

Abstract

The study explores the impact of brand-level information contained in media advertising on consumer decision-making when purchasing non-durable experience goods. Utilizing a random coefficient discrete-choice model on the ready-to-eat cereal industry, I consider the effects of advertising via nationwide media on consumer choices. Building on previous studies, I propose a new group of instrumental variables for addressing endogeneity and incorporating demographic household information on the consumers who purchased.

Introduction

Consumer decision-making has been a concern for decades. If we consider the **price** as a characteristic of a product, then it becomes a question of **if other characteristics can also be an influential factor**.

Advertising is one method that can deliver information to consumers, which, in turn, affects decisions. This study examines the effects of **advertising-related** features on consumers' decisions, in addition to the **characteristics of products**.

Moreover, the process of determining which products to purchase depends **not only on the attributes of the products but also on demographics that will influence the decision-making process**.

I focus on non-durable experience goods in this study, specifically the ready-to-eat cereal market. I aim to answer the question, "**How do advertisements influence consumers' choices of non-durable experience goods in the mass media channels?**" using the random coefficient discrete-choice model and the ready-to-eat cereal as a sample product category.

Empirical Model

To test the impact of advertising on consumer choice, in addition to using a simple logit model, a structural model at the brand-level is established based on BLP¹, Nevo², and Akerberg³'s choice models.

Logit Model

$$U_j = X_j\beta + A_j\gamma - \alpha P_j + \epsilon_j \quad (1)$$

Full Model

$$U_{ijt} = X_{jt}\beta_i + A_{jt}\gamma_i - \alpha_i P_{jt} + \xi_{jt} + \epsilon_{ijt} \quad (2)$$

- U_{ijt} is the utility of a household i choosing a brand j in a market t ;
- P_{jt} , X_{jt} , and A_{jt} are vectors prices, brand characteristics, and advertisement characteristics of a brand j in a market t ;
- ξ_{jt} is unobserved characteristics of brands consisting of latent features that cannot be captured in data but impact consumers' decisions.

Noted that a **market t** is defined in time dimension as a **year-month** observation.

Following Nevo's methodology on household characteristics using real data distribution, estimated **consumers' taste parameters**, $(\alpha_i, \beta_i, \gamma_i)$, can be modeled as,

$$\begin{pmatrix} \alpha_i^* \\ \beta_i^* \\ \gamma_i^* \end{pmatrix} = \begin{pmatrix} \alpha \\ \beta \\ \gamma \end{pmatrix} + \Pi D_i + \Sigma v_i, \quad (3)$$

where Π and Σ are matrices of coefficients, D_i captures the observed distribution of household characteristics, and v_i is independently and identically distributed, capturing the unobserved household characteristics

Data

Household-level data and advertising data were collected by Nielsen in collaboration with the **Kilts Marketing Data Center** at the University of Chicago, Booth School of Business. There are 39 brands covered in this study, from 3 firms that account for more than 80% market share in Texas from 2015 to 2019

Table 1. Summary of Variables

Household		Brand		Advertising	
Income	Annual income per household members (\$ 10K)	Nutrition	Market	Advertising	A dummy variable equals 1 when a brand has ads within a month.
		Protein	Price (per ounce)		
Kid	A dummy variable equals 1 when a household has at least one kid.	Fat	Market Share	Commercial duration	The monthly average duration of brand commercials
		Carbohydrate (grams per serving)		Media types	Number of media channels a brand advertised in

Endogeneity Problem

Two groups of instruments are used

IV _{BLP}	BLP ¹ and Berry ⁴ 's IVs & advertng spending variable
	New introduced instruments
IV _P	<ul style="list-style-type: none"> • The price of a brand in the market (t-12) • Sums of prices of other brands from the same firm in the market (t-12); • Sums of prices of brands from different firms in the market (t-12).

Logit Results

The simple logit model is a two-stage least squares regression of $\ln(s_j) - \ln(s_0)$, where s_j is the market share of a brand j and s_0 is the market share of outside goods, which are alternatives of 39 brands inside the data.

The first-stage adjusted R-squared for instrumental variable regression as shown below:

	(i)	(ii)	(iii)
IV _{BLP}	Yes		Yes
IV _P		Yes	Yes
<i>Shea's Adj. Partial R²</i>			
Advertising Dummy	0.775	0.010	0.784
ln(Price)	0.392	0.552	0.671

Notes: all tests include firm fixed effect.

Full-Model Results

Full model results are regressed from equation (2) by interacting with household demographics.

	Mean	SD	Interactions with Demographic Variables	
			Income	Kid
ln(Price)	-7.354*** (2.794)	0.034 (2.901)	1.072*** (0.308)	7.515*** (1.661)
Protein	3.443 (2.408)	0.000 (2.476)	-0.455 (0.377)	-6.256*** (1.311)
Fat	-0.195 (0.167)	0.010 (1.108)	-0.039* (0.020)	1.040** (0.326)
Carbohydrate	-0.113 (4.139)	1.349 (1.385)	-2.412* (0.981)	6.984* (3.213)

However, the full-model results do not present a statistically significant estimations on advertising-related variables. Possible reasons for statistically insignificant estimates: low variation over markets, and high heterogeneity between advertised and unadvertised brands. A further test is conducted for testing advertised brands only:

	Mean	SD	Interactions with Demographic Variables	
			Income	Kid
ln(Price)	-2.686*** (0.770)	0.061 (2.338)	0.180 (0.327)	4.929** (1.848)
Protein	0.264 (0.598)	0.000 (2.437)	-0.103 (0.282)	-4.792*** (1.201)
Fat	-0.155 (0.237)	0.008 (0.511)	0.058 (0.117)	-0.230 (0.209)
Carbohydrate	-4.699 (2.787)	0.000 (13.467)	1.624* (0.743)	-27.719*** (8.075)
Commercial Duration	-10.186 (9.853)	4.798* (2.134)	1.343 (1.640)	-2.192 (6.818)
Media Types	1.801** (0.586)	0.000 (1.000)	-0.342 (0.348)	-3.865*** (1.069)

Conclusion & Contribution

Conclusion

- Advertising on more media channels can help brands improve brand awareness;
- Brands with advertisements should be careful in marketing kids-orientated products about carbohydrate-related features;
- Consumers are less sensitive to the price of advertised brands, which implies that brand awareness and loyalty could be built through advertisements.

Contribution

- Applying advertising into a structural random coefficient discrete choice model
- Introducing new instrumental variables
- Using actual consumer purchasing data and panel data

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