

# **An Empirical Cross-Category Analysis of Effects of Food Advertising Strategies on Product Sales**

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## **Acknowledgements**

The authors appreciate the support by grants from the Social Sciences and Humanities Research Council of Canada.

## **Abstract**

We obtained a sample of 85 food commercials in nine food categories, and analyzed their contents according to prior literature. We coded the advertising strategies in these commercials into 14 items in three broad categories: product attributes highlighting, beliefs highlighting, and appeals. Then we linked the commercials to retail sale data. Using a hierarchical linear model, we were able to estimate the short term direct effects of TV advertising strategies on product sales and the moderating effects of advertising strategies on price elasticity and in-store promotion sensitivity of advertised product. We also found the effects vary across food categories.

***Keywords: advertising, sales, cross-category.***

## **Introduction and Objectives**

Advertising can influence consumer demand in many ways. Becker and Murphy (1993) and Erdem, Keane, and Sun (2008) argued that advertising can increase consumer willingness to pay and hence lift demand. Advertising was also shown to influence price elasticity for a product so that consumers become more or less price sensitive (Maurizi 1972; Steiner 1973; Cady 1976). We extend the literature by investigating how various strategies (or elements) of TV advertising influence either demand or price and promotion elasticities using real world TV commercials and linked product sales data. We obtained a sample of 85 food commercials in nine food categories, and coded their contents into 14 items under three broad categories: product attributes highlighting, beliefs highlighting, and appeals. Then we used a hierarchical linear model to estimate the short term (4 weeks) direct effects of TV advertising strategies on product sales and the moderating effects of advertising strategies on price elasticity and in-store promotion sensitivity of advertised product. We found not all advertising strategies are appropriate for all product categories, and some are more effective than others. These findings can help advertising managers identify the optimal advertising strategies.

## **Research Questions**

We answer the following research questions: how do advertising strategies influence price and promotion elasticities in food purchases?

## **Research Model - Identifying advertising strategies in TV food advertisements**

We tracked all TV food commercials that were aired on French TV channels during April 2013 in Montreal, Canada. From the set, we identified 85 commercials for products in yogurt, milk, fruit juice, cold cereal, hot cereal, energy drinks, chocolate candy, candy, carbonated soft drinks. These categories were selected to overlap with our existing retail sales data, and these advertisements are identified as being new commercials – the corresponding products did not receive other commercials within a month. We acquired the videos and campaign information for these selected food commercials.

In order to build the schema for content analysis of the advertisements, two university professors along with one PhD student derived as many items, i.e. questions to be asked, as possible in order to code commercials' content. Furthermore, literature review on peer-reviewed journal publications in marketing, advertisement and food journals on EBSCO database was performed to enrich the list. Thirteen peer reviewed papers in marketing and advertising context and six peer reviewed papers in food context were found to be very closely related to this project (the list is available upon request from the authors). The items used for content analysis of advertisements from these papers were also added to initial items. After deleting duplicates, we categorized items into three main sections: product attributes (what attributes is advertised); beliefs, values, and goals highlighted in ads (how it is advertised); and appeal strategies.

We hired two coders (undergraduate students) who were proficient in French language. We trained the coders in using the content analysis schema and asked them to code the commercials, after viewing the commercials as many time as needed, and independently. Each coder coded and wrote down scripts of all eighty-five advertisements in six weeks. To avoid any bias, coders did not receive any further guidelines after training. The coded results

agreed 79% of instances between the two coders, giving us a reasonable inter-coder reliability. Finally, the two coders met and reached an agreement on the coding. In the following, we briefly discuss the results of content analysis.

### *Product attributes*

The most advertised attribute of product is convenience of preparation/consumption, used in 71 ads. Ingredients of products are the second most advertised attribute of food products, used in 54 ads. Advertising naturalness/purity/being real with no additives or hormones is the third most frequent in food advertisement, used in 44 ads. Texture and taste are the next most frequent advertised attributes of food products.

### *Beliefs, values, and goals*

Generally, convenience (44 ads) was the most frequently highlighted value/belief in the ads, followed by naturalness (43 ads) and pleasure (39 ads). Healthiness and freshness are empathized only for certain categories.

### *Appeals*

Emotional appeal is frequently used, in 63 ads. Informational appeals are the next most used type of appeals in 53 ads.

[ Insert Table 1 about here ]

## **Method - Estimating the market impact of TV advertising strategies**

To evaluate the effectiveness of those advertising strategies, we look at the change of the target product's sales before and after the broadcasting of these TV advertisements. A successful advertisement should lead to an immediate increase in sales of the target product, after controlling for other market factors. Furthermore, different advertising strategies might have different degree of persuasiveness, and that should reflect in the change of sales as well as sensitivity to other marketing promotions. We propose a short-term market response model that looks at how advertising strategies influence sales, and how the different advertising strategies moderate price and promotion sensitivities.

### *Market Response Model and Data*

We obtained weekly sales data from Nielsen Canada that contains nice categories. We were able to match product items (UPCs) to each individual advertisement. Multiple product items could be under the influence of the same advertisement if they all belong to a brand. For each product, we can observe the weekly sales, price, in-store promotion of all the matched products of all stores in the five major grocery chains in Montreal. Since Montreal is a bilingual city and all the advertisements are broadcasted in French, we use census data to select French-speaking neighbourhoods (with 80% or more French speakers), and then only look at product sales from stores in those neighbourhoods. Fifty-three stores are identified through this process. We focus on the four weeks before and the four weeks after the introduction of each advertisement.

In our sample, sale of carbonated soft drink category was the highest amongst all food categories. Candy, chocolate candy and cold cereal were also categories with large sales. Chocolate candy products were most frequently put on in store promotion among all categories, while milk shows the least promotion activities (there are legal requirement regarding milk pricing in Quebec). Price per serving of products in energy drink category was the highest in our sample, while hot cereal and carbonated soft drinks had the lowest price per serving

To capture the effect of advertisement on product sales, we specify a Hierarchical Linear Model (HLM) that explain a product sales volume (in terms of standardized serving size defined by FDA) by the following equations:

$$Y_t = \beta_0 + B_1 \text{LogPrice} + B_2 \text{In-StorePromo} + B_3 \text{Ad} + Z_t\theta + v_t \quad (1)$$

$$B_i = \beta_{i0} + \beta_{i1} \text{Ad Strategies} + \omega_i; i = 1, 2, 3. \quad (2)$$

where  $Y_t$  is the stacked vector of the log sales of all product  $i$  in store  $s$  at time  $t$ .  $X_t$  is a matrix consisting of an constant, log price, in-store promotion dummies (it is set to 1 if a product item was under in-store promotion, and 0 otherwise), and a dummy AD to indicate whether this is before (AD=0) or after the advertisement was aired (AD=1).  $Z_t$  is a matrix composed of control variables such as product dummies, socioeconomic status variables such as income, proportion of French speakers, proportion of resident with lower education than high school, neighborhood population size, and store dummies.  $v_t$  is error term.  $B_{1-3}$  measures the effect of price, promotion and advertising on sales, and they are further assumed to be a function of advertising strategies. Therefore, Ad Strategies is a vector of dummy variables indicating various advertising strategies identified previously. The estimated coefficients of  $\beta_1$  and  $\beta_2$  show the effect of advertising strategies on customer's price sensitivity and in-store promotion sensitivity respectively, and estimated coefficients of  $\beta_3$  show the main effect of various advertisement strategies on sales.

In order to get reliably estimates, we limit our attention to advertising strategies that are frequently used. We only used advertising strategies with more than half of frequencies in each category (attributes, beliefs, appeals) in our model. Moreover, not all strategies we have coded were present in every single category. Therefore, we were only able to estimate the impact advertising strategies employed by a category. Finally, at category level, it is possible for multiple strategies to always be used simultaneously by advertisements, therefore, we had to eliminate strategies with strong multicollinearity within each category.

## Findings and Discussion

We estimated the proposed HLM model for each category separately using STATA. All models converged properly. The details of the estimation results and model fits statistics are available from the authors upon request.

The coefficients of prices are negative and significant in all categories except milk. The estimated price elasticity is highest for juice at -3.45, followed by cereal at -3.27. Milk has an insignificant price elasticity – it is not surprising since Quebec government sets a minimal

price for milk and stores are not allowed to price below it. The coefficients for store promotion are significant and positive in most categories except milk, which also give face validity to the model. Energy drink shows the highest tendency to benefit from in-store promotion. We did not observe in-store promotion of milk in our data so it is not possible to identify the in-store promotion sensitivity for it. Regarding other control variables, percentage of French speakers in the neighborhood have negative and significant effect on sales in all categories except energy drink and candy, Income has significant negative effect on sale of all categories except energy drink. Percentage of low education population significantly increases sale of carbonated soft drinks, candy, chocolate candy, energy drink and hot cereal, while significantly decreases sale of cold cereal, milk and yogurt.

Our main focus is on the effects of advertising strategies across categories on sales, price elasticity and in-store promotion sensitivities respectively. Table 2-3 summarize the main findings. A positive effect is indicated with +, a negative effect is indicated by -, and insignificant effects are indicated by 0 s. Blank cells mean that we were not able to estimate the effect, due to multicollinearity with other advertisement attributes or lack of variations within a category.

[ Insert Table 2 about here ]

Table 2 shows main effects of advertisement attributes on sale of food categories. We found that advertising product attributes tend to produce a large effect on sales than advertising highlighted beliefs. Among product attributes, texture has the most significant positive effect on sale. It has significant and positive impact on three categories. Easiness to prepare has positive impact on two categories. At the same time, mentioning ingredients seems to have the opposite effects – it decreases sales in three categories. Among highlighted beliefs in ads, unity/affiliation with others was found to have significantly positive impact on sales of two categories. Naturalness belief has a positive effect on sales in one category, while joy/pleasure belief has a negative effect. Regarding appeals, informational appeal increases sales while emotional appeal decreases the sales.

[ Insert Table 3 about here ]

Table 3 shows the moderating effects of advertising strategies on price elasticity across different food categories. Product attributes have the biggest impact on price elasticity, followed by highlighted beliefs and then appeals. Among product attributes, texture has the most positive effects on price elasticity, increasing price elasticity in candy and yogurt, making customers less price sensitive, and decreasing it in chocolate candy, making customers more price sensitive. Advertising ingredients of products decreases price elasticity in yogurt and increases it in milk and juice. Taste seems to have differential effect, increasing price elasticity in chocolate candy while decreasing price elasticity in milk. Highlighting certain beliefs in ads also changed price elasticity. Unity/affiliation with others was found to increase price elasticity in milk, making customers less price sensitive. Highlighting joy/pleasure increases price elasticity in chocolate candy, while highlighting naturalness decreases price elasticity in yogurt, making customers more price sensitive. Regarding appeals, we only found significant effects for emotional appeal, positive for energy drink and negative for chocolate candy.

Regarding the moderating effects of advertisement attributes on in-store promotion sensitivity across different food categories (the table was omitted due to space limitation), only product attributes showed significant influences. Advertising taste has the most significant effect -- increased in store promotion sensitivity in three categories. Advertising ingredients was also able to increase promotion sensitivity in two categories.

### **Conclusion and limitations**

We analyzed the impact of popular TV food advertising strategies on food sales. We identified product attributes, beliefs, and appeal strategies used in selected TV commercials, and compared the effectiveness of advertising strategies across several categories of consumer packaged food and beverage products. We showed that popular advertising strategies have significant impact on product sales through main effects on sales and through moderating effects on price sensitivities and in-store promotion sensitivities. The main and moderating effects also exhibit significant variations across categories.

Since this is a field study and we used real world commercials and product sales data, it is potentially possible for advertising managers to learn from their experience and optimize advertising strategies when they designed these commercials. To address the potential endogeneity, future studies should consider randomized advertising design and validate the results in lab and fields. Future studies should also examine why certain strategies are more effective than other in certain categories due to the nature of category (such as hedonism or utilitarian) and the perception of products (healthy or unhealthy).

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Table 1: List of Identified Advertising Strategies

1. Product Attributes	2. Beliefs, values and goals	3. Appeals
Taste	Convenience	Emotional
Ingredients	Unity/Affiliation	Informational
Texture	Natural	
Easy to Prepare	Health/Fit	
Natural	Enjoying/Pleasure	
Innovation	Freshness	



Table 2: Comparison of Main Effect of Advertisement Attributes on Sales across Categories

	CS D	Cand y	Chocolat e Candy	Cold Cereal	Energ y Drink	Hot Cereal	Juic e	Mil k	Yogur t
<b>Attributes of Product</b>									
Taste	-	0	-	0			0	-	0
Ingredients		0	+				-	-	-
Texture	+	+	+			0			-
Easy to use/prepare	+		-				+	0	0
Natural			+					0	0
Pioneer			-						0
<b>Highlighted Beliefs</b>									
Convenience			0						0
Unity/affiliation			+					+	0
Nature/Natural								0	+
Health/Fit									0
Enjoying/Pleasure			-						0
Freshness									0
<b>Appeals Used</b>									
Emotional appeal			0		-			0	
Informational appeal			+						

Table 3: Comparison of Moderating Effects of Advertisement Attributes on Price Elasticity across Categories

	C S D	Cand y	Chocolat e Candy	Cold Cereal	Energ y Drink	Hot Cerea l	Juic e	Mil k	Yogu rt
<b>Attributes of Product</b>									
Taste		0	+	0			0	-	0
Ingredients		0	0				-	-	+
Texture	0	+	-			0			+
Easy to use/prepare	0		+				0	0	0
Natural			-					0	0
Pioneer			+						0
<b>Beliefs Highlighted</b>									
Convenience			0						0
Unity/affiliation			0					+	0
Nature/Natural								0	-
Health/Fit									0
Enjoying/Pleasure			+						0
Freshness									0
<b>Appeals Used</b>									
Emotional appeal			-		+			0	
Informational appeal			0						