-nutritious food choices. Experimental auctions could be useful to examine these issues.

For experimental auctions, there are several future avenues of research that stand out. One current area of controversy with experimental economics research in general is that of deception. Many journals ban it, but some do not. Research on how deception can be avoided without sacrificing results would be incredibly useful to researchers. Further, experimental auctions currently just capture demand at one moment in time. Research to see how accurately an experimental auction can predict future behavior is needed.

It was a fortunate coincidence that GM foods became ubiquitous at the same time that experimental auction use became more widespread. The use of these auctions on GM foods brought significant insights into preferences for GM foods and best practices for experimental auctions that have helped scholars and practitioners in both areas.

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