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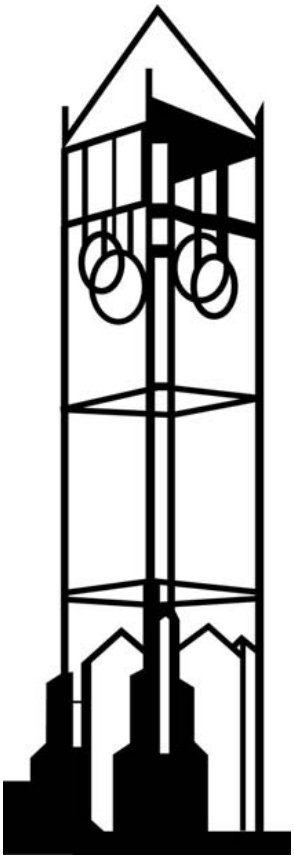

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by

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Abstract

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In most environments, information is critical to consumers' decision making. Consumers have prior beliefs about quality and price of goods and services and obtain new information which is used to update these prior beliefs or to form posterior beliefs, i.e., Bayesian learning. New food products made from herbicide-tolerant and insect-resistant crops using bioengineering, have appeared in U.S. supermarkets starting in 1996. The objective of this paper is to examine in depth the role of consumer's prior beliefs about genetic modification and of diverse, new information on their willingness to pay for foods that might be genetically modified. One hypothesis is that prior beliefs matter and, second, consumers give less weight to information from interested than disinterested par ties. We use a unique data set collected from a set of economics experiments to show that consumers who had informed prior beliefs behaved as if they placed more trust in the third-party information than in information from interested parties. Participants whose prior beliefs were uninformed revealed greater variation in their bidding behavior than informed participants.

The Effects of Prior Beliefs and Learning on Consumers' Acceptance of Genetically Modified Foods

In most environments, information is critical to consumer decision making (Akerlof 1970; Hirshleifer and Riley 1992; Mohol 1997; Stigler 1961). At any point in time, consumers have prior beliefs about the quality and price of goods available in the market.[1] As they receive new information, their posterior beliefs are updated, i.e., based on a weighted average of prior beliefs and new information. This method is called Bayesian learning (DeGroot 1970; Molhol 1997, pp. 248-49; Tirole 2003, pp. 373). For example, individuals who wish to purchase a new or used car locally have prior (subjective) beliefs about its quality. They may obtain information from car sales personnel or prior owners, which is subjective because these individuals are interested parties, or third-party information from an independent auto mechanic or repair shop.[2] The prior and new information (subjective and objective) are weighted into a new set of consumer posterior beliefs about quality and translated into an offer price for the car. Similarly, consumers can be expected to have prior beliefs about genetically modified (GM) foods, and may use new and possibly diverse information to update these beliefs. The agricultural biotech industry distributes pro-biotech information and environmental groups, e.g., Greenpeace, Friends of the Earth, and Action Aid, disseminate anti-biotech information. Independent third party information may also be available. See Rousu et al. (2002).

Suppliers of a variety of goods and services frequently provide private information in the form of "cheap talk," e.g., see Molhol 1997; Rousu et al. 2004; Fox et al. 2002. If consumers place heavy weight on this type of information as they make consumption

[1] These beliefs could, however, be uninformative, or diffuse (DeGrott 1970).
[2] Third-party information on price can also be obtained from *Kelly Blue Book* or an online service such as *Carfax*

decisions, they will make decisions that are not in their own best interest (see Molhol 1997; Morris and Shin 2002). Since consumers are utility maximizers subject to their resource constraints, they are not constrained in the same way as private firms who face a profit motive. Consumers will in general "survive," all be it, at some lower utility level, even when their decision making is heavily affected by interested parties. In contrast, private firms will go bankrupt quickly. The ability of consumers to accurately interpret new information from interested and disinterested parties depends on their information interpretative skills which undoubtedly are correlated with the amount of formal schooling and decision making experience that they have obtained (e.g., Schultz 1975; Huffman 2001).

A recent study by Rousu et al. examined consumers' willingness to pay for GM foods in laboratory experiments. In these experiments, food-label types and information treatments were randomly assigned to sessions or trials. In this setting, participants who perceived themselves as somewhat informed before the auction bid less for GM-labeled foods than those who considered themselves to be less informed. This raises an important issue of how does prior information affect the interpretation of information released during the auction? The objective of the current paper is to examine in greater depth the role of a consumer's prior beliefs about genetic modification and of diverse, new information on their willingness to pay for foods that might be genetically modified. One hypothesis is that prior beliefs matter and, second, consumers give less weight to information from interested, e.g., the agricultural biotech industry or environmental groups, than disinterested parties.

This research builds on the strength of data collected from laboratory auctions, which combine the methods of economic experiments, statistical experimental design, and survey design. Our experimental auction is a superior method for examining consumer beliefs about

GM foods relative to a hypothetical survey of the population. Our willingness to pay experiments are real auction experiences where it is in each participant's best interest to state her true preferences, and furthermore, the winners must "pay" what they "say" or " bid." Hence, participants are bound by a budget constraint. Because of the high cost of running a large number of experiment at different locations, we have chosen two locations—major cities—and a modest number of participants.[3] The results of this paper provide new evidence about how priors beliefs and new information affect consumers' decisions to purchase risky products.

The Conceptual Framework

We review a few pieces of highly relevant literature and then present our model. Other studies have shown that individuals place much less weight on prior beliefs than on new information when bidding on lotteries (e.g., see Grether 1995 or Tversky and Kahneman 1974). We extend this work in two important ways. First, we adopt the Bayesian concept of subject beliefs instead of assuming that prior beliefs are always "fact" or objective beliefs (DeGroot 1970). Second, we examine how prior beliefs and new information from interested and disinterested parties affect a consumer's willingness to pay for a new product that might cause environmental or human harm, i.e., they pose some potential risks.

A consumer's utility from consuming genetically modified food products is modeled as differing depending on their beliefs about genetic modification. Following Kivi and Shogren (2003), a state dependent indirect utility function is defined for a "good outcome"

[3] An alternative methodology is a contingent choice or value survey. In these surveys a random sample of households are contacted and asked to respond to hypothetical product preference or willingness to pay options. This approach has the advantage of being able to be administered relatively inexpensively to a large sample, which can give precision. For examples, see Johnston et al. 2001 However, because responses are hypothetical, they are not bound by a budget constraint. This can lead to biases or credibility problems which do not vanish as the sample size increases. For examples, see Diamond and Hausman (1994) and Fox et al. (1998).

$U(Y)$ and a "bad outcome" $V(Y-L)$ which are independent of an individual's prior beliefs or the amount of new information that he or she has acquired/received The indirect utility function is and they are weighted by the individual's subjective probabilities conditioned on his/her priors: p^I, probability of a bad outcome given the participant is informed, and $p^{no\text{-}I}$, probability of bad outcome given the participant is uninformed, to obtain a consumer's expected utility:

1) $$U\left(Y-WTP^I\right)=EU^I=p^I(I,\inf)V(Y-L)+\left(1-p^I(I,\inf)\right)U(Y)$$

2) $$U\left(Y-WTP^{no-I}\right)=EU^{no-I}=p^{no-I}(\inf)V(Y-L)+\left(1-p^{no-I}(\inf)\right)U(Y)$$

A consumer's indirect utility is a function of his or her household income, Y, minus his or her willingness to pay for the food products. Consumers are assumed to perceive that the "bad state" will occur with probability *p*, which differs between those who are "informed" and those who are not informed. It is a function of the information obtained/received on GM technologies and foods.

Normalizing utility such that U=1, and V=0, we can simplify the consumer's expected utility:

3) $$EU^I=\left(1-p^I(I,\inf)\right)$$

4) $$EU^{no-I}=\left(1-p^{no-I}(\inf)\right).$$

Next, consider a consumer's determination of his or her subjective probability of a bad outcome on GM foods, given the following parameterization:

5) $$p^I=\alpha_0+\alpha_{\inf}$$

6) $$p^{no-I}=\alpha_{\inf}.$$

Now α_0 is the effect of an informed consumer's prior beliefs about GM on his or her posterior beliefs about GM, and α_{inf} is the effect of new information on his or her posterior beliefs. Hence, if prior beliefs are informative, i.e., they are not diffuse priors (DeGroot 1970), then $0 < \alpha_0 < p$, which is positive but less than one. We can test the null hypothesis that participants place less weight on prior beliefs than on new information when the new information is from an independent, third party. However, if the new information is from one or more interested parties, we expect that they will place greater weight on prior beliefs than when new information is from a third party. Rearranging equations (5) and (6), we obtain the following relationship between posterior probabilities:

7) $$p^I = p^{no-pI} + \alpha_0$$

Substitute for p^I in equation (3), we obtain:

8) $$EU^I = \left(1 - p^{no-I} - \alpha_0\right),$$

and taking the difference in expected utility between equations (4) and (8), we obtain:

9) $$U\left(Y - WTP^I\right) - U\left(Y - WTP^{no-I}\right) = -\alpha_0$$

Thus, for consumers who have the same indirect utility values and receive the same information treatment, differences in expected utility are due only to *prior beliefs*.

Willingness to pay for GM-labeled foods could be higher or lower, depending on the prior beliefs and the content of the new information they obtain/receive. Hence, our experimental design and data allow us to test for the effects of prior beliefs under different information treatments.

Data

The observations and data for this paper are from a unique set of economic experiments reported in Rousu et al. 2002 and Huffman et al. 2003. A brief overview of the design is presented here, but the full design can be found in Huffman et al. or obtained from the authors upon request. The participants in these laboratory experiments were non-student adults selected randomly from the population of two major Midwestern cities. Participants came to a central location and bid on 3 foods that were rather dissimilar – russet potatoes, tortilla chips (made from yellow corn), and vegetable oil (made from soybeans) -- in two rounds of bidding. In one round participants were bidding on food products that were labeled as genetically modified and in the other round the food products had a plain-label.[4] Participants bid on products using the random nth-price auction mechanism, which has been shown to be superior to a 2rd price Vickery auction for eliciting consumers entire demand curve for new goods (Shogren et al. 2001).

Upon arrival at the lab site, participants were asked to complete a questionnaire asking about their social-economic characteristics and prior beliefs about new technologies. It included the question: "Regarding genetically modified foods: How informed do you consider yourself?" The participants were offered the following six options: extremely well informed, well informed, somewhat informed, not very informed, not informed at all, and I don't know. In particular, this information was collected before the start of the lab auction of GM-foods and release of new information.[5]

Approximately 10 percent of participants reported themselves "as very well informed" or "well informed," indicating that few participants were confident of their knowledge about GM-foods and technologies. See table 1. About 33 percent of participants

[4] The sequence was determined randomly.
[5] We made no effort to test participant's beliefs for objectiveness.

reported themselves as “somewhat informed” about genetically modified food products, and 40 percent of participants reported themselves to be “not very informed” about genetically modified food products. The remaining 18 percent of participants either reported that they were “not informed” at all or they “did not know how informed” they were. For this paper, all participants were placed into one of two groups: those who considered themselves “at least somewhat informed” about genetically modified food products and all the others (i.e., those who were not “at least somewhat informed.”)

Contrary to most economics experiments our participants engage in very few rounds of bidding. Participants did, however, receive instructions in the market mechanism of the random *n*th price auction—first with a candy bar auction and second with an auction of three goods: a candy bar, a deck of cards and a box of pens. They were also given a short quiz on the auction mechanism which was followed by discussion and clarification.

Next, one of the six information treatments was randomly assigned and released in each session or trial. These treatments were constructed from the three basic information types defined for these experiments. They were the (1) *industry perspective*—provided by a group of leading biotechnology companies, including Monsanto and Syngenta (Council for Biotechnology Information 2001); (2) *environmental group perspective*—from Greenpeace, a leading environmental group or biotech antagonist [Greenpeace (2001a, b), Friends of the Earth (2003)]; and (3) *verifiable perspective*—from a independent, third-party group of scientists, professionals, religious leaders, and academics, none with a financial stake in GM foods. This third type of information is an informed objective assessment without financial interest in genetic modification. The three information types were packaged into six information treatments: (1) the biotech industry perspective; (2) the environmental group

perspective; (3) agricultural biotech industry and environmental perspectives; (4) agricultural biotech industry and third-part perspectives; (5) environmental group and third-party perspectives; or (6) all three perspectives.

Because we use common food items available to shoppers in grocery stores and supermarkets, we wanted adults who were not primarily students to better reflect a typical household's decisions on grocery story food purchases.[6] Our participants are adults from the population of individuals 18 years of age or older and were chosen from two major metropolitan areas by a random digital dialing method. We ran two concurrent sessions on auction days and participants were alternately assigned to each group as they arrived, and each group/session consisted of 13 to 16 individuals. Table 2 summarizes the demographic characteristics of participants. Although our participants are slightly skewed toward women, Katsaras et al. 2001, showed that women make up a disproportional share of grocery shoppers—83 percent of shoppers versus 52 percent in the U.S. Census of Population.

Although the demographics of the sample do not perfectly match the population reported by the U.S. census demographic characteristics for these regions, they are similar and provide a sufficient representation for our initial probe into labeling and information for GM products (see Appendix A for the demographic characteristics of the areas).

Results

[6] Although several studies have used only college undergraduates in laboratory auctions of food items (including Lusk et al., 2001 and Hayes et al., 1995), they are not the best choice for participants when the items being auctioned are ones sold in grocery stores or supermarkets. For example, Katsaras et al. 2001, using a national random sample of grocery store shoppers, showed that the share of college-age (18 to 24 years) shoppers falls far below their share in the population—8.5 percent of shoppers versus 12.8 percent in the U.S. Census of Population. College students obtain a large share of their food from school cafeterias and a small share from grocery stores and supermarkets compared to older shoppers (Carlson et al., 1998).

The U.S. has a policy for GM-foods based on the Principle of Substantial Equivalence. If a new food product is made using genetic modification and it is equivalent to the non-GM counterpart, then no GM-food label is required. Hence, our plain-labeled food items are consistent with the current U.S. policy of GM-food labeling. Sample mean information for average bid prices for GM- and plain-labeled foods for all participants and for informed and not informed participants are reported in table 3.[7] Among all participants and commodities, average bids were 14 percent lower for GM than for plain-labeled commodities (part A). Hence, for these food items in the U.S. market, plain-labeled is the "superior quality" product. Among participants who had informed prior beliefs, they on average bid 18 percent less for GM- than plain-labeled commodities (part B), and among other participants, they on average bid 11 percent less, which is 49 percent smaller than for the informed participants..

What is the impact of subjective prior beliefs about genetic modification in a market with new information from interested parties? Table 4 summarizes the mean differences in bid prices from participants for GM- and plain-labeled food products due to the release of information from interested parties—the agricultural biotech industry or environmental NGOs, given prior beliefs. Part A examines the bid prices in a market without verifiable information. For participants who had informed prior beliefs and received only the industry perspective, the mean bid price differences between GM- and plain-labeled product were very small, e.g., less than plus or minus 10 cents per product. For participants who had informed priors and received only the agricultural biotech industry perspective, the mean bid price differences were 50 to 60 cents per product. For the uninformed, mean bid price

[7] We tested whether there were differences in the other demographic characteristics of those who perceived themselves as informed and uninformed, such as age and gender, and there were no differences between these groups that were statistically significant at the 10% level.

differences were only 32 to 37 cents per product. For informed participants who received both the agricultural biotech and environmental group perspectives, they discounted GM products on average 29 to 51 cents per product. In contrast, those participants who were not informed did not on average discount GM-products.

Part B of table 4 examines bids from consumers that received third-party or verifiable information. When participants—both informed and uninformed--received only pro-biotech information followed by third-party information, mean bid price differences between GM- and plain-labeled food items were small and were similar to those reported in part A. When participants were informed and received anti-biotech information followed by third-party information, mean bid price differences were 7 to 20 cents per food item, which is much smaller than the outcome without third-party information (as reported in part A). When informed participants received all three types of information, their mean bid price difference for GM- and plain-labeled food items were only 10 to 16 cents per product, which is much lower than the outcome when third-party information was not injected (as reported in part A). However, when uninformed participants received all three types of information, their mean price differences were similar to those reported when third-party information was not injected. Hence, prior beliefs seem to affect the way information about genetic modification is used by consumers in placing bids on food items that might be genetically modified.

In table 5, we report statistical tests of bid price differences between participants who had informed prior beliefs and the others (the uninformed). Part A reports the statistical tests for participants who did not receive verifiable information. This is a “difference-in-differences” test (see Wooldridge 2002, pp. 283-291, 128-131). When the participants received only the agricultural biotech industry perspective or the environmental group

perspective, no significant difference-in-differences existed at the 5 percent significance level. However, if they received the pro-biotech and anti-biotech perspectives, the estimate of the difference-in-differences estimator were significantly different from zero for potatoes (5% level) and tortilla chips (6 % level). However, the estimates of the difference-in-differences estimator were not significantly different for vegetable oil (p-value of 8%).[8]

Part B of table 5 reports addition difference-in-differences results for an environment where third-party information has been injected. We report results from tests of the null hypothesis that the difference in mean bid price differences for GM- and plain-labeled food items is zero across informed and uninformed participants. The information treatments are (i) pro-biotech and third-party, (ii) anti-biotech and third-party, and (iii) all three types of information. None of the estimates of the difference-in-difference estimator for these tests is significantly different from zero at the 5 percent level. Hence, third-party information seems to lower the relative weight placed on information received from interested parties when bids are placed on food items that might be genetically modified. Furthermore, when third-party information is injected into the experiment, prior beliefs about genetic modification seem to be unimportant to consumers. Hence, third-party information seems to be given significant weight by informed and uninformed participants and prior information downplayed.

Next we test for differences in bid prices due to information treatment effects for individuals that received verifiable information, given prior beliefs. Table 6 reports a new round of difference-in-differences tests to examine information treatment effects, given prior beliefs. The null hypothesis is that the difference in mean bid prices for GM- and plain-labeled food items under two different information treatments is zero, holding prior beliefs of participants constant. For uninformed participants, the estimate of difference-in-differences

[8] Wilcoxon Rank-Sum tests were also conducted, and provided similar results.

estimator is significantly different from zero (5 % level) for all three food items when participants receive pro- versus anti-biotech information. They are also significantly different from zero when participants receive anti-biotech information versus pro-biotech and biotech information. In fact these two sets of t-values look very similar (table 6). When participants received pro- versus pro- and anti-biotech information the estimate of the difference-in-difference estimator was not significantly different from zero. When participants had informed priors, none of the estimates of the differences-in-differences estimator was significantly different from zero at the 5 percent level. Hence, prior beliefs affect the relative weight placed on new information from informed parties when third-party information is unavailable.

Now we hold prior beliefs about genetic modification constant and produce tests of the differences-in-differences estimator across information treatments. For participants who had uninformed priors, three of nine tests in table 7 of zero for the estimate of the difference-in-differences estimator are rejected at the 6 percent level: for potatoes when participants received only pro-biotech information versus received only anti-biotech, and for tortilla chips and potatoes when participants received only anti-biotech information versus pro- and anti-biotech information. For participants having informed prior beliefs, none of the coefficients of the difference-in-differences estimator is significantly different from zero at the 6 percent level. Hence, with the injection of third-party information, we continue to find that participants who have uninformed prior beliefs bid differently on GM- versus plain-labeled food products. Those who are uninformed behave as if they place greater weight on new information than the uninformed even when it comes from informed parties.

Discussion and Conclusion

This paper has shown that prior beliefs and new information—both from interested parties and third-party sources---affect bidding for food items that might be genetically modified. This contradicts with the earlier findings of Grether (1995) and Tversky and Kahneman (1997). One potential explanation for this difference of outcome is that instead of measuring prior beliefs as objective knowledge (e.g., monetary lotteries), we asked lab participants to give us information about their prior knowledge about genetic modification. They were asked the following question: "How informed are you about genetic modification?" and they were given five options: extremely well informed, well informed, somewhat informed, not very informed, not informed at all. This information is therefore subjective and we use this as their subjective prior beliefs. Furthermore, we examined their use of prior beliefs and new information to inform decision on willingness to pay for common food items purchased in grocery stores and supermarkets and not in a lottery.

Overall, participants who claimed to have prior knowledge about genetic modification behaved were not as responsive to new information from interested parties as those who had uninformed prior beliefs. These participants behaved as if they placed more trust in third-party information. Participants whose prior beliefs were uninformed revealed more variation in their bids than informed participants.

These results have several implications for public information policy. First, it shows how both skeptics and proponents of new technologies, i.e., interested parties, might try to manage information to achieve private objectives. This is most likely to occur when much is unknown scientifically about the impacts of new technologies or where verifiable information is quite limited or not available (Huffman and Tegene 2002). Opponents to a new technology may try to target those individuals who are relatively uninformed about the

technology. Proponents of the technology may try to target individuals who have informative prior beliefs for maximum effectiveness. This reasoning might explain why the Council for Biotechnology Education (a pro-GM organization) funds TV commercials but the anti-GM groups does not. Individuals who are uninformed are less likely to be watching television and might better be targeted through other means.

Second, policy makers must decide how and when to invest in verifiable information (Huffman and Tegene 2002). If budgets for information creation and dissemination are limited, it might be best to target individuals who have informed prior beliefs, because they are more likely to respond to pro-biotechnology than to third-party, verifiable information. In this study we have used a relatively blunt measure of prior beliefs about genetic modification; future research might examine the effect of varying strengths of pro-biotechnology and anti-biotechnology prior beliefs.

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Table 1. Response of participants to the pre-experiment question of "How informed are you about genetic modification?" (N = 172)

Category	**Relative frequency** (%)
Extremely Well Informed	3.5
Well Informed	5.8
Somewhat Informed	32.6
Not Very Informed	40.1
Not Informed at All	15.7
I don't Know	2.3

Source: Pre-auction questionnaires

Table 2. Characteristics of the Auction Participants (N = 172)

Variable	Definition	Mean	St. Dev.
Gender	1 if female	0.62	0.49
Age	The participant's age	49.5	17.5
Married	1 if the individual is married	0.67	0.47
Education	Years of schooling	14.54	2.25
Household	Number of people in participant's household	2.78	1.65
Income	The households income level (in thousands)	57.0	32.6
White	1 if participant is white	0.90	0.30

Table 3. Mean bids for participants by commodity

A. Mean bids—all participants and treatments (N=172)

	mean bid	standard deviation	Median	Minimum	Maximum
GM OIL	0.91	0.84	0.75	0	3.99
OIL	1.05	0.85	1.00	0	3.79
GM CHIPS	0.93	0.86	0.70	0	3.99
CHIPS	1.08	0.85	0.99	0	4.99
GM POTATOES	0.78	0.67	0.69	0	3
POTATOES	0.91	0.67	0.80	0	3.89

B. Mean bids for participants who had informed prior beliefs about genetic modification (N=72)

	mean bid	standard deviation	Median	Minimum	Maximum
GM OIL	0.93	0.88	0.77	0	3.99
OIL	1.10	0.89	1.00	0	3.79
GM CHIPS	0.86	0.81	0.75	0	3.50
CHIPS	1.05	0.74	1.00	0	2.99
GM POTATOES	0.73	0.61	0.75	0	2.30
POTATOES	0.92	0.59	0.88	0	2.00

C. Mean bids for participants who had uninformed prior beliefs about genetic modification (N=100)

	mean bid	standard deviation	Median	Minimum	Maximum
GM OIL	0.90	0.82	0.68	0	3.25
OIL	1.01	0.82	0.99	0	3.29
GM CHIPS	0.97	0.90	0.69	0	3.99
CHIPS	1.10	0.92	0.99	0	4.99
GM POTATOES	0.81	0.72	0.60	0	3.00
POTATOES	0.90	0.73	0.75	0	3.89

Table 4. Mean difference in bid prices of participants for GM-labeled and plain-labeled food products due to information from interested parties, given prior beliefs

Part A: Participants who did not receive verifiable information

Information Treatments	Vegetable Oil	Tortilla Chips	Potatoes
Received only pro-biotechnology information, given informed priors (N=13)	-$0.10	$0.11	$0.02
Received only pro-biotechnology GM- information, given uninformed priors (N=17)	$0.03	$0.00	-$0.08
Received only anti-biotechnology GM-information, given informed priors (N=8)	$0.50	$0.61	$0.52
Received only anti-biotechnology GM-information, given uninformed priors (N=21)	$0.34	$0.37	$0.32
Received pro-biotechnology and anti-biotechnology GM-information, given informed priors (N=10)	$0.51	$0.29	$0.40
Received pro-biotechnology and anti-biotechnology GM-information, given uninformed priors (N=18)	$0.00	$0.01	$0.07

Part B: Participants who received verifiable information

Information treatment	Vegetable Oil	Tortilla Chips	Potatoes
Received pro-biotechnology and verifiable GM-information, given informed priors (N=14)	$0.13	$0.09	$0.07
Received pro-biotechnology and verifiable GM-information, given uninformed priors (N=14)	-$0.09	$0.07	-$0.05
Received anti-biotechnology and verifiable GM-information, given informed priors (N=13)	$0.07	$0.10	$0.20
Received anti-biotechnology and verifiable GM-information, given uninformed priors (N=16)	$0.29	$0.33	$0.26
Received pro-biotechnology, anti-biotechnology and verifiable GM- information, given informed priors (N=14)	$0.16	$0.10	$0.10
Received pro-biotechnology, anti-biotechnology and verifiable information, given uninformed priors (N=14)	$0.03	-$0.08	-$0.06

Table 5. Do the informed and uninformed bid differently? Test of null hypothesis that difference in mean bid price differences for GM- and plain-labeled food items is zero for informed and uninformed participants

Part A. Participants who did not receive verifiable information

Information Treatments	Vegetable Oil	Tortilla Chips	Potatoes
Received pro-biotechnology GM-information only (N=30)	t = 0.67 p = 0.51	t = -0.92 p = 0.37	t = -0.55 p = 0.59
Received anti-biotechnology GM-information only (N=29)	t = -0.61 p = 0.54	t = -0.92 p = 0.36	t = -0.99 p = 0.33
Received both pro-biotechnology and anti-biotechnology GM-information (N=28)	t = -1.83 p = 0.08	t = -1.94 p = 0.06	t = -2.22 p = 0.04

Part B. Participants who received verifiable information

Information Treatments	Vegetable Oil	Tortilla Chips	Potatoes
Received pro-biotechnology and verifiable GM-information (N=28)	t = -1.85 p = 0.08	t = -0.15 p = 0.89	t = -1.45 p = 0.16
Received anti-biotechnology and verifiable GM-information (N=29)	t = 0.87 p = 0.39	t = 0.92 p = 0.36	t = 0.36 p = 0.71
Received pro-biotechnology, anti-biotechnology, and verifiable GM- information (N=28)	t = -0.93 p = 0.36	t = -2.00 p = 0.06	t = -1.66 p = 0.11

Table 6. Results for difference-in-differences estimator when participants did not receive verifiable information: Null hypothesis that difference in bid prices for GM- and plain-labeled food items under different information treatments is zero, given participants' prior beliefs

A. Participants whose prior beliefs were uninformed about genetic modification			
Information Treatments	**Vegetable Oil**	**Tortilla Chips**	**Potatoes**
Received only pro-biotechnology GM-information versus received only anti-biotechnology GM information.	t = 2.11 p = 0.04	t = 2.71 p = 0.01	t = 3.53 p = 0.00
Received only pro-biotechnology GM-information versus received pro-biotechnology and anti-biotechnology GM-information.	t = 0.20 p = 0.84	t = -0.04 p = 0.97	t = -1.96 p = 0.06
Received only anti-biotechnology GM-information versus received pro-biotechnology and anti-biotechnology GM-information.	t = 2.03 p = 0.05	t = 2.68 p = 0.01	t = 2.26 p = 0.03
B. Participants who had informed prior beliefs about genetic modification			
	Vegetable Oil	**Tortilla Chips**	**Potatoes**
Received only pro-biotechnology GM-information versus received only anti-biotechnology GM-information.	t = 1.78 p = 0.09	t = 1.76 p = 0.09	t = 1.72 p = 0.10
Received only pro-biotechnology GM-information versus received pro-biotechnology and anti-biotechnology GM-information.	t = -1.76 p = 0.09	t = -0.96 p = 0.35	t = -1.45 p = 0.16
Received only anti-biotechnology GM-information versus received pro-biotechnology and anti-biotechnology GM-information.	t = -0.02 p = 0.98	t = 0.98 p = 0.34	t = 0.43 p = 0.68

Table 7. Results for differences-in-differences estimator when participants received verifiable information: Null hypothesis that difference in bid prices for GM- and plain-labeled food items under different information treatments is zero, given participants' prior beliefs.

A. Participants who had uninformed prior beliefs about genetic modification

Information Treatments	Vegetable Oil	Tortilla Chips	Potatoes
Bid prices when received pro-biotechnology and verifiable GM-information versus bids when received anti-biotechnology and verifiable GM-information.	t = 1.53 p = 0.14	t = 1.22 p = 0.23	t = 1.99 p = 0.06
Bids when received pro-biotechnology and verifiable GM-information versus bids when received pro-biotechnology, anti-biotechnology, and verifiable GM-information.	t = -0.93 p = 0.36	t = 1.37 p = 0.18	t = 0.16 p = 0.87
Bids when received anti-biotechnology and verifiable GM-information versus bids when received pro-biotechnology, anti-biotechnology, and verifiable GM-information.	t = 0.99 p = 0.33	t = 1.95 p = 0.06	t = 1.98 p = 0.06

B. Participants who had informed prior beliefs about genetic modification

Information Treatments	Vegetable Oil	Tortilla Chips	Potatoes
Bids when received pro-biotechnology and verifiable GM-information versus bids when received anti-biotechnology and verifiable GM-information.	t = -0.55 p = 0.58	t = 0.03 p = 0.97	t = 1.13 p = 0.27
Bids when received pro-biotechnology and verifiable GM-information versus bids when received pro-biotechnology, anti-biotechnology, and verifiable GM-information.	t = -0.25 p = 0.80	t = -0.03 p = 0.98	t = -0.42 p = 0.68
Bids when received anti-biotechnology and verifiable GM-information versus bids when received pro-biotechnology, anti-biotechnology, and verifiable GM-information.	t = -0.89 p = 0.38	t = 0.02 p = 0.98	t = 0.78 p = 0.44

Appendix A. Demographic Characteristics of Polk County, IA (including Des Moines area) and Ramsey County, MN (including St. Paul area)

Variable	Definition	Polk	Ramsey	Average
Gender	1 if female	0.52	0.52	0.52
Age	Median age	45.7	45.7	45.7
Married	1 if the individual is married *	59.5	51.4	55.5
Education	Years of schooling **	13.52	13.76	13.64
Income	The median households income level (in thousands)	46.1	45.7	45.9
White	1 if participant is white	0.9	0.8	0.85

Note: All variables are for individuals of all ages, except for Married, which is for individuals 18 or older, Education, which is for individuals 25 or older, and age, which is for individuals 20 or older.

* The estimate of the number of married people who are 18 or older was obtained by taking the number of people married over 15 and assuming that the number of people were married at ages 15, 16, and 17 were zero – this gives the percentage of people who are married who are 18 or older.

** The years of schooling was estimated by placing a value of 8 for those who have not completed 9^{th} grade, 10.5 for those who have not completed high school, 12 for those who have completed high school but have had no college, 13.5 for those with some college but no degree, 14 for those with an associate's degree, 16 for those with a bachelor's degree, and 18 for those with a graduate or professional degree.