Label position and its impacts on WTP for products containing GMO

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Many important product attributes in the food industry cannot be evaluated by consumers before purchase. For experience goods, consumers are able to learn about the product attributes when they consume the good. The presence of other attributes, however, cannot be detected by consumers, even if they have had the opportunity to consume the food product. These goods are known as credence goods (Darby and Karni, 1973), and the inability of consumers to judge the quality of these goods leads to problems of informational asymmetry between the producer and the consumer. Animal welfare attributes, organic production, and the presence of genetically modified ingredients are all examples of credence attributes.

Food labeling plays an important role in providing information about experience and credence goods to consumers in the marketplace. Labels are used as informational tools, to verify production techniques, and as quality signals. However, these labels can be confusing and may mislead consumers (Hawley et al., 2012), or may simply be overlooked (Bialkova et al., 2013; Cantor et al., 2015). Research has been conducted to identify attributes of labels that increase their effectiveness (Graham et al., 2012; Hodgkins et al., 2012); the upshot is that these same attributes may be used strategically by food manufacturers or policy makers to decrease the probability that consumers pay attention to or even see product information that firms are required by law to provide, but which may decrease demand for the product.

Recent legislation on the labeling of food products containing genetically modified (GM) ingredients may reflect this motive. In 2016, The U.S. Federal Government passed a mandatory labeling law for GM products, which requires companies to provide access to information about GM ingredients in their products by printing 800 numbers or QR codes on product packaging. Just prior to the enactment of this federal law, many food manufacturers had begun providing GM information in ingredients lists in response to a mandatory labeling law passed in Vermont,

which went into effect July 1, 2016. The Vermont bill required processed foods containing GM ingredients to be labeled that they were produced or partially produced with "genetic engineering." Therefore, for a brief period of time, some consumers already had access to GM information on processed foods. While the mandatory labeling law in Vermont gave producers latitude to indicate the presence of GM content on any side of the product, the federal legislation introduces a barrier to consumer acquisition of information by only providing access to GM information through a telephone call or use of the internet.

These labeling laws may have been written to allow companies to shroud product information that could be viewed by consumers as controversial or negative (Gabaix and Laibson, 2006). Making the information harder to access would contravene the principles of providing full information to consumers that proponents of legislation requiring GM labeling desired. Controversy surrounding the safety and ethics of GM technology may have played a role in the details of the bill passed by Congress, which, while nominally providing information on GM ingredients to consumers, is implemented in a way that introduces search costs.

If food manufacturers perceive that a GM label is a negative attribute, they have incentive to de-emphasize that information by placing the labels on the side or back of products. Research on the efficacy of nutritional labels suggests that consumers are more responsive to information on the front of labels than to information on the side or back. Becker et al. (2015) found that front of package labeling is more effective at attracting attention and suggested that consumers notice front labels more quickly than back labels. This result is similar to previous literature that found labels on the front of packages to be more noticeable than the traditional labeling on the side panel (Alexander and Hazel, 2008; Feunekes et al., 2008; Ducrot et al., 2015).

The overall objectives of this research are to examine 1) the consequences of information placement on consumer product valuation, and 2) signaling effects arising from information being provided on front vs. back labels. We achieve the first goal by examining consumers' valuation of food items that do and do not contain GM ingredients in an experimental Becker-DeGroot-Marschak (BDM) auction when that information is provided on front of package versus back of package labels under natural information search conditions. We address the second goal by prompting all participants to engage in information search after a set number of valuation rounds.

Literature Review

Foods produced with GM technology have been available in U.S. grocery stores since 1996. Until recently, and despite the fact that the use of GM technology has been opposed by certain segments of society, U.S. consumers have not had direct access to information on whether or not products contain GM ingredients. Food manufacturers have had the option to voluntarily label products, which led to the development of labels indicating a lack of GM products (for instance, the Non-GMO Project, which is also an advocacy group, has been a major source of voluntary GM-free labels). Since GM ingredients are a credence attribute, it is impossible for consumers to judge whether a product is produced with the use of biotechnology or genetic engineering (Dannenberg et al., 2011) solely based on taste and appearance.

A significant literature has arisen around the issue of consumer attitudes towards and preferences for GM technology. From the beginning, researchers noted that consumer acceptance was critical for the development and use of genetic modification in food production (Frewer, Howard, and Aaron, 1998), and myriad of papers have examined differences in consumer

valuation and heterogeneity in response to information and labeling about GM foods (e.g., Hobbs and Plunkett, 1999; Lusk and Fox, 2002; Huffman et al., 2003; Rousu et al., 2004; Noussair et al., 2004; Kiesel et al., 2005; Rousu et al., 2007; Dannenberg et al., 2011; Costanigro and Lusk, 2014; Lewis et al., 2016); differences in consumer preferences within countries (Boccaletti and Moro, 2000; Burton et al., 2001; Noussair et al., 2002); and from one country to another (Lusk et al., 2003; Lusk et al., 2006). The reason for and method of modifying products has also been found to make a difference (Lusk et al., 2001; Burton and Pearse, 2002; Rousu et al., 2005; Kaneko and Chern, 2005; Roe and Teisl, 2007; Colson et al., 2011), with recent attention paid to responses to GM products in developing countries that could benefit importantly from both producer and consumer-oriented GM products (Kimenju and DeGroote, 2008; Kushwaha et al., 2008; Gonzalez et al., 2009). Most recently, researchers have begun to investigate linkages between education, knowledge about GM, and consumer attitudes towards GM (Wunderlich and Gatto, 2015; McFadden and Lusk, 2016).

Although there is extensive evidence that a substantial group of consumers is concerned about GM technology in food—even in the U.S.—there is little evidence collected under real-world conditions to suggest what effect a labeling system would have on consumer behavior (see, however, Kiesel et al. (2005) on rBST milk and labeling). As pointed out by Hu et al. (2006), giving consumers access to information about GM foods is not the same as guaranteeing exposure to the information, even for consumers who access to information.

Placement of information or labels influences the likelihood that a consumer will see the information. A study using high-resolution eye tracking examined how consumers respond to actual packages with and without Front of Pack (FOP) nutrition labels (Becker et al., 2015; Graham et al., 2015). The study found that FOP labels were more effective in attracting

consumers' attention to nutritional information. When compared to the traditional nutrition fact panel, the simplified FOP information was favored and better understood by consumers (Grunert & Wills, 2007; Van Kleef et al., 2008). Crosetto et al. (2016) find that the benefits of FOP labels are especially pronounced in an experiment in which participants made food choices under a time constraint (compared to no time constraint), a condition that likely reflects real world shopping conditions. While Berning and Roe (2017) find that most consumers have access to the technology required to obtain information provided by the National Bioengineered Food Disclosure Standard of 2016, the results of Crosetto et al. (2016) raise questions about how accessible the information will be to most shoppers.

Data and Methods

During March and April of 2017, shoppers at two local grocery stores in Lincoln, Nebraska were recruited to participate in a valuation experiment based on the Becker-DeGroot-Marschak (BDM) mechanism (Becker et al., 1964). Shoppers were approached about participating in the research upon entering the store and received a $10 gift card in compensation for their time. A total of 300 shoppers participated in the experiment and completed a follow-up survey collecting demographic data, attitudes towards GM foods, and a measure of objective GM knowledge. Table 1 reports the demographic variables of the participant sample. Women comprised 48% of the sample, which is slightly lower than the percentage of females in Lincoln, NE in 2015 of 49.9% (American Community Survey, 2015). The mean age of participants (38.9 years old) was slightly higher than the mean age in Lincoln, Nebraska, which is 35.5 years (American Community Survey, 2015), which could be due in part to an exclusion criterion that participants needed to be at least 19 years of age. The average household income was $58,230, which is

slightly higher than the average household income in Lincoln, which was $51,503 in 2015 (American Community Survey, 2015).

The BDM auction was structured so that participants completed six rounds of bidding on products. In each round, participants bid on two products, resulting in bids on a total of 12 items. Each round included a pair of closely related products, one of which was GM-free and one of which contained a GM ingredient (Table 2). The products used in the experiment are familiar consumer products, including common brands of breakfast cereals and potato chips, and cookies baked in-store.[1] The product that contained a GM ingredient either had a front label or a back label. Each participant was randomly placed in a front label or back label condition; therefore, they would have access to the GM information only on the front or the back of a product for all rounds.

The BDM auction was used in order to provide an incentive for each participant to honestly report the most they were willing to pay for each product. At the completion of the six rounds, the computer randomly chose a binding round and product as well as a randomly drawn price. If the participant's bidding price was lower than the random price they did not buy the product. If the participant's bid price exceeded the "random price", they would purchase the product for the randomly drawn price.

The second objective was addressed by including a trigger question after the third round of valuation. The trigger question asked participants to report which product in the previous round contained GM ingredients. Participants were then presented with the remaining three rounds of products. We included the trigger question to draw all participants' attention to the fact

[1] Products were chosen based on the availability in the stores and were among frequently sold items.

that there was information about GM ingredients available in the event that they had not noticed the information.

Results

Preliminary results find WTP for chips and cookies to be less than cereal, by $0.74 and $2.16, respectively. No differences were found in WTP for products that contained GM labels either on the front of the package or the back of the package compared to products that did not contain GM ingredients and therefore had no label. Only 22% of respondents (67 out of 300), correctly answered the label trigger question. Interestingly, after the prompt, WTP decreased by $0.27. This could be due to the fact that the signal alerted consumers of the potential for GM containing products and they responded with lower prices, even though they did not differentiate between products.

Future research will examine the impacts of knowledge about GM products and participant demographics on WTP for the GM labels. Preliminary results suggest a relationship between the duration of time spent on the round and consumers' WTP.

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Table 1: Characteristics of survey respondents (n=300)

Variable	Definition	Mean	Min	Max	SD
Age	Age in years	38.93	19	69	12.91
Gender	1 if female; 0 otherwise	0.48			0.50
Income[a]	Annual household Income in $1000s	58.23	10	18	33.23
Education[b]	Average years of education	14.73	10	110	2.19
PShopper	1 if primary shopper for food; 0 otherwise	0.71			

[a] Categorical incomes were averaged using the average mean within a category

[b] While categorical education levels were asked, averages were used based on the category

Table 2: Food Products

Product Type[a]	Description	Food Type
Cookies	Chocolate Chips	GM[b]
	Snicker Doodle	Non - GM
	Sugar	Non - GM
	Peanut Butter	GM
Cereals	Whole wheat	Non - GM
	Whole wheat Flakes	GM
	Toasted Oats	Non - GM
	Toasted Oat grains	GM
Chips	Potato chips	Non - GM
	Flavored potato chips	GM
	Thin Sliced Potato Crisps	Non - GM
	Flavored Thin sliced Potato Crisps	GM

[a]All cookies were non-branded store cookies, while Cereals and Chips were branded products.
[b]GM (Genetically Modified Ingredients)

Table 3: Regression Results WTP for Chips, Cereals and Cookies

	Estimate	Std. Error	
(Intercept)	2.98	0.06	***
Round	0.05	0.03	*
Chips	-0.74	0.05	***
Cookies	-2.16	0.03	***
Back Label	0.01	0.04	
Front Label	-0.01	0.03	
AfterPrompt	-0.27	0.09	***

Adjusted Rsq. = 0.48, n=3,596

* Indicates 10% significance level, ** indicates 5% significance level, and *** indicates 1% significance level