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Can information costs affect consumer choice? Nutritional labels in a supermarket experiment

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ABSTRACT

This paper investigates whether information costs under currently regulated nutritional labeling prevent consumers from making healthier food choices. We implement five nutritional shelf label treatments in a market-level experiment. These labels reduce information costs by highlighting and summarizing information available on the Nutritional Facts Panel. Following a difference-in-differences and synthetic control method approach, we analyze weekly store-level scanner data for microwave popcorn purchases from treatment and control stores. Our results suggest that consumer purchases are affected by information costs. Implemented *low calorie* and *no trans fat* labels increase sales. In contrast, implemented *low fat* labels decrease sales, suggesting that consumer response is also influenced by consumers' taste perceptions. A combination of these claims into one label treatment increases information costs and does not affect sales significantly.

1. Introduction

Existing research documents consumers' general understanding of the link between food consumption and health, and widespread interest in the provision of nutritional information on food labels (e.g. Williams, 2005; Grunert and Wills, 2007). However, consumers cannot verify this information at any point from purchase to consumption.[1] Instead, they base their product choice on beliefs arrived at by way of a labyrinth of information printed on food packages. In such markets, firms might not have an incentive to fully reveal their product quality (Bonroy and Constantos, 2008), might try to highlight certain attributes in their advertising claims while shrouding others (Gabaix and Laibson, 2006), or provide information in a less salient fashion (Chetty et al., 2007).

The Nutrition, Labeling, and Education Act (NLEA) of 1990 gave the Food and Drug Administration (FDA) the authority to require nutritional labeling for most food products. In 1994, the Nutrition Facts Panel (NFP) was implemented in order to improve consumer access to nutritional information and to promote healthy food choices. This paper uses a supermarket-level experiment to address the relationship between information costs and healthy food choices under these labeling regulations.

About 50% of consumers claim to use the NFP when making food purchasing decisions (Blitstein and Evans, 2006). Consumers trying to lose weight are more likely to read the NFP (Mandal, 2008), and NFP use can result in weight loss and a decrease in obesity (Variyam and Cawley, 2006). However, self reported consumer use of nutrition labels declined from 1995 to 2006, with the largest decline for younger age groups (20–29 years) and less educated consumers (Todd and Variyam, 2006). This decline could be a result of consumers' inability to perform quantitative tasks (Levy and Fein, 1998), and preferences for short health claims and short front label claims instead of NFP's lengthy back label explanations (e.g. Levy and Fein, 1998; Williams, 2005; Wansink, et al., 2004; Grunert and Wills, 2007).[2] Yet, simple claims, such as *low fat* labels could potentially mislead consumers and increase their caloric food intake through perceptions of an increased acceptable serving size and a reduction in consumption guilt (Wansink and Chandon, 2006), especially when combined with a positive image and suggestive health references (Geyskens et al., 2007). Conversely, perceived tradeoffs between nutritional considerations and taste preferences could prevent consumers from choosing reduced-fat

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[1] Nutritional characteristics can be defined as credence attributes. Credence attributes vary significantly from search and experience goods in that reputation and signaling can rarely be used to alleviate information asymmetries (see Nelson, 1970; Roe and Sheldon, 2007).

[2] Looking at GMO claims, Roe and Teisl (2007) found that simple claims are viewed as most accurate, and labels certified by the FDA and, in some cases, USDA are perceived as more credible than third party and consumer organization certification.

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alternatives if they are labeled as such (Yeomans et al., 2001; Stubenitsky et al., 2000, and French et al., 1999).

The limited number of market-level empirical studies exhibits mixed results regarding consumer use of nutritional information. Displaying lists of information on vitamins and minerals as well as sugar content in supermarkets resulted in increased nutritional information use (Russo et al., 1986), and voluntary labels had significant effects on consumer choices prior to the NLEA (Ippolito and Mathios, 1990). Still, Mojduszka and Caswell (2000) argue that information provided by firms voluntarily prior to the NLEA was incomplete and not reliable. Mathios (2000) finds that mandatory guidelines resulted in a significant decline in sales of high fat products, despite prior voluntary disclosure of low-fat products, and Teisl et al. (2001) find that consumer behavior was significantly altered by the NLEA, but purchases of "healthy" products increased only in some of the product categories.

Less attention has been paid to interdependencies of regulation and alternative information sources in these studies. This is important because experimental research (Cain, et al., 2005) suggests that people do not sufficiently take motives of the information source into account when evaluating information, even after disclosure of conflicts of interest. In this context, Ippolito and Pappalardo (2002) suggest that regulatory rules and enforcement policy induced firms to move away from reinforcing nutritional claims. Critical news coverage of regulatory challenges (Nestle, 2000), and the "Food News Blues" in general (Kantrowitz and Kalb, 2006) could have also contributed to decreased labeling use over time.

Our experimental design adds to this literature by focusing on information costs under current NFP labeling. Conducting our experiment in a real market setting eliminates possible bias generated in hypothetical experiments and survey responses, and controls for potential confounding factors such as marketing claims and media coverage.

We implemented nutritional shelf labels for one product category (microwave popcorn) in cooperation with a major supermarket chain in five treatment stores over a period of four weeks. The supermarket chain also provided store-level scanner data for a total of 32 stores, covering a time period before and after our labeling implementation. Our collected NFP information indicated substantial variation in nutrient content and suggested serving size across products included in the data. Consumers trying to compare products based on their nutritional characteristics might therefore face significant information costs. We reduce information costs by either repeating or summarizing NFP information and providing it a new format. Using *low calorie*, *low fat*, and *no trans fat* claims, we address the following questions: (i) Are consumer purchases affected by nutritional shelf labels? (ii) Do effects differ depending on nutrients displayed (e.g. calories versus fat content)? (iii) Do effects depend on disclosure of information source (FDA)? (iv) Do effects differ depending on display of a single versus multiple nutrients on a label? and (v) Do we find evidence consistent with consumers making inferences about the nutritional content of unlabeled products?

Following a difference-in-differences and synthetic control method approach, we find results consistent with information costs mattering and conclude that nutritional information is not provided effectively under current labeling guidelines. In particular, we find that a shelf label of *no trans fat* significantly increases sales of treated products, even though this information is already provided in a less uniform format. *Low calorie* labels also significantly increase sales of treated products. *Low fat* labels, on the other hand, significantly reduce quantity sales of targeted products, especially when adding an FDA approval to our labeling treatments. We attribute this effect to consumers having less favorable taste perceptions of *low fat* foods than of *low calorie* foods. When combining claims in a single label, we do not detect significant purchase responses because this treatment increases information costs for the consumer. Finally, we find no consistent evidence that consumers make inferences about unlabeled products and their relatively inferior nutritional quality. The synthetic control method further detects the largest labeling effect immediately following our initial implementation. Labeling effects dissipate quickly after our treatment period for the *low calorie* and *low fat* treatment, but persist for the *no trans fat* label. *No trans fat* products are highlighted in manufacturer claims and are easier to identify by consumers under the current NFP labeling.

In the next section, we describe our experimental design and the main features of our data. We introduce our empirical specification, report estimation results, and test the robustness of our findings in Section 3. In Section 4, we conclude by discussing our results and their relevance for regulatory changes.

2. The supermarket experiment

In collaboration with a major supermarket chain, we were able to design and implement nutritional shelf labels in order to make information more salient and easier to process. Our labeling treatments either repeat information already available on the NFP in a more uniform format (e.g. *no trans fat*), or transform quantitative statements into relative statements (e.g. *low fat*, *low calorie*). They reduce information costs by allowing consumers to directly compare alternatives on a relative scale within our targeted product category. If consumers already incorporated the NFP information in their purchases, our labels should not affect purchases as we are not providing additional nutritional information.[3] We implemented five differentiated labeling treatments over a period of four weeks in each of five stores, targeting microwave popcorn products.

2.1. Experimental design

The selection of microwave popcorn as the treated product category was based on a number of considerations. We had to focus our intervention on a relatively small product category that could potentially be healthy and offered enough variation in nutrients to result in sufficient variation for the implemented labeling treatments. Microwave popcorn further allows us to target a product that is appealing to families with children, as healthy or unhealthy eating patterns develop during childhood.[4] Lastly, product alternatives within this category are similar in taste and appearance across brands, allowing for cross-product comparisons in our analysis.

The information needed to construct our treatment product group was collected from the NFP displayed on all microwave popcorn varieties available at local area stores, complemented by online searches. We observed significant variation in serving size and nutrients per serving before classifying each microwave popcorn product on a categorical scale (low, medium, and high) for a certain nutrient.[5] The supermarket chain permitted positive claims only, favored a very basic design, and expressed a primary interest in fat related claims, possibly motivated by research findings suggesting that *low fat* claims increase food intake (e.g. Wansink and Chandon, 2006). We were provided with five treatment stores, but with no

[3] This statement is especially valid for the *no trans fat* treatment. For the *low fat* and *low calorie* treatment, one could argue that the ranking of products is new information. As this ranking is based on the information already provided on the NFP, we argue that we are decreasing information costs rather than providing new information.

[4] Overweight children are more likely to be overweight as adults. Successfully preventing and treating overweight children can reduce the risk of being overweight as adults and therefore help to reduce the risk of related health conditions (American Heart Association, 2008).

[5] We for instance categorized the lowest 25% of products within the overall product category of microwave popcorn as *low fat* or *low calorie*. These categories are based on the *Traffic Light Color Signpost Labeling* introduced by the Food Standards Agency in the UK in 2007 (FSA, 2007). For more details on label design and distribution of serving size and nutrients per serving targeted in our treatments see Kiesel and Villas-Boas (2009).