The signaling effect of mandatory labels on genetically engineered food

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ABSTRACT

It has been suggested that the adoption of mandatory labeling for genetically engineered food might send a signal to consumers that foods produced with biotechnology are unsafe or should be avoided. To date, however, there is little empirical evidence to substantiate this claim. This paper utilized data from two studies to explore whether consumers exposed to labels on genetically engineered foods expressed greater aversion to genetic engineering than consumers in control groups, who were exposed to decoy labels unrelated to the technology. We find little evidence of a signaling effect resulting from the mere exposure to labels. However, in Study 1, we find signaling operating in another fashion: there were stark differences in the implied willingness-to-pay to avoid genetically engineered foods when consumers were exposed to mandatory "contains" labels vs. voluntary "does not contain" labels. In study 1, we also find aversion to a non-GE technology – ethylene ripening – that is comparable to aversion to biotechnology.

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Introduction

Ballot initiatives in California and Washington in 2012 and 2013 have re-ignited the debate over mandatory labeling of foods containing genetically engineered (GE) ingredients in the United States. Although the GE food labeling initiatives in these states failed, legislatures in Connecticut and Maine have recently passed mandatory labeling laws that will go into effect if a threshold number of other states pass similar measures, and in 2014 Vermont was the first state in the U.S. to pass an outright mandatory GE food labeling law. It appears the debate has just begun. The organization "*Just Label It*" coordinates groups aiming to pass mandatory labeling in at least 30 U.S. states, while groups such as Grocery Manufacturers Association and the American Farm Bureau have supported a newly introduced federal bill, the "Safe and Accurate Food Labeling Act" which would preempt state-level mandatory initiatives and reassert the authority of the Food and Drug Administration to determine whether mandatory labeling is required.

These current events have served to open up old empirical and conceptual arguments about the potential effects of mandatory GE labeling. Advocates of labeling point to a "right to know" argument and highlight the popularity of labeling in opinion polls (Pino, 2012; Boxer, 2012). They also tend to argue that the costs of adding

a labeling represent a trivial expense relative to typical labeling changes that food companies routinely incur. Opponents of labeling tend to consider the dynamic effects of such a policy on firm-level decision making. A mandatory label might cause firms to eschew GE ingredients, switch to non-GE ingredients, and drive up costs in the process (Alston and Sumner, 2012; Carter et al., 2012). The example of the European Union seems to support the argument that companies will substitute away from GE food if labels are mandatory (Carter et al., 2012).

A more subtle argument made by some opponents of GE labeling relates to the potential signaling effect of the label. In most economic models (e.g., Crespi and Marette, 2003; Fulton and Giannakas, 2004; Giannakas and Fulton, 2002; Lapan and Moschini, 2004; Lence and Hayes, 2005) and empirical analyses (Hu et al., 2005; Lusk et al., 2005b; Rousu et al., 2004) on the topic, a GE label simply serves as an identifier, which is used by consumers to select the product they most prefer, given labeling costs and relative prices. In these models, preferences for GE vs. non-GE foods are fixed. They are assumed exogenous to whatever labeling policy is in place. Some academic research has questioned this assumption. For example, Artuso (2003) constructed a conceptual model in which the addition of a mandatory label sends a signal about the relative safety of GE food, and Lusk and Rozan (2008) provided some empirical support for the supposition. If labels are signals, they not only sort consumers according to their relative willingness-to-pay, the labels potentially shift preferences, and change the resulting welfare consequences of the policy.

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Although there is, to date, relatively little empirical support for the labels-as-signals hypothesis, the signaling arguments seem to have gained traction among many GE labeling opponents. For example, the chemical and biotechnology company Monsanto (2013) argued that "mandatory labeling could imply that food products containing these ingredients are somehow inferior to their conventional or organic counterparts." Of course, such arguments could be dismissed since they arise from self-interest. However, major scientific organizations such as the American Association for the Advancement of Science (2012) have also asserted that "Legally mandating such a label can only serve to mislead and falsely alarm consumers." Cass Sunstein, University of Chicago Law Professor and former head of the White House Office of Management and Budget's Office of Information and Regulatory Affairs for President Obama, similarly asserted that (2013): "GM labels may well mislead and alarm consumers, especially (though not only) if the government requires them. Any such requirement would inevitably lead many consumers to suspect that public officials, including scientists, believe that something is wrong with GM foods – and perhaps that they pose a health risk." Such an effect would be problematic because, as Sunstein (2013) notes, most major scientific organizations have actually argued that foods produced through genetic engineering are no riskier than foods produced through conventional breeding techniques.

Despite these conceptual arguments, there is relatively little empirical research on the potential signaling effects of mandatory GE labels. However, the research that does exist suggests that a signaling effect might well exist. Lusk and Rozan (2008) found that consumers who believe a mandatory GE labeling policy exists are also more likely to believe GE food is unsafe to eat; however, their approach leaves some doubt as to whether the relationship is causal. Kanter et al. (2009) present experimental evidence that organic and non-rBST labeling in milk sends a signal about the relative desirability of conventional milk; the mere presence of organic milk serves to reduce willingness-to-pay for conventional milk. Hu et al. (2006) present survey evidence and Liaukonyte et al. (2013) present experimental evidence that adding a "contains" label generates different willingness-to-pay values than adding a "does not contain" label; these different labels appear to send different signals about the quality of the unlabeled food.

This paper aims to more definitively ascertain the potential signaling effect of GE labels. Two studies are conducted in which we compare treatment groups (exposed to GE labels) to control groups (exposed to other labels unrelated to GE content) in terms of subsequent stated risk perceptions and willingness-to-pay to avoid GE food. The two studies are used to provide a more robust investigation into the issue, and to determine the extent to which choice of products (apples, a fresh fruit vs. Cheerios, a processed food) and design issues (making active choices vs. simply visually evaluating labels) affects how GE labels influence beliefs about the safety of GE food. To the extent that similar results are found across study 1 and study 2, we can be more confident in the overall finding.

The first study entails consumers making choices between apples that have, depending on the treatment, "does not contain" or "contains" GE labels, in addition to a control group where consumers are instead shown labels indicating whether the apples have been ripened with ethylene. We find little evidence to suggest that the mere exposure to GE labels in decision making tasks alters subsequent appraisals of the safety or desirability of GE foods relative to people exposed to ethylene labels. However, analyzing the choices people actually made, we corroborate the results of Hu et al. (2006) and Liaukonyte et al. (2013), finding evidence that the implied willingness-to-pay to avoid GE is about 140% higher in the presence of mandatory "contains GE" labels than in the presence of voluntary "does not contain" GE labels. Interestingly, aversion to the "decoy" attribute, ethylene ripening in apples, is as great as aversion to GE food.

In study 2, respondents are shown a picture of a box of Cheerios that either does or does not contain a claim about GE content, and are asked to click on the area of the box that is most and least desirable. There was no significant difference in subsequent appraisals of the safety or desirability of GE foods among people who had seen a Cheerio box with a GE label as compared to people who had seen a Cheerio box without a GE label.

The next section describes the methods and procedures for Study 1, which is followed by the results of that study. Then we present the methods, procedures, and results for Study 2. The last section concludes.

Study 1

Overview

Study 1 consists of a between-subject design with two treatments and one control group. Data were collected from responses to online questionnaires. Participants were recruited by the online survey software provider, Qualtrics, and their associated partners, and were randomly assigned to one of three groups. In total, 647 subjects participated in study 1, with 213 randomly assigned to the control, 217 randomly assigned to Treatment 1, and 217 randomly assigned to Treatment 2. The sample was almost perfectly split between males and females, and there was adequate representation across all age categories: 15% were between 18 and 26 years old, 27% were between 25 and 34 years old, 16% were between 35 and 44 years old, 19% were between 45 and 54 years old, 15% were between 55 and 64 years old, and 8% were 65 years or older. About 45% of the sample had attained a bachelor's degree from a university or college. There were no significant differences across the treatments with respect to these demographic variables.

Methods

Study 1 entailed an examination of whether exposure to GE labels in market-like choices subsequently affected beliefs about the safety of GE foods. If the idea is that if the presence of GE labels sends a signal about relative safety and quality, then exposure to GE labels should affect subsequent safety and quality evaluations.

After reading a statement about rights as human subjects involved in research, participants proceeded to answer eight choice questions. For each question, subjects indicated which of two apples they preferred. The eight questions varied according to the prices of the apples ($1.40/lb or $2.80/lb), the color of the apples (Red or Green), the presence or absence of damage (bruised nor not bruised), and the presence or absence of a technology label. Attribute levels varied across options so that the level or presence/absence of each attribute is uncorrelated with the level or presence/absence of other attributes within and across choice options.

The treatments varied according to which technology label was utilized in the choice experiment. As shown in Fig. 1, the control utilized the technology "ripened with ethylene"; we were not interested in the technology *per se*, but rather it is a "decoy" attribute.[1] Treatment 1 utilized a "contains" labeling similar to what

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[1] The identifying assumption is that signaling about GMOs, which (potentially) causes increased concern for GMOs, does not also increase concern for an unmentioned technology like ethylene. To the extent that changes in concern for GMOs and ethylene are positively correlated, we may fail to find a significant treatment effect even if signaling exists. We address this concern in two ways. First, as will be described momentarily, we use a trade-off question that forces people to indicate concern for GMOs *relative* to ethylene and other issues (i.e., all issues cannot be rated as more concerning). Second, study 2 utilizes a control in which no other technology is mentioned.