Demand for "Healthy" Products: False Claims in Advertising*

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Abstract

Firms often make selective or deceptive claims in their advertising. Such claims can have negative consequences for consumers, especially if consumers are not fully informed and the claims are hard to verify. This paper aims to measure the impact of such false claims on consumer demand, and to understand which type of consumer these claims primarily affect. Using a panel dataset of consumer purchases and firm advertising, we exploit the fact that four popular products settled charges raised by the Federal Trade Commission, leading to an exogenous discontinuation of the false advertising campaigns, to measure this impact. We further control for and document firm responses in terms of price and advertisement changes around the date of the settlement. Our findings indicate a significant decline in demand following the termination of the claims resulting in a 12%-67% monthly loss in revenue across the four products, which amounts to a \$0.40m-\$3.82m loss in monthly revenue. We further find that these claims primarily affect consumers who are least loyal.

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1 Introduction

Firms often have incentives to make deceptive or selective claims, especially when they can lead to an increase in demand or can prevent substitution away from their products. Examples abound in our day-to-day world: products selectively claiming to be made with whole wheat even when whole wheat is not a main ingredient; products claiming to be "all-natural" even when they contain synthetic compounds. Although regulatory bodies such as the Federal Trade Commission (FTC) exist to safeguard consumers from deception, the vast number of companies and advertisements suggests some claims are likely to go unnoticed for prolonged durations.

This paper asks what (if any) impact false claims have on consumers' purchase decisions. The extent to which such claims have an impact on demand is unclear: if consumers are completely informed or these claims are easily verifiable through search (e.g., reading the ingredient list) or experience (e.g., having consumed the product once), any additional information without product-composition change should have no impact on demand. However, claims that are hard to verify can mislead consumers.

Empirically measuring the impact of false claims is challenging for multiple reasons. First, little variation exists in whether a claim is present, because most claims accompany a product's introduction. Second, even if there is variation, for instance, a claim is introduced or removed after a certain date, these changes are likely to be endogenous and an active part of a brand's positioning strategy. To overcome these challenges, our empirical strategy uses exogenously determined claim termination as enforced by the FTC.

We exploit the fact that the FTC was investigating four products for making false health claims. These companies reached an agreement with the FTC that required a termination of the false claims on or before the publicly issued consent order. The FTC issued these agreements with an accompanying press-release statement. We use the timings of these consent orders as exogenous shocks that (a) reduced the levels of the false advertising campaigns to 0 and (b) led to widespread information diffusion, via national press coverage, about these misleading claims.

As an example, Kellogg's Frosted Mini-Wheats started making the claim in January 2008 that the cereal was "clinically shown to improve kids' attentiveness by nearly 20%" without any change in the composition of its product. On April 2009, the FTC issued a consent order that required Kellogg's to stop making these claims. For Frosted Mini-Wheats, this order implied both a discontinuation of television advertisements and a change in their front-of-the-box labeling. AP, Reuters, The Wall Street Journal, and three other news services picked up the FTC press release on that same date. Our empirical strategy is based on comparing

market shares before and after these FTC-issued public statements to give us a measure of the impact of these false claims.

Using household-level purchase data from products across four categories – Kellogg's Frosted Mini-Wheats cereal, Dannon's Activia Yogurt, Dannon's DanActive Yogurt drink, and the nutritional supplement Airborne - all of which were issued consent orders by the FTC, we find the termination of these claims led to a significant decline in demand. Because competitors as well as the impacted brand can choose to respond strategically around the date of the consent order, we further account for these responses. We find the decline in market share persists even after we control for the competitive environment, prices, and advertisements.

Our findings further indicate the misleading health claims primarily affect newcomers, and not the loyal users. For Kellogg's Frosted Mini-Wheats, for which we have a start date of the false claim, we find further evidence corroborating this heterogeneity: the sharpest decline is for those households that, prior to the start of the false claims, had not purchased the product. These consumers are likely to have been the most influenced by the new – albeit false – information presented in the advertisements and front-of-the-box packaging. We also find directional evidence that markets that received more false advertisements prior to the consent order saw sharper drops in market share.

Quantifying the economic impact of these claims, the drop in monthly revenue (compared to the peak sales prior to the consent order) ranges from \$0.40m-\$3.82m across the four brands, with Airborne and Frosted Mini-Wheats being the most affected. This finding is indicative of the extent to which the false claims contribute to each brand's revenue. A back-of-the-envelope calculation shows Frosted Mini-Wheats is likely to have gained \$105m in revenue because of the false claims - a substantial amount compared to the \$4m fund it settled to in a recent class-action lawsuit.

1.1 Contribution

Although studies have looked at the role of information on consumer decisions, the consequences of false or misleading health claims on consumer purchases has received little empirical attention. A large literature has studied the role of information, using shifts in regulatory policies. For example, Ippolito and Mathios (1990, 1995) find that after a regulatory ban on advertising health benefits was lifted, information acquisition became easier and more people were able to purchase healthier products; Dhar and Baylis (2011) find that a regulatory ban on advertising targeting children had a positive impact on reducing fast-food consumption. Jin and Leslie (2003) find that a policy change requiring restaurants to display

hygiene-quality grade cards resulted in consumers becoming more sensitive to this information. Moorman (1996) studies the influence of front-of-package information on consumers following the implementation of the Nutrition Labeling and Education Act. This literature has, to our knowledge, not focused on the impact of misleading information. Stated purchase intentions and consumer beliefs about brands making deceptive claims has been studied in lab settings, for example, Darke and Ritchie (2007), Burke et al. (1988), Dyer and Kuehl (1978), and Johar (1995). We contribute to both these streams of literature by empirically measuring the impact of false health claims, using actual purchase data.

Perhaps closest to our paper is Peltzman (1981), who studies the effects of FTC regulation on the capital market, advertising expenditure, and market share of the impacted brands. Peltzman postulates that false advertisements should affect first-time buyers rather than loyal buyers. However, data limitations at the time forced Peltzman to rely on an aggregated yearly autoregressive market share model which imposes strong assumptions on individual behavior as pointed out in Givon and Horsky (1985). On the other hand, our paper exploits within-household variation to identify heterogeneity in consumer responses. Heterogeneity in information-processing has been shown in Bronnenberg et al. (2015), who find experts in a certain category are more likely to buy the generic versions, whereas novices are more likely to buy the branded versions of an otherwise homogenous product. Our paper finds evidence supporting heterogeneity in consumers' response to misleading information, where loyal users are more likely to continue purchasing the product even after termination of the false claims.

Researchers have studied firm deception in other contexts, such as buyers being misled by sellers' quality claims in the baseball-card market (Jin and Kato 2006) and ski resorts deceptively reporting more snowfall on weekends when demand is likely to be more (Zinman and Zitzewitz 2013). Unlike these studies, which focus on experience goods where quality is observed post purchase, our work focuses on products with credence attributes, where the claims are difficult to verify even with repeated purchases. Our paper is also related to the product-recall literature (e.g., Liu and Shankar 2015). Whereas product recalls are in effect when the product presents a tangible danger to consumers, we study a very different effect whereby the product is not harmful per se. In other words, the product is safe to consume and continues to be sold, and only the specific false advertising messages have been recalled.

In the next section, we describe the data and provide reduced-form evidence on the impact of misleading claims on consumer demand. In Section 3, we describe the demand estimation that controls for prices, advertisements, and the competitive environment to quantify the impact of these misleading claims. Section 4 describes the results, Section 5 documents firm responses in terms of price and advertisement changes around the date of the consent order,

and Section 6 concludes.

2 Data

We use the Nielsen Homescan data, which contains households' purchases at the UPC-date level, the RMS data, which contains the weekly price at the UPC-store level for participating retailers, and the Nielsen Media data, which contain the ad-spend, airtime, and frequency of campaigns at the creative-title level for each brand. The Homescan data consist of a panel of about 40,000-60,000 households. Both the Homescan and Media data span the years 2004-2012, whereas the RMS data span 2006-2012.

We combine these data with the dates the FTC issued consent orders pertaining to various companies in the Ready To Eat (RTE) cereal, yogurt, yogurt-drink, and nutritional supplements categories. The relevant population of firms affected by the FTC consent orders can be found on the FTC website[1] and consists of cases and proceedings classified under the mission of Consumer Protection and the topic of Health Claims. As of August 2015, a total of 135 such cases existed. We restrict our attention to four of these cases based on the following inclusion criteria (the number in parentheses pertain to the number of cases that do not meet the listed criteria): 1. The cases should not pertain to internet scams or products sold only online (54) 2. The case-filing date should be after 2003 and before 2012 to be within the timeframe of the Homescan data (39) 3. The cases should involve consumer product goods (e.g., insurance, tanning services etc. were excluded) and be present in the Nielsen products file (22) 4. The total number of observations across households and months should be at least 1,000, to ensure statistically meaningful measures (16). This leaves us with four well-established products that are sold in retail stores.[2] Table 1 lists these products, the claims they were making, and the date they were asked to terminate these claims. Figure 1 shows the front-of-the-package claims highlighted on these products prior to the FTC consent order.

[1] http://www.ftc.gov/enforcement/cases-proceedings/advanced-search

[2] A large portion of FTC cases (over 30%) pertain to weight-loss products. Cawley et al. (2013) study this category, where deception is common and the products are ineffective and often harmful, using the National Consumer Survey to obtain measures of consumption and deceptive ad exposure. Instead, we focus on popular and well-established products for which deception is less-common (note the distinction between deception and puffery which is more common and legal) and products cater to the mass-market.

Table 1: Products asked to terminate misleading claims by the FTC

Product	Category	Claim	Consent Order
Kel Mini-Wheats	RTE cereal	improve kids' attentiveness by 18%	April 2009
Dannon Activia	Yogurt	help with slow intestinal transit	Dec 2010
Dannon Dan Active	Yogurt drink	helps strengthen your body's defenses	Dec 2010
Airborne	Supplement	offers guaranteed cold-fighting protection	Aug 2008

Figure 1: Front-of-the-Package Labels of Products Containing the False Claims

The FTC typically conducts a private investigation of firms' claims prior to the release of the formal and public complaint. The FTC does not disclose the start date of the investigation. While the firm is made aware of this investigation, consumers and members of the press have no knowledge of it. Thus, the informational impact of the termination notice occurs only after the date of the consent order. However, firms can choose to make changes (for the better) to their marketing activities prior to the announcement. We verify that normal advertising activities do not cease following the FTC order, i.e., the brand replaces the false ads with other ads, ensuring that our measure is one of false claims and not overall ad-exposure. We explore this further in Section 5.

We now provide some preliminary evidence in Sections 2.1 and 2.2 that false claims may have an impact on consumer demand.

2.1 Reduced-Form Evidence: Market shares

Figures 2 - 4 plot the aggregate market shares over time of the impacted products. The farthest vertical lines in these graphs indicate the date of the consent order, and the preceding vertical lines (if any) correspond to the start of the misleading claims.

RTE Cereal

Figure 2 plots the market shares of Frosted Mini-Wheats over time. The farthest vertical line in the graph corresponds to April 2009 when the FTC issued a consent order to Kellogg's to stop making claims that eating the cereal increased children's attentiveness by nearly 20%. The plot indicates a fairly sharp decrease in market share after this event and a symmetric increase in market share before this event.

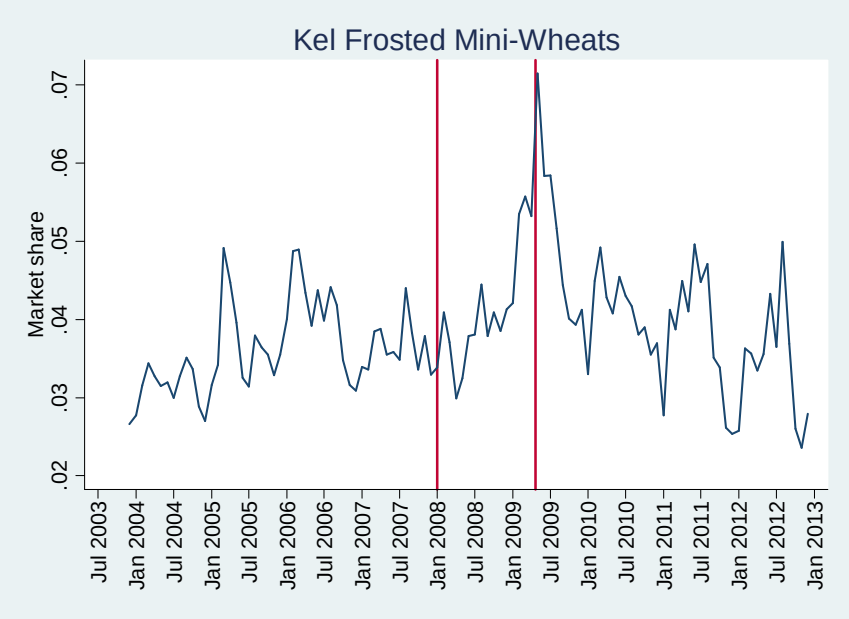


Figure 2: Frosted Mini-Wheats Market Shares over Time
(Right reference line indicates date of FTC Order. Left line indicates start of false claims.)

Yogurt and Yogurt Drinks

In the refrigerated-yogurts category, Dannon was issued a consent order in December 2010 to stop making the claim that Activia "relieves irregularity" and DanActive "helps people avoid catching colds or the flu". These claims had been present in the brands since introduction: for Activia in February 2006 and DanActive in January 2007. The specific settlement required that Dannon cannot state its products reduce the likelihood of getting a cold or flu unless approved by the FDA; Dannon cannot state digestive benefits unless (1) it clearly states that three servings of Activia be taken everyday to obtain these benefits or (2) reliable scientific evidence or two well-designed human clinical studies back these claims. Figure 3 plots market shares for both these products.

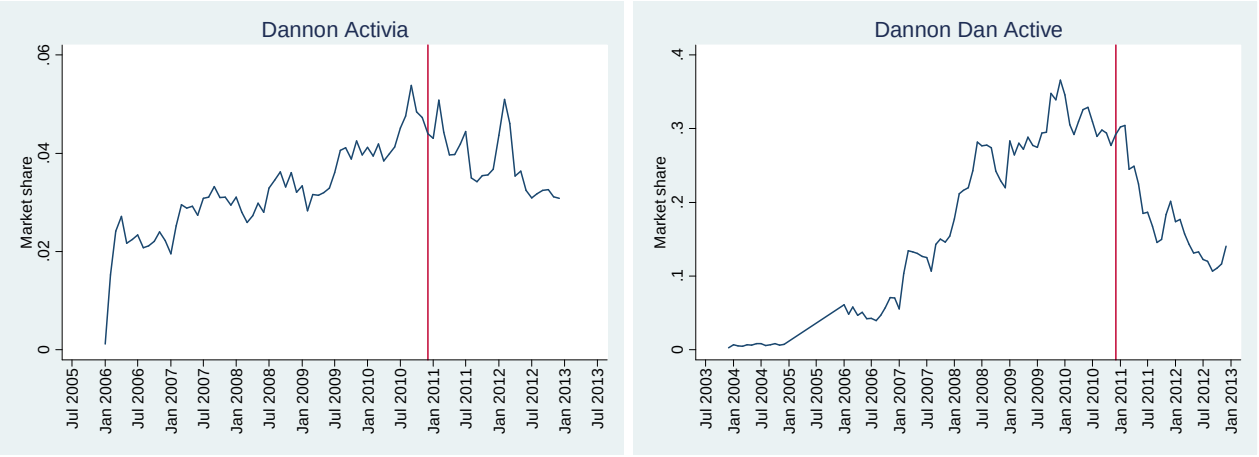


Figure 3: Dannon Activia (Yogurt) and DanActive (Yogurt Drink) Market Shares over Time
(Reference lines indicate date of FTC Order)

Nutritional Supplements

Airborne is a dietary supplement that since its introduction had claimed it had "guaranteed cold-fighting properties" and "if taken at the first sign of a cold symptom, its herbal formulation is clinically proven to nip most colds in the bud". The FTC in August 2008 issued a consent order to the company to stop making these unsubstantiated claims. Figure 4 shows a marked decrease in market shares following the FTC request to terminate these claims.

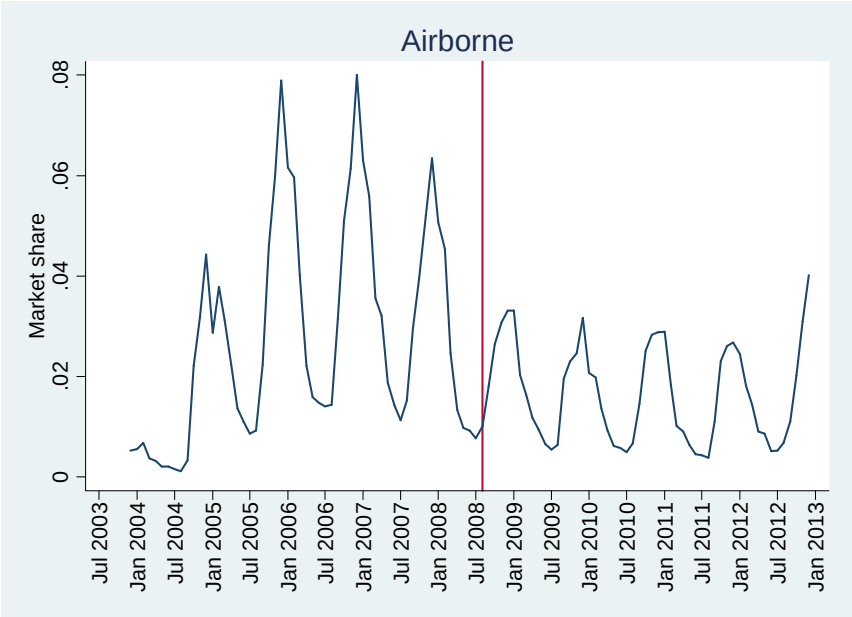


Figure 4: Airborne Market Shares over Time
(Reference line indicates date of FTC Order)

These figures indicate a perceptible impact of the removal of false claims and provide preliminary evidence of the extent to which these misleading claims might affect consumers. However, some unobservable trend that coincided with the timing of these consent orders might have affected the entire category. To rule out this explanation, we perform a reduced-form regression of market shares on the time since the consent order. We compare these results with the same regression run on similar products but that are unlikely to be substitutes for the impacted product. We consider all likely substitutes in Section 3.

2.2 Reduced-Form Evidence: Market share regression

To reflect the patterns in Figures 2 and 3, we estimate the following reduced-form regression for the brands affected by the consent order and for control brands:

$$s_{jt} = \overbrace{\alpha_j^{\text{pre}}}^{\text{Pre False}} + \overbrace{\alpha_j^{\text{false}}\text{I}\left(\text{False}_t\right) + \beta_j^{\text{false}}\text{I}\left(\text{False}_t\right).\left(t-\tau\right)}^{\text{During False Claims}} \overbrace{+\alpha_j^{\text{ftc}}\text{I}\left(\text{FTC}_t\right) + \beta_j^{\text{ftc}}\text{I}\left(\text{FTC}_t\right).\left(t-\tau\right)}^{\text{After FTC}} + \varepsilon_{jt}$$

Here, s_{jt} is the market share of brand j in month t, $\text{I}\left(\text{False}_t\right)$ is 1 if t belongs to the period when the focal brand f was making the false claims, and $\text{I}\left(\text{FTC}_t\right)$ is 1 if t belongs to the period after the FTC has issued the consent order to focal brand f. $\text{I}\left(\text{False}_t\right).\left(t-\tau\right)$ and $\text{I}\left(\text{FTC}_t\right).\left(t-\tau\right)$ capture any upward/downward time-trends before and after the event date τ, respectively. In this specification, $\alpha_j^{\text{false}}, \beta_j^{\text{false}}$ measure the intercept and slope during the false-claims period. $\alpha_j^{\text{ftc}}, \beta_j^{\text{ftc}}$ measure the intercept and slope after the FTC press-release statement. A negative β_j^{ftc} indicates a declining market share after the issuance of the consent order. If the termination of the false claims indeed affects demand for the impacted brand, we should see a significantly larger drop in market share levels as measured by $\alpha_{j=f}^{\text{ftc}} - \alpha_{j=f}^{\text{false}}$ than with $\alpha_{j\neq f}^{\text{ftc}} - \alpha_{j\neq f}^{\text{false}}$ and/or a significantly more negative coefficient associated with $\beta_{j=f}^{\text{ftc}}$ than with $\beta_{j\neq f}^{\text{ftc}}$.

To capture the seasonal patterns associated with Airborne (Figure 4), we estimate the following reduced-form regression for the Nutritional Supplements category:

$$s_{jt} = \alpha_j^{\text{false}}\text{I}\left(\text{False}_t\right) + \alpha_j^{\text{false,notFlu}}\text{I(notFlu)}.\text{I}\left(\text{False}_t\right) + \alpha_j^{\text{ftc}}\text{I}\left(\text{FTC}_t\right) + \alpha_j^{\text{ftc,notFlu}}\text{I(notFlu)}.\text{I}\left(\text{FTC}_t\right) + \varepsilon_{jt}$$

Here, I(notFlu)is an indicator for the non-flu season. The drop in market-share levels during the flu season, if any, is captured by the difference $\alpha_j^{\text{ftc}} - \alpha_j^{\text{false}}$.

Control Brands

Comparing the impacted brands with other similar products can be problematic especially if consumers substitute to/away from these similar products as a response to the consent orders. To get around this problem, we use products that are similar to but are unlikely substitutes for the impacted product.

In the RTE cereal category, we use Quaker Oats, which is a hot cereal, as a control. Because Quaker Oats is not an RTE cereal but is still likely to be affected by the same unobservable trends as all cereals, it serves as a good control. Similarly, for the yogurt and yogurt-drink categories, we expand the market to include refrigerated puddings as well. We then use Swiss Miss Puddings as the relevant control brand. In the nutritional supplements category, we use Bausch & Lomb products that are vitamins meant only for eye health.

Table 2: Reduced-Form Evidence: Market Shares of Impacted Brands Drop after Consent Orders

	Impacted brand		**Control Brand**	
	coeff	t-stat	coeff	t-stat
	Mini-Wheats		Quaker Oats	
Cumulative False Claims, β^{false}	0.0012	5.21	-0.0006	-0.71
Drop in Level after FTC order, $\alpha^{\text{ftc}} - \alpha^{\text{false}}$	-0.0065	-2.32	-0.0012	-0.12
Months since FTC warning letter, β^{ftc}	-0.0003	-5.19	-0.0001	-0.27
	Activia		Swiss Miss	
Cumulative False Claims, β^{false}	0.0008	18.32	-0.00005	-1.79
Drop in Level after FTC order, $\alpha^{\text{ftc}} - \alpha^{\text{false}}$	-0.0096	-3.17	0.00093	0.53
Months since FTC warning letter, β^{ftc}	-0.0008	-4.52	-0.00009	-0.87
	Dan Active		Swiss Miss	
Cumulative False Claims, β^{false}	0.0001	7.23	-0.00005	-1.79
Drop in Level after FTC order, $\alpha^{\text{ftc}} - \alpha^{\text{false}}$	-0.0076	-5.82	0.00093	0.53
Months since FTC warning letter, β^{ftc}	-0.0002	-2.58	-0.00009	-0.87
	Airborne		Bausch and Lomb	
Drop in Level after FTC order, $\alpha^{\text{ftc}} - \alpha^{\text{false}}$	-0.0167	-4.51	-0.0004	-0.37

Table 2 reports the results of this regression. The estimates indicate all the impacted brands faced a decline in market share after the date of the issuance of the consent order, both as measured by the drop in level as well as the declining trend after the order. This finding is largely consistent with Figures 2-4 as well. Moreover, the estimates for the control brands do not show any significant drop in shares after the respective dates for each of the impacted brands.

These regressions provide consistent evidence that the drop in market share for each of the impacted brands is unlikely due to other unobservable events that coincided with the issuance of the consent order. We now turn to a consumer choice model that controls for the competitive environment.

3 Estimation

We now analyze the data treating each household as a unit of observation. Within a product category, we assume a household makes a choice from C options every time a transaction occurs. The price of the chosen option is directly observed from the purchase panel data. We construct the prices of the other options in the consumer's consideration set using the RMS data. For each brand, we construct an average within-market weekly price by averaging prices (per lb) of the brand across all stores and UPCs each week. We then match the products in each household's choice set to these market-level prices. For those market-weeks for which this observation is missing, we use the weekly national average (average across markets).

We also construct a measure of ads seen by each household. Most of the brands advertise heavily at the national level. However, some advertising occurs at the local level. Specifically, the Nielsen data contain data on ads aired via National, Network Clearance, Spot, and Syndicated Clearance TV. National represents all nationally aired advertisements via Cable, Network, and Syndicated TV. Spot TV corresponds to ads aired directly in local markets. Network Clearance and Syndicated Clearance correspond to those commercials that are fed from the satellite with the Network or Syndicated program and aired by the local affiliate in the market (Nielsen Report Guide 2012). We use the duration[3] (in seconds) of advertisements aired per Designated Market Area (DMA) and match it to the household's DMA. Nielsen divides the United States into 210 DMAs.

To construct the choice set, for each category, we start with the top nine brands by total sales and exclude private labels and those that were discontinued. This leaves us with eight brands in the cereal category, six in the yogurt category, four in the yogurt-drinks category, and three in the nutritional-supplements category. For cereal, we add back the store-brand frosted shredded wheats as an additional control. We also ensure these brands are likely to be purchased by the heavy[4] consumers of the impacted brand so that all likely substitutes

[3]Other measures such as expenditure and GRPs are highly correlated with duration. However, ad expenditure is not available at the local level in all cases, because these ads are purchased nationally and then assigned to Clearance TV.

[4]Heavy consumers are those who purchased more than 16 units of the brand over the timespan of the data.

are included in our analysis. We aggregate the rest of the products into a composite brand called "Other". Note that doing so ensures all products are still included in our analysis. Following Shum (2004), we construct a composite measure of prices and advertisements for the Other brand. For price, $p_{\text{Other},t}$, we use the sales-volume-weighted average price across all other brands. For advertisement, $\mathbf{Ad}_{\text{Other},t}$, we use the total air duration of all other advertisements:

$$p_{\text{Other},t} = \sum_{j \notin C} \frac{v_{jt}}{\sum\limits_{k \notin C} v_{kt}} p_{jt}$$

$$\mathbf{Ad}_{\text{Other},t} = \sum_{j \notin C} \mathbf{Ad}_{jt}$$

where v_{jt} is the sales-volume of brand j at time t.

Table 6 provides summary statistics of the prices and advertisements by brand for each category.

Utility Specification

We specify individual i's utility from purchasing brand j at time t as

$$u_{ijt}(\theta) = \overbrace{\alpha_{ij}^{\text{pre}}}^{\text{Pre False}} + \overbrace{\alpha_{ij}^{\text{false}} \text{I}(\text{False}_t) + \beta_{ij}^{\text{false}} \text{I}(\text{False}_t) \,.\, (t-\tau)}^{\text{During False Claims}} \overbrace{+\alpha_{ij}^{\text{ftc}} \text{I}(\text{FTC}_t) + \beta_{ij}^{\text{ftc}} \text{I}(\text{FTC}_t) \,.\, (t-\tau)}^{\text{After FTC}} + \quad \gamma \mathbf{F}_{jt} + \varepsilon_{ijt}$$

where α_{ij}^{pre} is consumer i's preference for brand j before the focal brand began making the false claim. $\text{I}(\text{False}_t)$ is 1 if t belongs to the period when the brand was making the false claims. $\text{I}(\text{FTC}_t)$ is 1 if t belongs to the period after the FTC order. τ is the date of the FTC order. $t-\tau$ measures how far t is from the date of the consent order[5]. $\alpha_{ij}^{\text{false}}, \beta_{ij}^{\text{false}}$ measure the intercept and slope during the false-claims period. $\alpha_{ij}^{\text{ftc}}, \beta_{ij}^{\text{ftc}}$ measure the intercept and slope in the period after the FTC press release, that is, once the consumer knows the claim is false. $\beta_{ij=f}^{\text{ftc}} < 0$ indicates declining demand for the focal brand f after the withdrawal of the claim; $\mathbf{F}_{jt} = \{p_{jt}, \mathbf{Ad}_{\text{jt}}\}$ is a vector that includes prices, and the duration of aired national and local advertisements. γ indicates a consumer's sensitivity to these firm-side variables $\mathbf{F}_{jt}$. θ is the set of parameters $\left\{\alpha_{ij}^{\text{pre}}, \alpha_{ij}^{\text{false}}, \beta_{ij}^{\text{false}}, \alpha_{ij}^{\text{ftc}}, \beta_{ij}^{\text{ftc}}, \gamma\right\}$ governing a consumer's decision. We estimate a different specification for each category to capture the specifics of that category.

In the yogurt and yogurt-drinks category, there is no "before" period, because the claims were present since product introduction. Hence, we use the following specification:

[5]Because we capture declining market share via a time trend, and specifically model the seasonality effects in the nutritional-supplements category, we do not include time fixed effects.

$$u_{ijt}(\theta) = \alpha_{ij}^{\text{false}} \mathrm{I}(\text{False}_t) + \beta_{ij}^{\text{false}} \mathrm{I}(\text{False}_t) \,.\, (t-\tau) + \alpha_{ij}^{\text{ftc}} \mathrm{I}(\text{FTC}_t) + \beta_{ij}^{\text{ftc}} \mathrm{I}(\text{FTC}_t) \,.\, (t-\tau) + \gamma \mathbf{F}_{jt} + \varepsilon_{ijt}$$

Lastly, in the nutritional supplements category, seasonality - whether it is the flu season or not - is captured using the following specification:

$$u_{ijt}(\theta) = \alpha_{ij}^{\text{false}} \mathrm{I}(\text{False}_t) + \alpha_{ij}^{\text{false,notFlu}} \mathrm{I}(\text{notFlu}) * \mathrm{I}(\text{False}_t) + \alpha_{ij}^{\text{ftc}} \mathrm{I}(\text{FTC}_t) + \alpha_{ij}^{\text{ftc,notFlu}} \mathrm{I}(\text{notFlu}) * \mathrm{I}(\text{FTC}_t) + \gamma \mathbf{F}_{jt} + \varepsilon_{ijt}$$

The probability that individual i chooses brand j at time t is then given by

$$\Pr_{ijt}(\theta) = \frac{e^{u_{ijt}(\theta)}}{\sum_{k \in C} e^{u_{ikt}(\theta)}}$$

Aggregating the probabilities over all purchase occasions that i makes, the individual-level probability is

$$\Pr_i(\theta) = \prod_{t=1}^{T} \prod_{j=1}^{C} \Pr_{ijt}^{\mathrm{I}_{ijt}}(\theta)$$

where I_{ijt} is 1 if individual i purchased brand j in purchase occasion t.

The overall log-likelihood across all individuals can then be written as

$$LL(\theta) = \sum_{i=1}^{N} log \Pr_i(\theta)$$

Discussion on Endogeneity

We do not use instrumental variables for prices and advertisements for the following reason. Endogeneity concerns typically arise from omitted variable biases. Of particular relevance to us are two cases. In the first case, a variable exists that is unobserved to the researcher but is observed by both consumers and the firm. In our analysis, this is less of a concern especially in the local window around the FTC order, because we observe the typically omitted variables in the period of interest. In other words, if firms and consumers respond to the FTC press-release statement, explicitly including the before and after variables, $\mathrm{I}(\text{False}_t)$ and $\mathrm{I}(\text{FTC}_t)$, in our analysis reduces such endogeneity concerns. The second case pertains to firms changing strategic variables in response to anticipated demand. For example, a firm may add a "gluten-free" label on its packaging responding to an increasing consumer trend for gluten-free products. A before-after analysis following this change will lead to an upward bias on the impact of the label. However, in our analysis inference is based on the

termination of the false claims and the revelation of deception to consumers, both of which are not in the firm's control.

4 Results

We estimate the model including all the data post event, which gives us a long-run measure of the impact of the event. This estimate is likely to be conservative, especially if market shares rebound quickly. We also estimate the model using a shorter six-month and two-month period after the event, and conduct a placebo test in Section 4.1, pretending the event occurred at a different date.

The results of the demand estimation for all categories are reported in Tables 7 - 10. In specification S1, we verify the patterns presented in Section 2 hold even after including the relevant set of competitors. Specification S2 controls for the price of the purchased brand as well as prices of the competing brands. Specification S3 adds controls for advertisements at both the national and regional (DMA) levels. All specifications cluster at the household level.

Tables 7 - 9 show the slope coefficient for the focal brand is significantly negative (i.e. $\beta_f^{\text{ftc}} < 0$), indicating declining demand for the focal brand f after the withdrawal of the claim. In the nutritional-supplements category, where we estimate level differences in the flu and non-flu seasons, the difference in levels during the flu season, that is, $\alpha_j^{\text{ftc}} - \alpha_j^{\text{false}}$, is significantly negative for Airborne.

Because the relative magnitudes of all estimates matter, we simulate the market shares of all brands using the estimates to highlight the decline in demand. Figures 5 and 6 plot the decline in market share four months after the focal brand was required to terminate the false claims, relative to the market share just before. These figures provide further evidence of the decline in demand after the FTC consent order. All impacted brands face a significant decline in demand even after we control for prices, advertisements, and the competitive environment. In the yogurt category, we find Yoplait faces a steeper decline than Activia, possibly because of spillovers to Yoplait, which caters to a similar segment as Activia.

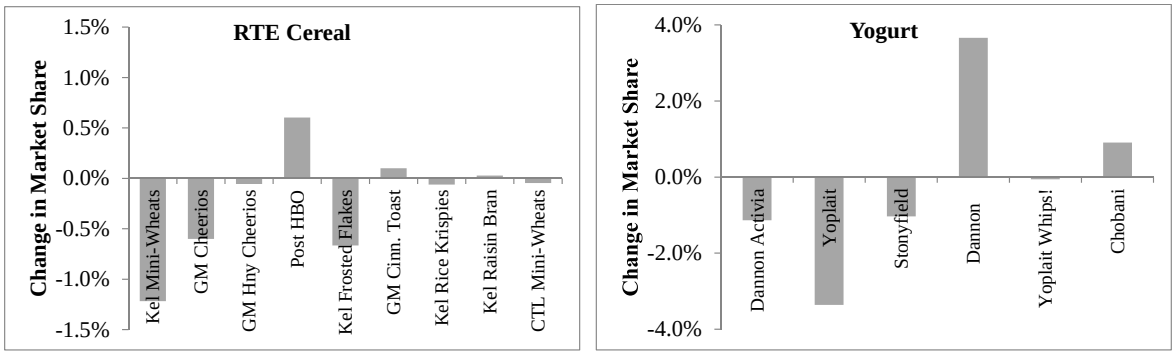


Figure 5: Decline in Market Share Four Months after Termination of False Claims is Steepest for Frosted Mini-Wheats

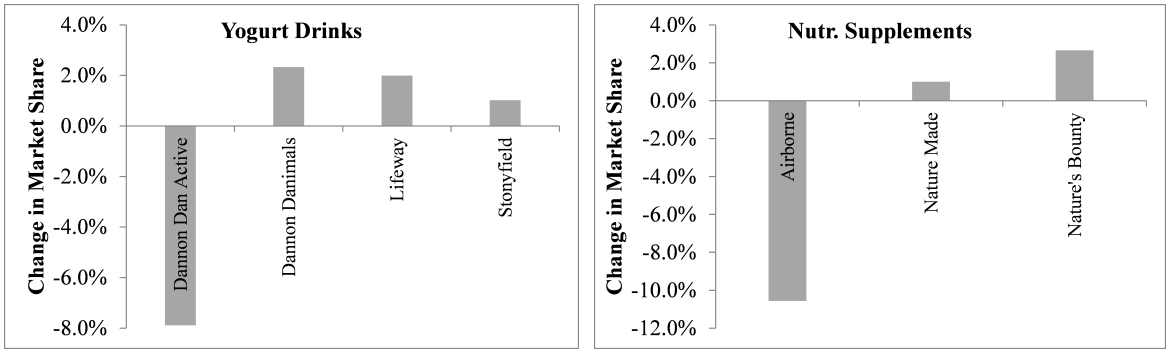


Figure 6: Decline in Market Share Four Months after Termination of False Claims is Steepest for Focal Brands: DanActive and Airborne

4.1 Placebo Tests

As market shares can fluctuate for many reasons, we conduct a placebo test to measure the drop in market share in a placebo period and compare it to the drop in market share after the termination of the claims. Whereas the previous analysis used all the data after the FTC consent order, we limit our analysis here to a period of six- and two- months before and after the order. For nutritional supplements, we use the three-month peak flu season from December to February. This provides an additional validity check on shorter-term effects.

We choose the placebo event as conservatively as possible, picking the date prior to the FTC consent order when the market-share dip appears to be the steepest in Figures 2-4. For Frosted Mini-Wheats, this date corresponds to August 2006; for Activia, October 2008; for DanActive, May 2008; and for Airborne, the previous year. Tables 11 - 14 report the estimates using the six- and two- month periods.

Figure 7 plots the drop in market share four months after the FTC event and compares it with the placebo period. In all four cases, we find the drop following the consent order is

steeper than the drop after the placebo event; that is, controlling for prices and advertisements explains most of the market-share decline following the placebo event, but does not explain the decline after the FTC order.

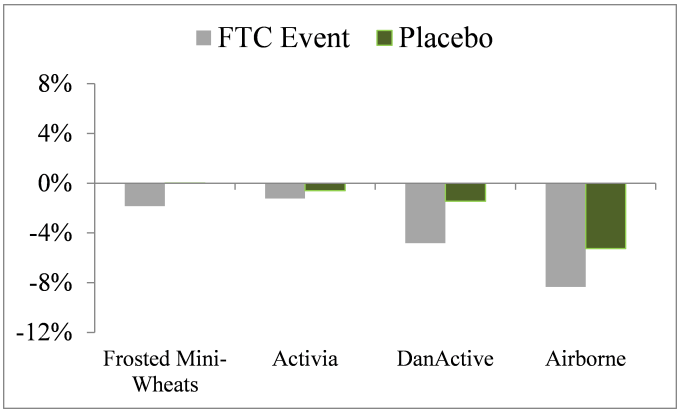


Figure 7: Decline in Market Shares is Steeper Following the FTC Consent Order than for a Placebo Event

4.2 Economic Significance

To determine the magnitude of revenue decline relative to the peak, we project the estimated decline to the U.S. population. To do so, we first compute the share of households $\left(\frac{\text{hh}_{cat}}{\text{hh}_{panel}}\right)$ that consume products in a given category, *cat*. We do so because not every household participates in a given category (e.g., not everyone buys RTE cereal). We then multiply this amount by the total households in the United States, HH_{US}, to get the relevant household population for each category. We then compute the average units consumed per household. To do so, we infer the total units $q_{cat,t}$ sold in month t in category *cat* directly from the data. $\frac{q_{cat,t}}{hh_{cat}}$ gives us the average category consumption per household. Last, the share of the focal brand, s_{jt}, is computed from our demand estimates. Multiplying this with the average brand price p_j, where j is the impacted brand, gives us the estimated revenue R_{jt}:

$$R_{jt} = \left(\frac{\text{hh}_{cat}}{\text{hh}_{panel}}.\text{HH}_{US}\right)\frac{q_{cat,t}}{hh_{cat}}s_{jt}.p_j$$

Table 3 lists the monthly revenue drop $R_{j,\tau+4} - R_{j,\tau}$ for the impacted brand, where $R_{j,\tau}$ is the revenue in the month of the FTC Order. The table also lists estimated yearly revenues. These numbers closely correspond to revenue/sales figures reported in news media. Mini-Wheats and Airborne are the hardest hit in terms of the decline relative to their peak sales.

Table 3: Revenue Decline Relative to Peak ($millions)

Brand	$R_{j,\tau+4} - R_{j,\tau}$	Yearly revenue
Kel Mini-Wheats	-$3.51	$149.23
Dannon Activia	-$3.82	$375.23
Dannon Dan Active	-$0.40	$30.79
Airborne	-$3.63	$65.30

Perhaps more important is the firm's potential revenue gain from the false claims. To quantify this, we calculate the revenue gain for Frosted Mini-Wheats, for which we have a start date of the claims. If we assume the entire gain in market share from January 2008 (start of the false claims) to September 2010 (when market shares seem to stabilize to pre-2008 levels) was due to the presence of the false claims, the total revenue gain for these 32 months from these claims is $105m. This gain is substantial, even after controlling for advertisement expenses (which were similar to 2008), relative to the 2013 class-action settlement in which Kellogg's agreed to a $4 million settlement fund.

These calculations show that firms stand to gain from making false claims even if they are eventually caught. However, whether this is true in the long-run is unclear, because consumers may begin to lose trust in the brand and class-action settlements may involve larger sums.

4.3 Heterogeneity in Consumer Responses

We next explore heterogeneity in consumer responses to see who these claims affect the most. We first explore heterogeneity in consumer responses to the Frosted Mini-Wheats claim withdrawal, because we have a start and end date of the false claims for this product. At the start date of the claims (Jan 2008), the only addition to the product was the front-of-the-package label without any product composition change. This enables us to investigate the behavior of those households that had never purchased the brand prior to the false claims.[6]

We classify households into two types based on whether they purchased any units prior to the start of the claims. This is indicative of households that began purchasing Frosted Mini-Wheats because of the claims. Our hypothesis is that the drop in market-share for this group is higher than for those consumers who were purchasing the product prior to the start of the false claims. Figure 8 plots the market share by the number of units purchased prior to Jan.

[6]We found that consumers who differed on observable demographics exhibited little difference in purchase behavior. This finding is consistent with Rossi, McCulloch, and Allenby (1996), who found that purchase histories were more informative than observable demographics.

2008. By virtue of our classification, we expect to see a regression to the mean where heavy users' consumption levels drop and non-users' consumption levels increase. However, our inference relies on the pattern at the date of the FTC consent order, when the market-share decline is starkest for the users who had not purchased prior to January 2008.

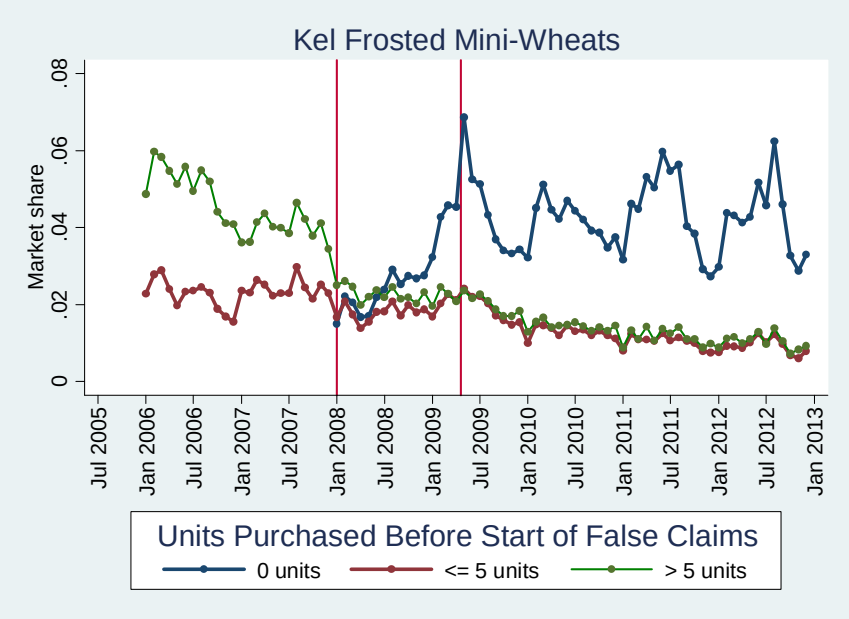


Figure 8: Heterogeneity in Responses to the withdrawal of the Mini-Wheats claims

We further quantify this heterogeneity by estimating a demand system that specifically accounts for these two different types of households:

$$u_{ijt}(\theta) = \overbrace{\alpha^{\text{false}}_{\text{loy},j}\mathrm{I}(\text{False}_t) + \beta^{\text{false}}_{\text{loy},j}\mathrm{I}(\text{False}_t).(t-\tau)}^{\text{During False Claims}} \quad \overbrace{+\alpha^{\text{ftc}}_{\text{loy},j}\mathrm{I}(\text{FTC}_t) + \beta^{\text{ftc}}_{\text{loy},j}\mathrm{I}(\text{FTC}_t).(t-\tau)}^{\text{After FTC}}$$
$$+\alpha^{\text{false}}_{\text{new},j}\mathrm{I}(\text{False}_t) + \beta^{\text{false}}_{\text{new},j}\mathrm{I}(\text{False}_t).(t-\tau) \quad +\alpha^{\text{ftc}}_{\text{new},j}\mathrm{I}(\text{FTC}_t) + \beta^{\text{ftc}}_{\text{new},j}\mathrm{I}(\text{FTC}_t).(t-\tau)$$
$$+\gamma\mathbf{F}_{jt} + \varepsilon_{ijt}$$

where $\theta_{\text{loy}} = \left\{\alpha^{\text{false}}_{\text{loy},j}, \beta^{\text{false}}_{\text{loy},j}, \alpha^{\text{ftc}}_{\text{loy},j}, \beta^{\text{ftc}}_{\text{loy},j}\right\}$ is the parameter vector for the loyal households and $\theta_{\text{new}} = \left\{\alpha^{\text{false}}_{\text{new},j}, \beta^{\text{false}}_{\text{new},j}, \alpha^{\text{ftc}}_{\text{new},j}, \beta^{\text{ftc}}_{\text{new},j}\right\}$ is the additional change over θ_{loy} for households that had not purchased prior to the claim. In this specification, the relevant parameter vector for the new households is $\theta_{\text{loy}} + \theta_{\text{new}}$. Table 15 reports the estimates for the loyal and new households. Figure 9 below plots the change in market share four months after the FTC consent order. This points to the fact that the most loyal consumers are the least affected by the termination of the false claims.

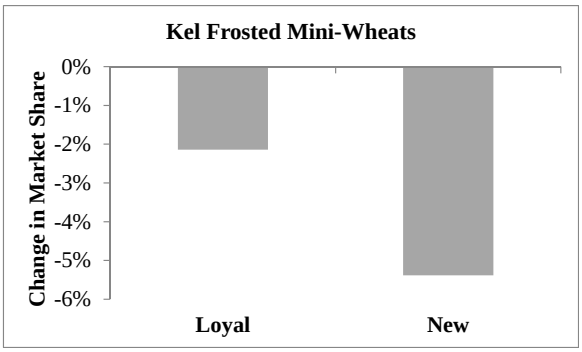


Figure 9: Heterogeneity in Responses: Loyal Consumers Impacted Less

For the other three categories, we cannot make such a direct comparison, because the claims were present in the products' messages since inception. Therefore, we cannot identify which consumer is likely to have purchased the brand because of the claim, and which consumer purchased the product for other reasons (e.g. taste, brand loyalty etc.). Instead, we examine the brand's ability to attract newcomers and retain loyal users in the year of and the year after the FTC order. For each year, we define newcomers as those who had not purchased the brand in any previous year but purchased it that year. Loyal users are those who had purchased the brand in any of the previous years and continue to purchase that year.

Figures 10-12 plots the additional percentage of newcomers the focal brand (and the top competitor) received each year compared to the previous year. The figures also plot the increase/decrease in the firm's loyal users each year. Across all brands, the percentage of newcomers joining the brand is lower for the impacted brand (and not the competitor brands) the year of or the year after the consent order. Loyal users also begin to decline, but the drop is not as steep. Note that the competitors appear to be increasing their base of loyal users at a fairly stable rate. These figures provide additional evidence that the impacted brand's ability to attract newcomers drops drastically following the FTC order and that loyalty can play a big role in a firm's ability to retain its consumers.

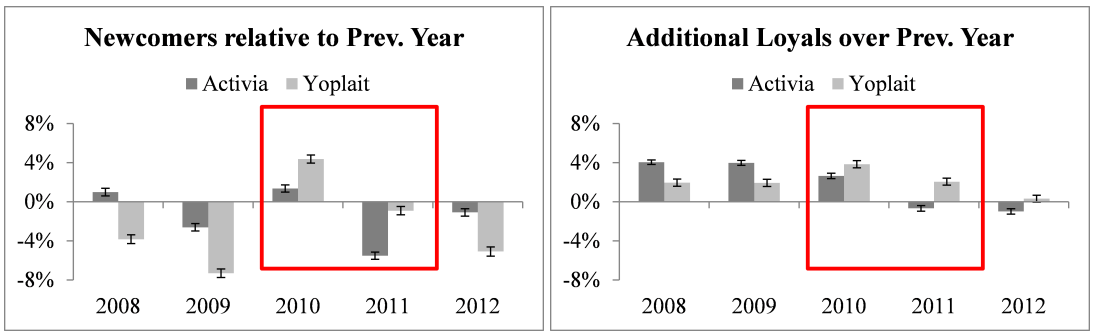


Figure 10: Yogurt: Activia Attracts Fewer Newcomers in 2011. Additional Loyals Decline but at a Smaller Rate.

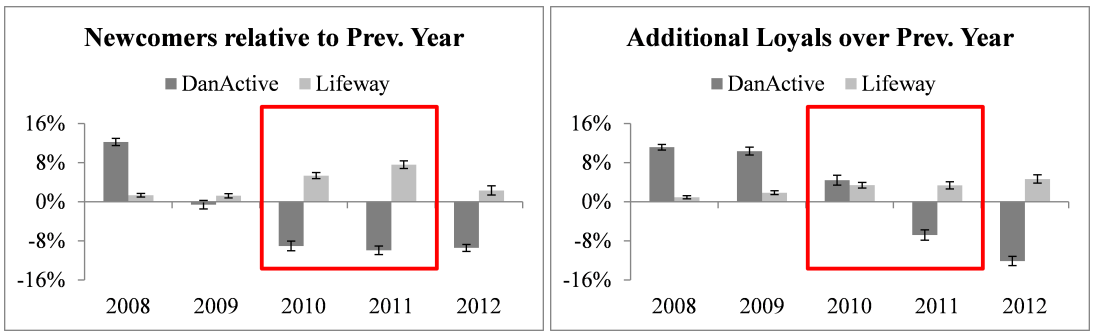


Figure 11: YogurtDrinks: Fewer Newcomers Join DanActive the Year Of and the Year After the FTC Order.

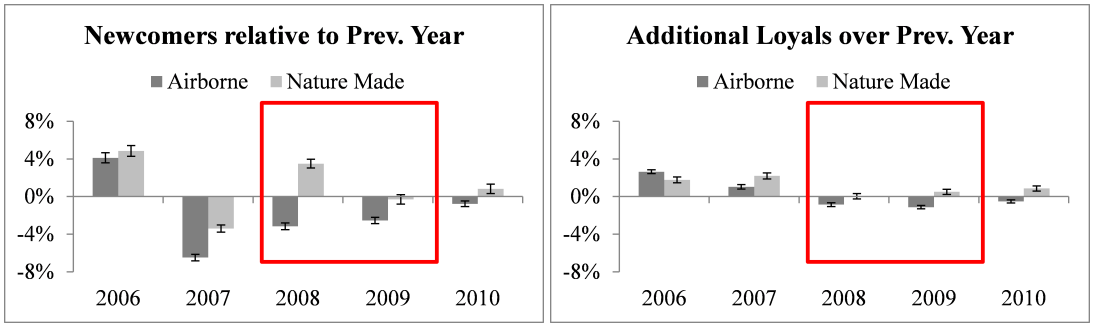


Figure 12: Nutr. Supplements: Fewer Newcomers Join Airborne Around Date of FTC Order

4.4 Heterogeneity across Markets

We next explore whether different markets respond differently to the false advertising campaigns. To do so, we estimate the household-level choice model for each of the 210 markets with one difference: we exclude the advertising covariate from the utility specification. This

allows us to correlate the market-share changes in each market to the amount of false advertising aired in each market. Table 4 below shows the correlation and its corresponding significance level for each brand.

Table 4: Correlation between Market-Share Changes and Own Advertising

	Correlation	t-stat
Kel Frosted Mini-Wheats	-0.2515	-3.71
Dannon Activia	0.0161	0.23
Dannon Dan Active	-0.0896	-1.28
Airborne	-0.0514	-0.74

One pattern emerges from the above table: as the amount of aired false advertising increases, the decrease in market share following the FTC consent order increases. More specifically, the correlation coefficient for Kellogg's Frosted Mini-Wheats is -0.2515. This implies a 1% increase in false advertising in a market is associated with a 0.25% decrease in market share for said market. This relationship is less transparent in other brands that have experienced false advertisings. Dannon Activia has a near-zero correlation, implying no perceptible relationship between false advertising in markets with market-share drops post FTC. Both Dannon DanActive and Airborne experienced a negative correlation similar to that of Kellogg's Frosted Mini-Wheats, but at statistically insignificant levels. This is possible because these brands advertise nationally, which makes any additional local market variation relatively small.

We now turn to exploring possible firm-side changes in terms of price and advertisement responses in the following section.

5 Firm Response

5.1 Prices

Figure 13 plots the price per lb of the impacted brands averaged across DMAs. Across all brands, little perceptible change appears to occur in prices around the time of the consent order. To test for a change in prices around the time of the consent order, we regress (for each DMA) the impacted brand's store-specific prices on the average category price in that store and test if the price coefficient in the four-month window post FTC is different from the coefficient pre FTC. Specifically, we test if $\beta_{j,post} = \beta_{j,pre}$ in the following equation:

$$p_{jst} = \beta \bar{p}_{st} + \beta_{j,pre} \mathrm{I}(preFTC).\bar{p}_{st} + \beta_{j,post} \mathrm{I}(FTC).\bar{p}_{st} + \varepsilon_{jst}$$

where s is the store, j is the brand and t is the quarter. I(FTC) is 1 if the quarter is in the four-month window after the FTC press-release statement and I(preFTC) is 1 if the quarter is in the four-month window before the FTC press-release.[7] We define the average category price, $\bar{p}_{st}$, as the weekly sales-volume-weighted average across all brands in a given store; that is,

$$\bar{p}_{st} = \sum_{j \in J_{st}} \frac{v_{jst}}{\sum_k v_{kst}} p_{jst}$$

where v_{jst} is the sales volume of brand j sold in store s in week t, and J_{st} is the set of all brands sold in store s that week.

We perform a placebo test to test if the difference

$$(\beta_{j,post} - \beta_{j,pre}) \mid_{\text{Event=FTC}} - (\beta_{j,post} - \beta_{j,pre}) \mid_{\text{Event=Placebo}}$$

is statistically significant,where Event = Placebo is defined to be one year before the FTC consent order. We count the DMAs in which this difference is positively or negatively statistically significant. Table 5 reports for each impacted brand in each category the percentage of DMAs in which prices increased/decreased using this measure. These results indicate no systematic increase/decrease occurs in prices around the timing of the FTC consent order across a majority of the DMAs for the impacted brands.

Testing for differences across competitors, we find evidence of competitor response in the RTE cereal category[8]: GM Cinnamon Toast Crunch increases prices in 31% of the DMAs and store-brand Shredded Wheats decreases prices significantly in 19% of the DMAs. This finding further highlights the importance of controlling for prices in the demand analysis.

Table 5: Percentage DMAs with Statistically Significant Changes in Price

Impacted Brand	Increase	Decrease	Total No. DMAs
Kel Frosted Mini-Wheats	14%	0%	205
Dannon Activia	3%	5%	204
Dannon Dan Active	3%	5%	196
Airborne	9%	5%	205

[7]We aggregate the weekly price data to the quarterly level to avoid inconsistent standard errors that can result due to the presence of serially correlated observations (Bertrand et al. 2004). Thus, the pre and post periods have only one observation per time period.

[8]There is some evidence for price increases in the nutritional supplements category, but this is largely due to a drop in price in the placebo period.

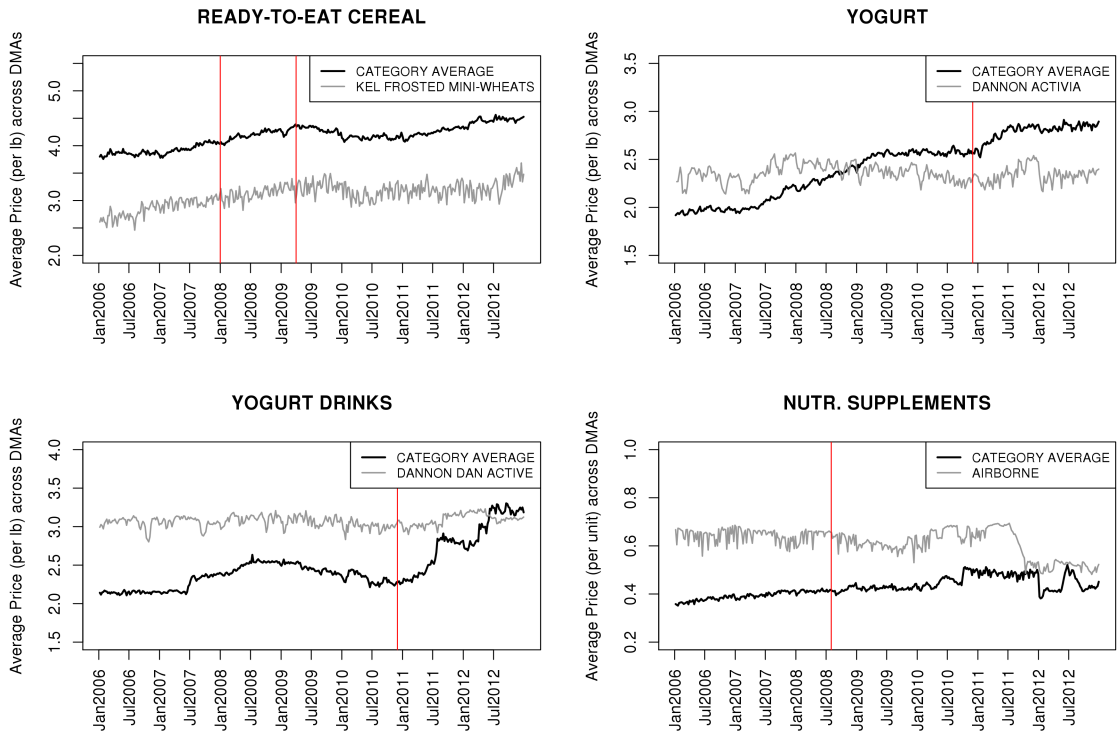


Figure 13: Average Prices (per lb) of the Impacted Brands

5.2 Advertisements

In this section, we first explore when the focal firm might have changed its advertising. We use the Nielsen Media data and the Wayback Machine (https://archive.org/web/) to infer when the company might have taken action. In Section 5.2.2, we quantify total ad quantity changes to measure changes after the FTC order.

5.2.1 Advertisements and False Claim Termination

The FTC complaint for Frosted Mini-Wheats highlights two specific TV ads shown in Figure 14. In the Media data, we are able to identify these ads based on the creative-title name, air date, and the corresponding video files available on Youtube and Adland. Figure 15 plots the total aired duration of these creative-titles at the national level for Kellogg's Frosted Mini-Wheats. While the two creatives which started in 2008 had already stopped[9], existing packages containing the misleading claims were likely not replaced until the date of the order: a Flickr photo of a cereal aisle, taken on Jan. 27 2009 confirms this. The FTC order requires these be absent only following the order.

[9]The ad that reappears later has the same creative but a different voiceover making weaker claims.

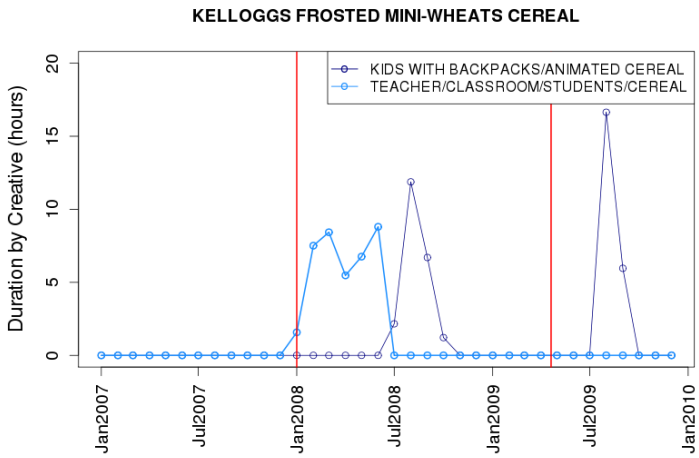
Mini-Wheats on BackPacks & 1st day of school[1] Teacher Loses Place, Attentive Boy Reminds[2]

Kellogg's Frosted Mini-Wheats - Back To School (2008) :30 (USA)

Noah Munck - Frosted Mini Wheats Commercial (2009)

[1]http://adland.tv/commercials/kelloggs-frosted-mini-wheats-back-school-2008-30-usa
[2]https://www.youtube.com/watch?v=uXQKM7gxxo8

Figure 14: Creatives Containing the False Claims

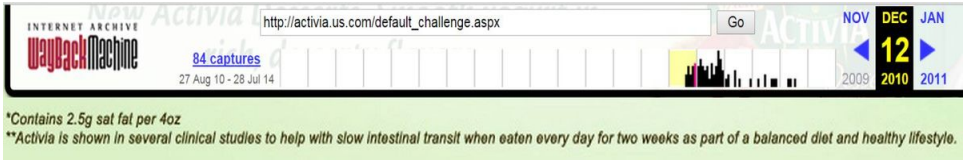


Note: The ad that reappears in 2009 has the same creative but makes weaker claims

Figure 15: Kellogg Creatives Containing False Claims End Prior to Consent Order

For the remaining brands, all ad campaigns have the false claims. To identify when the brands might have responded to the order, we use the Wayback Machine. For Dannon, a perceptible change occurs in the website text in December 2010 versus January 2011 (prior to and after the consent order). In particular, we see the words "shown in several clinical studies", which was the subject of the FTC complaint, had been removed. The positioning of Activia largely remained the same.

Prior to FTC Order[1]



After FTC Order[2]

[1]Text in December 2010 States "shown in clinical studies"
[2]Text in January 2011 No Longer States "clinical studies"

Figure 16: Activia Website Before and After FTC Order

For DanActive, national TV ads were discontinued early 2009. Airborne seemed to have responded around the date of the FTC consent order, both as evidenced in Table 19 as well as in its website text. In April 2008, the text had a lot of details on how Airborne "combats the airborne germs and viruses that are all around in places like classrooms, offices and airplanes". In May 2008, the text no longer contained these claims.

This discussion indicates brands largely responded around the date of the consent order. More importantly, the informational impact to consumers occurred at the date of the consent order. We now examine whether these terminations led to overall changes in ad levels.

5.2.2 Total Ads

To quantify possible changes in advertisements, we estimate the following regression equations for ad-spend, duration and frequency of advertisements at the brand-week level.

$$\text{Ad}_{jt} = \gamma_{jt} + \gamma_{j,pre}\text{I}(preFTC) + \gamma_{j,post}\text{I}(FTC) + \varepsilon_{jt}$$

where Ad_{jt} is the vector of ad-related variables {AdSpend, Duration, Frequency}. I(FTC) is 1 if week t is in the four-month window after the FTC press-release statement and I(preFTC) is 1 if week t is in the four-month window before the FTC press-release. $\gamma_{j,post}$ measures changes relative to the average ad level after the FTC order and $\gamma_{j,post} - \gamma_{j,pre}$ measures changes relative to the four-month period before the order.

Tables 16 - 19 report coefficients for the focal and competing brands across the four categories. Across all categories, $\gamma_{j=f,post}$ is not significantly different from zero for the focal brand, indicating ad-levels after the FTC order remain close to average levels. Except for Activia and Airborne, the change relative to the pre FTC period, $\gamma_{j,post} - \gamma_{j,pre}$, is not

significantly different using any of the measures. Activia's ad-duration drops by 2.186 hours (expenditures and frequency do not change significantly) and Airborne's frequency drops by 74.35 occurrences (duration and expenditures do not change significantly). Note that the regression equations overstate significance because each observation is a week resulting in highly correlated observations. Therefore, the significance of the decline we measure is an overestimate - the brand likely kept ads unchanged.

In the cereal category, only General Mills Cheerios, General Mills Honey Nut Cheerios and Post Honey Bunches of Oats exhibit a significant increase in advertisements in this period. In the yogurt category, Stonyfiled appears to have increased ad levels after the FTC order. These provide some evidence of possible strategic competitor response.

5.3 Availability

Following the FTC consent order, the impacted products might be out of stock in stores (e.g., manufacturers may need a few weeks to replace the packaging of their existing products). Lack of availability of the impacted products can explain the patterns observed in the data. However, a withdrawal of products from the shelves would imply an immediate sharp drop and a subsequent increase in market share. Since we do not observe this pattern in any of the products, our findings are likely not associated with stock-out effects. However, it is possible that stock-out occurs in some stores which may cause this gradual decline. To ensure demand-side factors, and not product stock-outs, drive the decline in market shares following the FTC consent order, we check for discontinuity patterns in store availability.

Although the RMS data does not contain measures of availability, we infer store availability by exploiting the nature of the missing data. An observation in the RMS data can be missing if 1) the store did not report sales of the UPC that week: if this occurs, it should occur randomly and not systematically after the FTC consent order, 2) the UPC had no sales in that store-week, and 3) the product was not available. Although separating out (2) and (3) is hard given the data, we take advantage of the fact that stock-outs, if they occur, should affect the entire brand and not just a single UPC. A brand typically has 20-70 UPCs associated with it. Aggregating UPCs to the brand level, Figure 17 plots the number of stores that sold at least one unit of the brand.

Across all brands, only Dannon's DanActive exhibits a sharp drop in the count of stores that sold at least one unit of the product. We next verify if the demand patterns documented thus far hold for DanActive, controlling for availability. To do so, we exclude those stores where a product was available in early 2010, but unavailable late 2010 and early 2011. We restrict attention to only those stores present in the RMS data. The market shares are

remarkably close to the ones plotted in Figure 3, indicating the decline in market share is likely to be due to demand-side factors.

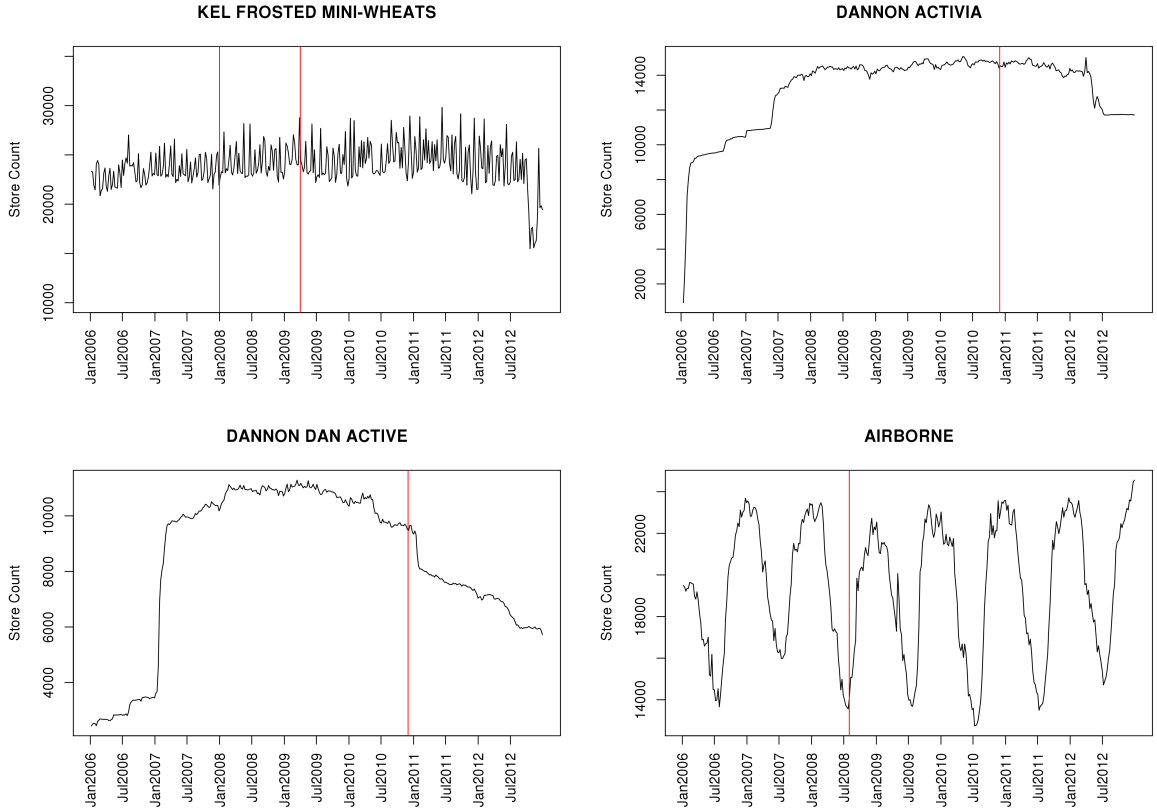


Figure 17: Number of Stores That Sold at Least One unit of the Brand

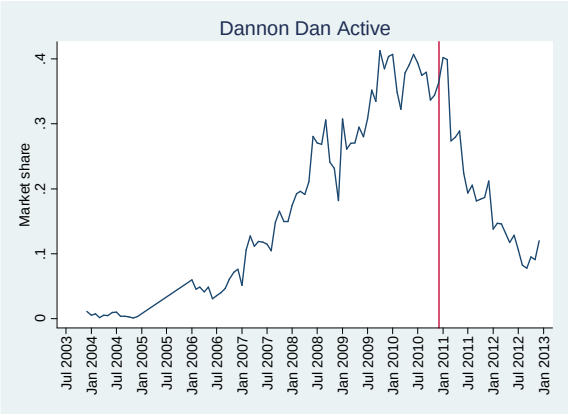


Figure 18: Dannon DanActive Market Shares Excluding Stores Where It Was Likely Not Available

6 Conclusion

This paper finds that false claims can have a significant impact on consumer demand, based on the evidence that termination of these claims led to a decline in consumer demand. The findings have implications for consumers, firms and regulatory authorities. From a firm's perspective making false claims appears lucrative, especially in the short-run. A back-of-the-envelope calculation shows that Kellogg's Frosted Mini-Wheats gained nearly $105m in revenue as a result of these claims. However, as more firms get caught and as class action lawyers sue for even larger compensations, it is unclear if this revenue gain will hold true for future brands. Furthermore, multiple violations by a single brand can cause consumers to lose trust in the brand. Measuring the effects of repeatedly misleading consumers will add to the literature on the long-run effects of advertising and is a suggestion for future work.

Regulatory bodies clearly play a big role, especially in the case of claims a consumer cannot reasonably verify. The role of the authority lies in ensuring that the false claims are terminated as well as ensuring that consumers are made aware that a deception has occurred. Our work does not emphasize the mechanism by which consumers internalize the claims: whether it is a response to the claims no longer being present or a response to information (via national press coverage) that the claims are false. The effect we measure is an aggregate of consumer responses to the termination of the claims, as well as to possible strategic firm-side responses in terms of price and advertisement changes. The firm-side data provide some evidence that competitors, especially in the Cereal and Yogurt categories respond with price and/or ad changes.

Lastly, because randomizing the presence of a false claim is nearly impossible in practice, our work provides an identification strategy that can be used in other contexts. In-lab studies are limited to hypothetical brands: one cannot credibly vary the presence of a false claim in a real brand because respondents can easily verify this. We exploit the timing of the FTC consent orders and measure aggregate market share responses and individual-level purchase behaviors before and after this event, controlling for prices, advertising, and the competitive environment. We find evidence suggesting response to the termination of the false claims is heterogeneous: newcomers are most impacted by these false claims while the long-time users persist in their purchases even after the false claims have been identified and removed. Moreover, markets that saw more ads respond more strongly once they know the claims are misleading.

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Table 6: Summary Statistics

Cereal	Price (per lb)	Duration (hours aired per week)			
		National	Network	Spot TV	Syndicated
Kel Frosted Mini-Wheats	$ 3.10	2.72	0.08	0.01	0.02
G M Cheerios	$ 5.18	1.38	0.05	0.07	0.01
G M Honey Nut Cheerios	$ 4.40	2.00	0.03	0.09	0.01
Post Honey Bunches of Oats	$ 3.37	1.51	0.05	0.01	0.01
Kel Frosted Flakes	$ 3.69	1.25	0.03	0.00	0.00
G M Cinnamon Toast Crunch	$ 4.00	1.06	0.02	0.00	0.00
Kel Rice Krispies	$ 4.29	2.26	0.05	0.01	0.01
Kel Raisin Bran	$ 2.60	1.63	0.06	0.00	0.01
CTL BR Frosted Mini-Wheats	$ 2.10	0.00	0.00	0.00	0.00
Other	$ 3.58	19.56	0.47	0.22	0.15
Yogurt	Price (per lb)	Duration (hours aired per week)			
		National	Network	Spot TV	Syndicated
Dannon Activia	$ 2.35	4.44	0.20	0.02	0.06
Yoplait	$ 1.76	3.16	0.08	0.13	0.02
Stonyfield	$ 2.82	0.36	0.00	0.00	0.00
Dannon	$ 1.89	2.88	0.08	0.01	0.02
Yoplait Whips!	$ 2.54	0.80	0.03	0.02	0.00
Chobani	$ 3.47	2.29	0.05	0.00	0.01
Other	$ 1.74	2.14	0.04	0.05	0.01
Yogurt drinks	Price (per lb)	Duration (hours aired per week)			
		National	Network	Spot TV	Syndicated
Dannon Dan Active	$ 3.07	2.85	0.13	0.03	0.03
Dannon Danimals	$ 2.19	0.82	0.03	0.00	0.00
Lifeway	$ 1.85	0.00	0.00	0.00	0.00
Stonyfield	$ 2.75	0.00	0.00	0.00	0.00
Other	$ 2.11	0.51	0.03	0.02	0.00
Nutr. Supplements	Price (per unit)	Duration (hours aired per week)			
		National	Network	Spot TV	Syndicated
Airborne	$ 0.62	0.93	0.03	0.02	0.02
Nature Made	$ 0.17	2.21	0.01	0.00	0.01
Nature's Bounty	$ 0.14	0.13	0.02	0.00	0.01
Other	$ 0.20	41.56	1.29	0.22	0.60

A Demand Estimates

Table 7: Demand Estimates: RTE Cereal

		S1		S2		S3	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Kel Frosted Mini-Wheats							
False Claims	α^{false}	-1.994	(-138.44)	-2.434	(-139.89)	-2.429	(-133.73)
	β^{false}	0.037	(27.67)	0.034	(24.01)	0.034	(23.63)
FTC	α^{ftc}	-2.159	(-152.57)	-2.564	(-153.45)	-2.562	(-141.64)
	β^{ftc}	-0.008	(-15.47)	-0.017	(-27.92)	-0.016	(-26.57)
G M Cheerios							
False Claims	α^{false}	-2.799	(-143.98)	-0.660	(-23.34)	-0.646	(-21.23)
	β^{false}	-0.012	(-8.38)	-0.073	(-48.06)	-0.073	(-47.91)
FTC	α^{ftc}	-2.744	(-150.96)	-1.035	(-41.43)	-1.021	(-36.71)
	β^{ftc}	-0.005	(-7.51)	-0.004	(-6.96)	-0.004	(-7.07)
G M Honey Nut Cheerios							
False Claims	α^{false}	-2.817	(-142.21)	-1.726	(-78.80)	-1.716	(-72.45)
	β^{false}	0.004	(2.58)	0.000	(-0.13)	0.000	(-0.31)
FTC	α^{ftc}	-2.763	(-162.90)	-1.868	(-100.72)	-1.859	(-87.73)
	β^{ftc}	0.002	(4.20)	0.023	(40.22)	0.023	(39.25)
Post Honey Bunches of Oats							
False Claims	α^{false}	-3.065	(-134.07)	-3.010	(-127.33)	-3.000	(-121.99)
	β^{false}	-0.025	(-15.25)	-0.005	(-3.05)	-0.006	(-3.19)
FTC	α^{ftc}	-2.860	(-144.18)	-2.785	(-136.45)	-2.772	(-124.44)
	β^{ftc}	-0.007	(-9.69)	-0.015	(-19.66)	-0.015	(-19.19)
Kel Frosted Flakes							
False Claims	α^{false}	-3.040	(-147.38)	-2.797	(-142.38)	-2.782	(-132.40)
	β^{false}	0.025	(14.33)	0.032	(18.98)	0.032	(18.87)
FTC	α^{ftc}	-3.188	(-168.88)	-3.328	(-170.92)	-3.313	(-156.11)
	β^{ftc}	0.001	(1.62)	0.034	(46.42)	0.034	(45.39)
G M Cinnamon Toast Crunch							
False Claims	α^{false}	-3.418	(-140.40)	-2.801	(-112.25)	-2.787	(-105.09)
	β^{false}	0.000	(0.23)	-0.012	(-5.89)	-0.013	(-5.97)
FTC	α^{ftc}	-3.330	(-162.53)	-2.814	(-136.96)	-2.799	(-120.71)
	β^{ftc}	0.000	(-0.05)	0.014	(18.98)	0.014	(18.63)
Kel Rice Krispies							
False Claims	α^{false}	-3.572	(-153.51)	-2.486	(-100.00)	-2.474	(-92.23)
	β^{false}	0.003	(1.55)	-0.028	(-13.67)	-0.028	(-13.70)
FTC	α^{ftc}	-3.491	(-156.98)	-2.527	(-111.83)	-2.520	(-99.81)
	β^{ftc}	-0.007	(-9.18)	-0.009	(-11.22)	-0.009	(-10.53)
Kel Raisin Bran							
False Claims	α^{false}	-3.497	(-144.31)	-4.615	(-154.05)	-4.598	(-153.27)
	β^{false}	0.011	(5.03)	0.008	(3.68)	0.008	(3.57)
FTC	α^{ftc}	-3.422	(-161.60)	-4.605	(-165.63)	-4.590	(-164.34)
	β^{ftc}	-0.003	(-3.70)	-0.005	(-5.87)	-0.005	(-5.54)
CTL BR Frosted Mini-Wheats							
False Claims	α^{false}	-3.896	(-105.21)	-5.707	(-125.13)	-5.762	(-121.77)
	β^{false}	-0.002	(-0.72)	-0.010	(-3.44)	-0.010	(-3.46)
FTC	α^{ftc}	-3.985	(-124.28)	-5.782	(-140.96)	-5.838	(-136.25)
	β^{ftc}	0.006	(5.31)	0.002	(1.48)	0.002	(1.60)
Log Likelihood		-6,382,328		-5,240,808		-5,240,736	
Prices				Yes		Yes	
Ads						Yes	
N hh		44,544					
N obs		5,177,394					
Cluster		Household					

Table 8: Demand Estimates: Yogurt

		S1		S2		S3	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Dannon Activia							
False Claims	α^{false}	-1.359	(-58.70)	-0.455	(-15.61)	-0.458	(-15.45)
	β^{false}	0.023	(24.65)	0.008	(8.54)	0.008	(8.50)
FTC	α^{ftc}	-1.447	(-59.31)	-0.560	(-18.62)	-0.534	(-17.28)
	β^{ftc}	-0.010	(-6.57)	-0.019	(-12.82)	-0.020	(-13.38)
Yoplait							
False Claims	α^{false}	-0.216	(-9.78)	-0.212	(-10.18)	-0.178	(-8.17)
	β^{false}	0.011	(12.88)	0.004	(4.40)	0.004	(5.38)
FTC	α^{ftc}	-0.435	(-18.31)	-0.400	(-17.96)	-0.369	(-15.67)
	β^{ftc}	0.008	(5.91)	0.012	(9.32)	0.011	(8.43)
Stonyfield							
False Claims	α^{false}	-2.485	(-49.93)	-0.561	(-9.60)	-0.561	(-9.62)
	β^{false}	0.067	(39.30)	0.077	(46.98)	0.077	(46.96)
FTC	α^{ftc}	-2.883	(-55.24)	-1.014	(-17.33)	-1.006	(-17.17)
	β^{ftc}	-0.010	(-2.66)	-0.005	(-1.38)	-0.004	(-1.26)
Dannon							
False Claims	α^{false}	-1.034	(-41.65)	-0.915	(-38.48)	-0.941	(-39.35)
	β^{false}	0.015	(15.23)	0.007	(6.86)	0.006	(6.17)
FTC	α^{ftc}	-1.062	(-40.98)	-0.753	(-30.06)	-0.753	(-30.04)
	β^{ftc}	0.004	(2.32)	0.021	(12.18)	0.020	(11.88)
Yoplait Whips!							
False Claims	α^{false}	-2.372	(-48.72)	-1.206	(-22.37)	-1.206	(-22.34)
	β^{false}	0.003	(1.52)	-0.010	(-6.09)	-0.010	(-5.99)
FTC	α^{ftc}	-2.584	(-44.94)	-1.206	(-19.26)	-1.193	(-19.06)
	β^{ftc}	0.002	(0.42)	-0.015	(-4.46)	-0.014	(-4.38)
Chobani							
False Claims	α^{false}	-2.288	(-44.45)	0.441	(6.27)	0.442	(6.29)
	β^{false}	0.102	(31.99)	0.111	(35.90)	0.111	(35.98)
FTC	α^{ftc}	-2.018	(-51.13)	0.537	(8.76)	0.553	(9.00)
	β^{ftc}	0.029	(12.92)	0.013	(5.93)	0.013	(5.83)
Log Likelihood		-8,335,325		-7,772,024		-7,770,710	
Prices				Yes		Yes	
Ads						Yes	
N households		35,837					
N observations		5,697,053					
Cluster		Household					

Table 9: Demand Estimates: Yogurt Drinks

		S1		S2		S3	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Dannon Dan Active							
False Claims	α^{false}	1.131	(10.25)	1.330	(13.43)	1.384	(13.87)
	β^{false}	0.032	(11.46)	0.032	(11.98)	0.037	(12.91)
FTC	α^{ftc}	1.003	(8.09)	1.266	(9.94)	1.301	(10.18)
	β^{ftc}	-0.037	(-4.08)	-0.042	(-4.59)	-0.043	(-4.65)
Dannon Danimals							
False Claims	α^{false}	-0.711	(-5.75)	-0.700	(-5.90)	-0.677	(-5.69)
	β^{false}	0.042	(11.65)	0.042	(12.06)	0.042	(12.24)
FTC	α^{ftc}	-0.545	(-3.88)	-0.500	(-3.63)	-0.464	(-3.38)
	β^{ftc}	-0.025	(-2.59)	-0.029	(-2.99)	-0.030	(-3.07)
Lifeway							
False Claims	α^{false}	-1.299	(-6.91)	-1.354	(-7.19)	-1.332	(-7.06)
	β^{false}	0.054	(9.10)	0.056	(9.45)	0.056	(9.37)
FTC	α^{ftc}	-1.244	(-7.14)	-1.196	(-6.94)	-1.160	(-6.73)
	β^{ftc}	0.013	(1.30)	0.006	(0.60)	0.006	(0.54)
Stonyfield							
False Claims	α^{false}	-3.495	(-9.73)	-3.355	(-9.27)	-3.320	(-9.27)
	β^{false}	-0.012	(-1.19)	-0.013	(-1.24)	-0.013	(-1.25)
FTC	α^{ftc}	-2.535	(-7.14)	-2.354	(-6.62)	-2.319	(-6.53)
	β^{ftc}	-0.020	(-1.35)	-0.025	(-1.73)	-0.026	(-1.77)
Log Likelihood		-176,861		-176,154		-175,882	
Prices				Yes		Yes	
Ads						Yes	
N households		8,828					
N observations		166,080					
Cluster		Household					

Table 10: Demand Estimates: Nutritional Supplements

		S1		S2		S3	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Airborne							
False Claims	α^{false}	-0.851	(-32.00)	-0.852	(-31.19)	-0.887	(-22.63)
	$\alpha^{\text{false,notFlu}}$	-1.048	(-39.79)	-1.075	(-40.69)	-1.056	(-32.63)
FTC	α^{ftc}	-1.405	(-46.83)	-1.405	(-46.06)	-1.471	(-40.03)
	$\alpha^{\text{ftc,notFlu}}$	-1.017	(-29.82)	-1.038	(-28.82)	-1.001	(-24.18)
Nature Made							
False Claims	α^{false}	-2.223	(-48.44)	-2.223	(-48.34)	-2.259	(-39.74)
	$\alpha^{\text{false,notFlu}}$	-0.085	(-2.62)	-0.072	(-2.25)	-0.052	(-1.39)
FTC	α^{ftc}	-2.161	(-62.95)	-2.161	(-62.83)	-2.232	(-50.75)
	$\alpha^{\text{ftc,notFlu}}$	-0.061	(-2.64)	-0.051	(-2.16)	-0.008	(-0.26)
Nature's Bounty							
False Claims	α^{false}	-2.727	(-43.70)	-2.727	(-43.56)	-2.763	(-38.10)
	$\alpha^{\text{false,notFlu}}$	-0.011	(-0.25)	-0.019	(-0.42)	0.001	(0.03)
FTC	α^{ftc}	-2.306	(-49.97)	-2.306	(-49.78)	-2.376	(-43.59)
	$\alpha^{\text{ftc,notFlu}}$	0.024	(0.94)	0.036	(1.39)	0.079	(2.44)
Log Likelihood		-243,921		-243,892		-243,839	
Prices				Yes		Yes	
Ads						Yes	
N households		10,738					
N observations		279,679					
Cluster		Household					

Table 11: Demand Estimates: RTE Cereal (6-month, 2-month, Placebo)

		FTC Order				Placebo			
Window post-event		6-month		2-month		6-month		2-month	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Kel Frosted Mini-Wheats									
False Claims	α^{false}	-1.816	(-107.86)	-2.393	(-45.91)	-2.224	(-90.81)	-2.775	(-37.06)
	β^{false}	0.111	(21.82)	0.209	(6.67)	-0.013	(-2.11)	0.129	(3.26)
FTC	α^{ftc}	-1.786	(-85.84)	-2.460	(-32.00)	-2.283	(-66.56)	-2.617	(-28.10)
	β^{ftc}	-0.107	(-20.31)	-0.050	(-1.48)	-0.043	(-6.33)	-0.113	(-2.66)
G M Cheerios									
False Claims	α^{false}	-2.856	(-119.54)	-0.927	(-14.77)	-2.808	(-91.36)	-1.554	(-19.51)
	β^{false}	-0.022	(-3.58)	-0.122	(-3.38)	0.002	(0.33)	-0.042	(-0.96)
FTC	α^{ftc}	-2.517	(-91.99)	-0.741	(-8.56)	-2.685	(-66.48)	-1.759	(-16.75)
	β^{ftc}	-0.067	(-10.88)	-0.054	(-1.35)	-0.021	(-2.66)	0.168	(3.48)
G M Honey Nut Cheerios									
False Claims	α^{false}	-2.858	(-110.25)	-1.703	(-30.41)	-2.707	(-80.45)	-2.032	(-29.45)
	β^{false}	-0.006	(-0.91)	0.224	(5.53)	0.115	(11.25)	0.010	(0.21)
FTC	α^{ftc}	-2.665	(-100.51)	-1.716	(-22.76)	-2.972	(-64.79)	-2.028	(-18.16)
	β^{ftc}	-0.019	(-3.00)	-0.037	(-1.02)	-0.003	(-0.36)	-0.065	(-1.11)
Post Honey Bunches of Oats									
False Claims	α^{false}	-3.142	(-103.96)	-3.225	(-53.34)	-2.721	(-88.11)	-2.812	(-41.19)
	β^{false}	-0.011	(-1.44)	0.053	(1.19)	0.040	(4.50)	0.237	(4.83)
FTC	α^{ftc}	-3.141	(-95.20)	-3.472	(-34.53)	-2.421	(-63.14)	-2.636	(-28.64)
	β^{ftc}	0.042	(6.01)	0.240	(4.97)	-0.088	(-10.48)	-0.097	(-1.97)
Kel Frosted Flakes									
False Claims	α^{false}	-2.948	(-113.72)	-2.823	(-50.24)	-3.280	(-93.79)	-3.604	(-47.43)
	β^{false}	0.057	(7.55)	0.056	(1.43)	-0.046	(-4.91)	0.038	(0.74)
FTC	α^{ftc}	-2.992	(-97.08)	-2.906	(-32.85)	-3.497	(-72.06)	-3.667	(-31.83)
	β^{ftc}	-0.055	(-7.35)	-0.098	(-2.35)	0.034	(3.41)	-0.081	(-1.34)
G M Cinnamon Toast Crunch									
False Claims	α^{false}	-3.457	(-111.55)	-2.805	(-45.64)	-3.658	(-88.01)	-2.728	(-30.95)
	β^{false}	0.011	(1.17)	0.227	(4.59)	-0.022	(-1.80)	0.094	(1.43)
FTC	α^{ftc}	-3.262	(-91.16)	-2.920	(-29.66)	-3.543	(-64.70)	-2.744	(-21.13)
	β^{ftc}	-0.018	(-2.16)	0.076	(1.57)	-0.028	(-2.40)	-0.031	(-0.46)
Kel Rice Krispies									
False Claims	α^{false}	-3.737	(-110.94)	-2.607	(-41.24)	-3.689	(-84.33)	-2.520	(-30.05)
	β^{false}	-0.074	(-7.39)	-0.064	(-1.26)	0.017	(1.36)	0.231	(3.63)
FTC	α^{ftc}	-3.405	(-92.55)	-2.404	(-22.92)	-3.822	(-61.06)	-2.466	(-18.85)
	β^{ftc}	-0.026	(-2.80)	-0.102	(-1.87)	0.062	(5.31)	0.018	(0.26)
Kel Raisin Bran									
False Claims	α^{false}	-3.227	(-116.80)	-4.569	(-70.78)	-3.454	(-88.83)	-4.373	(-50.52)
	β^{false}	0.125	(13.87)	0.147	(3.04)	0.004	(0.37)	0.163	(2.64)
FTC	α^{ftc}	-3.219	(-92.63)	-4.509	(-44.14)	-3.727	(-65.89)	-4.496	(-35.64)
	β^{ftc}	-0.081	(-8.95)	-0.124	(-2.46)	0.021	(1.79)	0.031	(0.45)
CTL BR Frosted Mini-Wheats									
False Claims	α^{false}	-3.832	(-92.19)	-5.870	(-75.07)	-3.600	(-80.72)	-5.452	(-51.11)
	β^{false}	0.025	(2.35)	0.089	(1.69)	0.049	(4.19)	0.030	(0.45)
FTC	α^{ftc}	-3.883	(-82.62)	-6.021	(-52.76)	-3.588	(-54.19)	-5.250	(-36.41)
	β^{ftc}	0.019	(1.87)	0.072	(1.35)	-0.044	(-3.51)	-0.119	(-1.74)
Log Likelihood		-1,057,463		-303,191		-630,688		-170,197	
Prices		Yes		Yes		Yes		Yes	
Ads		Yes		Yes		Yes		Yes	
N hh		28,328		24,777		24,748		13,889	
N obs		840,935		287,094		519,422		161,051	
Cluster		Household		Household		Household		Household	

Table 12: Demand Estimates: Yogurt (6-month, 2-month, Placebo)

		FTC Order				Placebo			
Window post-event		6-month		2-month		6-month		2-month	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Dannon Activia									
False Claims	α^{false}	-0.476	(-11.86)	-0.334	(-7.34)	-0.277	(-5.40)	-0.324	(-4.62)
	β^{false}	0.000	(0.02)	-0.018	(-0.56)	0.023	(3.31)	-0.031	(-0.80)
FTC	α^{ftc}	-0.430	(-10.96)	-0.052	(-0.78)	-0.246	(-4.53)	-0.261	(-3.40)
	β^{ftc}	-0.047	(-8.71)	-0.200	(-6.53)	-0.011	(-1.62)	0.012	(0.38)
Yoplait									
False Claims	α^{false}	-0.180	(-6.40)	-0.180	(-5.44)	-0.204	(-6.70)	-0.249	(-6.34)
	β^{false}	0.007	(1.35)	0.116	(3.78)	0.030	(4.67)	0.043	(1.39)
FTC	α^{ftc}	-0.233	(-8.39)	-0.155	(-2.20)	-0.047	(-1.30)	-0.247	(-4.12)
	β^{ftc}	-0.028	(-4.91)	-0.111	(-3.04)	-0.013	(-2.12)	0.052	(1.70)
Stonyfield									
False Claims	α^{false}	-1.102	(-14.19)	-0.867	(-9.97)	-21.329	(-412.16)	-22.374	(-315.13)
	β^{false}	0.011	(0.84)	-0.132	(-1.94)	-0.009	(-1.82)	9.875	(337.99)
FTC	α^{ftc}	-0.999	(-12.95)	-0.917	(-7.24)	-3.345	(-30.85)	-42.351	.
	β^{ftc}	-0.011	(-0.79)	0.084	(1.30)	0.449	(26.25)	19.575	(224.73)
Dannon									
False Claims	α^{false}	-1.027	(-33.82)	-1.038	(-29.54)	-1.188	(-31.34)	-1.193	(-24.61)
	β^{false}	-0.005	(-0.76)	-0.078	(-1.95)	-0.031	(-3.98)	-0.070	(-1.66)
FTC	α^{ftc}	-0.756	(-24.72)	-1.298	(-18.07)	-1.091	(-25.62)	-1.153	(-14.93)
	β^{ftc}	-0.004	(-0.60)	0.319	(8.11)	0.032	(4.08)	-0.010	(-0.24)
Yoplait Whips!									
False Claims	α^{false}	-1.169	(-17.50)	-0.954	(-13.09)	-0.367	(-5.15)	-0.439	(-4.88)
	β^{false}	-0.007	(-0.58)	-0.009	(-0.12)	0.017	(1.53)	-0.177	(-3.09)
FTC	α^{ftc}	-1.391	(-18.59)	-0.757	(-6.41)	-0.307	(-3.50)	-0.189	(-1.41)
	β^{ftc}	0.029	(2.22)	-0.263	(-4.14)	-0.049	(-3.54)	-0.147	(-2.27)
Chobani									
False Claims	α^{false}	0.067	(0.72)	0.433	(4.18)	-2.177	(-9.75)	-2.112	(-8.15)
	β^{false}	0.000	(0.00)	-0.171	(-2.57)	0.242	(2.58)	0.278	(1.06)
FTC	α^{ftc}	0.460	(5.54)	0.369	(3.00)	-2.358	(-12.37)	-2.398	(-6.83)
	β^{ftc}	0.023	(2.35)	0.302	(6.15)	0.227	(6.44)	0.029	(0.15)
Log Likelihood		-1,687,315		-550,189		-1,306,491		-379,070	
Prices		Yes		Yes		Yes		Yes	
Ads		Yes		Yes		Yes		Yes	
N households		26,404		21,019		24,657		17,797	
N observations		1,190,268		394,694		1,097,248		326,752	
Cluster		Household		Household		Household		Household	

Table 13: Demand Estimates: Yogurt Drinks (6-month, 2-month, Placebo)

		FTC Order				Placebo			
Window post-event		6-month		2-month		6-month		2-month	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Dannon Dan Active									
False Claims	α^{false}	2.000	(7.80)	2.002	(5.66)	0.291	(3.23)	0.282	(2.13)
	β^{false}	0.008	(0.24)	0.432	(2.61)	0.117	(6.40)	0.118	(1.32)
FTC	α^{ftc}	2.346	(9.16)	2.628	(5.61)	0.565	(5.22)	0.271	(1.40)
	β^{ftc}	-0.135	(-4.49)	-0.459	(-2.45)	-0.081	(-3.69)	0.091	(1.12)
Dannon Danimals									
False Claims	α^{false}	-0.765	(-4.15)	-0.673	(-3.04)	-2.131	(-16.65)	-2.280	(-14.73)
	β^{false}	-0.101	(-2.57)	0.285	(1.30)	0.045	(1.49)	-0.231	(-1.49)
FTC	α^{ftc}	-0.217	(-1.12)	-0.737	(-1.73)	-2.106	(-13.52)	-2.227	(-8.05)
	β^{ftc}	-0.068	(-1.87)	0.314	(1.47)	-0.050	(-1.58)	-0.115	(-0.69)
Lifeway									
False Claims	α^{false}	-1.180	(-6.00)	-0.936	(-4.40)	-3.038	(-13.37)	-3.049	(-12.06)
	β^{false}	0.066	(1.56)	0.570	(2.24)	0.030	(0.38)	0.118	(0.49)
FTC	α^{ftc}	-1.060	(-4.58)	-0.568	(-1.16)	-3.128	(-10.82)	-3.047	(-3.82)
	β^{ftc}	-0.015	(-0.36)	-0.366	(-1.39)	0.034	(0.66)	0.030	(0.07)
Stonyfield									
False Claims	α^{false}	-2.309	(-6.26)	-2.114	(-4.56)	-3.740	(-11.78)	-3.443	(-9.85)
	β^{false}	-0.077	(-0.93)	0.564	(1.07)	-0.041	(-0.45)	0.471	(1.00)
FTC	α^{ftc}	-1.842	(-4.13)	-1.579	(-2.55)	-3.428	(-9.19)	-4.916	(-7.26)
	β^{ftc}	-0.034	(-0.39)	-0.222	(-0.74)	-0.058	(-0.89)	0.845	(2.43)
Log Likelihood		-23,184		-7,699		-37,709		-12,007	
Prices		Yes		Yes		Yes		Yes	
Ads		Yes		Yes		Yes		Yes	
N households		2,741		1,550		4,388		2,521	
N observations		20,992		7,195		39,148		12,774	
Cluster		Household		Household		Household		Household	

Table 14: Demand Estimates: Nutritional Supplements (3-month Flu Season, Placebo)

		FTC Order		Placebo	
		3-month Flu season		3-month Flu season	
		Coeff	t-stat	Coeff	t-stat
Airborne					
False Claims	α^{false}	-1.351	(-8.91)	-1.247	(-11.38)
FTC	α^{ftc}	-1.891	(-12.68)	-1.514	(-12.77)
Nature Made					
False Claims	α^{false}	-2.635	(-16.93)	-2.734	(-23.49)
FTC	α^{ftc}	-2.616	(-17.68)	-2.815	(-22.23)
Nature's Bounty					
False Claims	α^{false}	-2.930	(-18.78)	-3.510	(-24.71)
FTC	α^{ftc}	-3.000	(-18.58)	-3.123	(-23.91)
Log Likelihood		-24,013		-25,629	
Prices		Yes		Yes	
Ads		Yes		Yes	
N households		5,725		6,093	
N observations		25,296		26,325	
Cluster		Household		Household	

B Heterogenous Demand Estimates

Table 15: Heterogenous Demand Estimates: RTE Cereal

		Loyal: θ_{loy}		New: θ_{new}	
		Coeff	t-stat	Coeff	t-stat
Kel Frosted Mini-Wheats					
False Claims	α^{false}	-0.876	(-37.56)	0.039	(1.22)
	β^{false}	0.012	(6.42)	0.051	(16.38)
FTC	α^{ftc}	-0.875	(-36.65)	-0.149	(-4.87)
	β^{ftc}	-0.019	(-20.67)	0.004	(3.45)
G M Cheerios					
False Claims	α^{false}	0.629	(17.56)	-0.187	(-4.92)
	β^{false}	-0.070	(-35.36)	-0.024	(-7.97)
FTC	α^{ftc}	0.448	(13.21)	-0.059	(-1.66)
	β^{ftc}	-0.007	(-7.66)	0.000	(-0.38)
G M Honey Nut Cheerios					
False Claims	α^{false}	-0.292	(-9.28)	-0.115	(-2.89)
	β^{false}	-0.012	(-5.54)	-0.004	(-1.01)
FTC	α^{ftc}	-0.211	(-7.52)	-0.090	(-2.78)
	β^{ftc}	0.019	(21.44)	0.000	(0.20)
Post Honey Bunches of Oats					
False Claims	α^{false}	-1.501	(-45.90)	-0.235	(-4.93)
	β^{false}	-0.012	(-5.59)	-0.014	(-3.99)
FTC	α^{ftc}	-1.246	(-40.01)	-0.115	(-2.80)
	β^{ftc}	-0.014	(-12.77)	0.001	(0.90)
Kel Frosted Flakes					
False Claims	α^{false}	-1.404	(-46.28)	0.022	(0.54)
	β^{false}	0.021	(9.21)	0.006	(1.74)
FTC	α^{ftc}	-1.787	(-60.42)	-0.008	(-0.21)
	β^{ftc}	0.032	(28.86)	0.001	(1.04)
G M Cinnamon Toast Crunch					
False Claims	α^{false}	-1.412	(-38.52)	0.010	(0.21)
	β^{false}	-0.024	(-8.84)	-0.002	(-0.38)
FTC	α^{ftc}	-1.281	(-38.12)	0.062	(1.53)
	β^{ftc}	0.008	(7.07)	0.002	(1.42)
Kel Rice Krispies					
False Claims	α^{false}	-1.137	(-31.64)	-0.040	(-0.86)
	β^{false}	-0.037	(-14.08)	0.000	(-0.11)
FTC	α^{ftc}	-1.056	(-30.88)	0.065	(1.62)
	β^{ftc}	-0.011	(-9.35)	0.000	(-0.11)
Kel Raisin Bran					
False Claims	α^{false}	-3.025	(-82.39)	-0.146	(-2.85)
	β^{false}	-0.001	(-0.27)	-0.003	(-0.58)
FTC	α^{ftc}	-2.889	(-83.93)	-0.133	(-2.97)
	β^{ftc}	-0.007	(-5.94)	0.002	(1.05)
CTL BR Frosted Mini-Wheats					
False Claims	α^{false}	-2.264	(-43.21)	-0.154	(-2.01)
	β^{false}	0.008	(2.17)	-0.004	(-0.74)
FTC	α^{ftc}	-2.065	(-42.43)	-0.131	(-2.00)
	β^{ftc}	-0.008	(-4.94)	0.000	(0.17)
Log Likelihood		-5,718,196			
Prices		Yes			
Ads		Yes			
N hh		44,544			
N obs		5,177,394			

*Note: the parameters for those who did not purchase prior to the claim: $\theta_{\text{loy}} + \theta_{\text{new}}$

C Ad Regressions

Table 16: Advertising regressions: RTE Cereal

	Duration (hours)		Ad Spend ($)		Frequency	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Kel Frosted Mini-Wheats						
Change after FTC order, γ_{post}	0.704	(1.34)	-67067	(-0.40)	60.54	(0.94)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-0.969	(-1.27)	-149217	(-0.62)	-116.16	(-1.24)
G M Cheerios						
Change after FTC order, γ_{post}	1.352	(2.40)	533657	(4.34)	15.85	(0.14)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	3.063	(3.85)	974471	(5.60)	374.75	(2.33)
G M Honey Nut Cheerios						
Change after FTC order, γ_{post}	0.351	(1.39)	285634	(3.82)	3.87	(0.08)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.933	(2.61)	488107	(4.61)	131.30	(1.95)
Post Honey Bunches of Oats						
Change after FTC order, γ_{post}	0.942	(3.20)	93730	(0.88)	255.76	(4.37)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	1.591	(3.87)	139299	(0.94)	388.85	(4.75)
Kel Frosted Flakes						
Change after FTC order, γ_{post}	-0.784	(-2.53)	-306545	(-2.38)	-115.90	(-2.91)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.127	(0.29)	92404	(0.51)	5.93	(0.11)
G M Cinnamon Toast Crunch						
Change after FTC order, γ_{post}	-0.135	(-0.81)	-60057	(-1.07)	-56.52	(-1.48)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.334	(1.43)	158528	(1.99)	60.60	(1.12)
Kel Rice Krispies						
Change after FTC order, γ_{post}	0.149	(0.37)	-74396	(-0.74)	15.64	(0.32)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.859	(1.47)	137779	(0.94)	103.14	(1.46)

Table 17: Advertising regressions: Yogurt

	Duration (hours)		Ad Spend ($)		Frequency	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Dannon Activia						
Change after FTC order, γ_{post}	-0.098	(-0.14)	25414	(0.14)	110.07	(1.15)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-2.186	(-2.29)	-30751	(-0.12)	-161.66	(-1.22)
Yoplait						
Change after FTC order, γ_{post}	0.138	(0.48)	-39653	(-0.42)	14.78	(0.30)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-0.972	(-2.49)	-368999	(-2.90)	-178.20	(-2.63)
Stonyfield						
Change after FTC order, γ_{post}	0.169	(5.09)	2724	(2.08)	20.22	(5.09)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.203	(4.34)	4460	(2.41)	24.39	(4.34)
Dannon						
Change after FTC order, γ_{post}	1.997	(1.22)	50235	(0.10)	618.75	(2.43)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-1.979	(-0.89)	-523520	(-0.78)	-266.37	(-0.77)
Yoplait Whips!						
Change after FTC order, γ_{post}	-0.210	(-2.05)	-89882	(-2.00)	-43.84	(-1.96)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-0.129	(-0.92)	-99916	(-1.61)	-31.05	(-1.01)
Chobani						
Change after FTC order, γ_{post}	0.209	(1.37)	351	(0.00)	25.13	(1.38)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.336	(1.58)	163916	(0.37)	40.35	(1.59)

Table 18: Advertising regressions: Yogurt Drinks

	Duration (hours)		Ad Spend ($)		Frequency	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Dannon Danimals						
Change after FTC order, γ_{post}	-0.337	(-2.95)	-53913	(-2.85)	-46.05	(-2.87)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-0.035	(-0.22)	-10608	(-0.41)	-4.21	(-0.19)

Table 19: Advertising regressions: Nutritional Supplements

	Duration (hours)		Ad Spend ($)		Frequency	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Airborne						
Change after FTC order, γ_{post}	-0.096	(-0.67)	-2470	(-0.04)	-18.73	(-0.94)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-0.325	(-1.59)	-108946	(-1.28)	-74.35	(-2.63)
Nature Made						
Change after FTC order, γ_{post}	0.117	(0.28)	-37616	(-0.52)	-41.67	(-1.15)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	-1.877	(-3.37)	-237679	(-2.43)	-131.42	(-2.67)
Nature's Bounty						
Change after FTC order, γ_{post}	-0.039	(-1.71)	-29523	(-1.44)	-7.32	(-1.85)
Change relative to Pre period, $\gamma_{post} - \gamma_{pre}$	0.001	(0.03)	369	(0.01)	0.11	(0.02)