Consumer Response to Package Downsizing: An Application to the Chicago Ice Cream Market

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Introduction

- Package downsizing is the practice of reducing the volume of product per package such that the new size replaces the old one.
- Downsizing is commonly observed in U.S. consumer goods markets, and has been especially common in food manufacturing.

- **Objective:** To provide empirical evidence on the economic reasons and consequences of downsizing.

Research Questions

- **What is the consumer response to downsizing?**
- **How does it compare to the consumer response to price changes?**

The US Bulk Ice Cream Industry

Brand	1998	2004	2007
	Size (Oz.)		
NB 1	64.00	56.00	54.83
NB 2	64.00	56.23	56.00
SB 1	64.00	62.62	60.47
NB 3	64.00	56.11	56.00
NB 4	64.00	64.00	64.00
SB 2	64.00	64.00	56.00
NB 5	64.00	61.35	58.67
NB 6	64.00	56.00	56.00
NB 7	64.00	57.67	57.97
NB 8	64.00	63.45	61.78
NB = National Brand			
SB = Store Brand			
Source: Nielsen Homescan			

Year	Natioanal Brand 1			National Brand 2		
	Price per Package (dollars)	Price per Oz. (dollars)	Size (Oz.)	Price per Package (dollars)	Price per Oz. (dollars)	Size (Oz.)
2000	3.330	0.053	62.45	3.451	0.054	64.00
2001	3.345	0.054	63.70	3.520	0.055	63.49
2002	3.200	0.056	57.02	3.451	0.056	61.33
2003	3.208	0.056	57.24	3.469	0.061	56.59
2004	3.375	0.060	56.00	3.353	0.060	56.23

Source: Nielsen Homescan

- Typical of oligopolistic differentiated product markets.
  - Top 6 brands account for the half market.
  - Downsizing is frequently observed.
  - Unit price changes with downsizing.

The Data

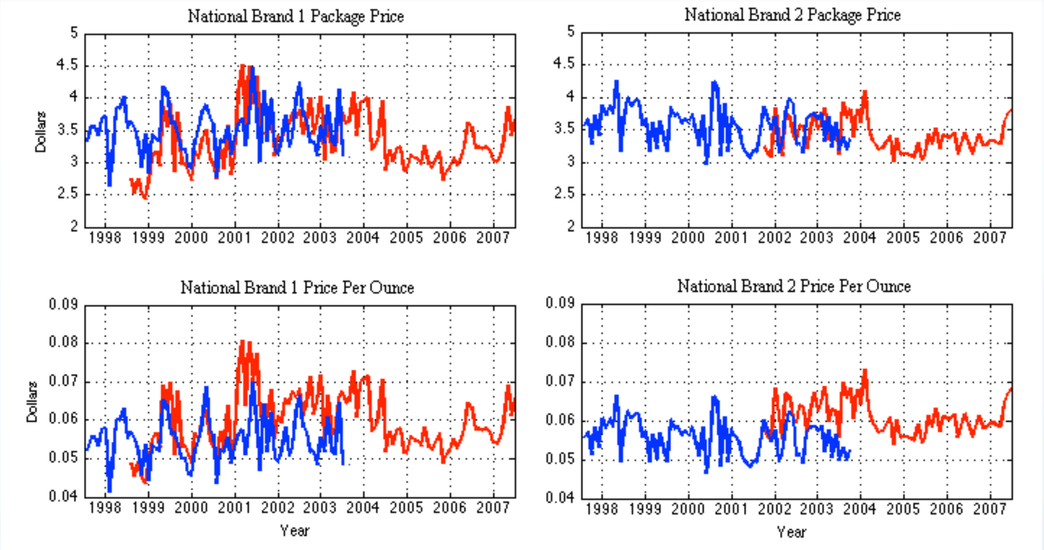
- A panel of households on half gallon ice cream purchases in Chicago, 1998-2007, provided by Nielsen Homescan.
- Four major brands: Three national brands, one store brand
- Information on price, package size, promotion and household demographics.

Descriptive Statistics

Brand	Choice Share	Price (Dollars)	Package Size (1/2 gal.)	Promotion (Percentage)
National Brand 1	0.26	3.36	0.91	76
National Brand 2	0.23	3.44	0.92	79
Store Brand 2	0.04	3.17	0.96	75
National Brand 8	0.17	3.10	0.99	80

Source: Nielsen Homescan

The Package and Unit Price Trends of Top Two Brands in Chicago, 1998-2007



The Econometric Model

- A simultaneous demand and supply model of market with differentiated products.
  - Demand: random coefficient logit
  - Supply: reduced form
- The model incorporates consumer heterogeneity, controls for price endogeneity, and copes with unbalanced panel nature of data.
- **Estimation:** We adapt a Bayesian approach for estimation.

Results

- Average price elasticity of bulk ice cream demand is -0.5
- Average package size elasticity is 0.12
- Store brand's pricing affects national brands' demand considerable less than the effect of national brands' pricing on store brand's demand.
- In the event of downsizing households switch more heavily to larger products.
- Households sensitivity to price and package size changes varies by demographics
  - Smaller households, households with higher income and education are less sensitive to price changes
  - Households with an employed household head are less sensitive to package size changes

Posterior Mean and (SD) of Price Elasticities

	N. Brand 1	N. Brand 2	S. Brand 2	N. Brand 8
N. Brand 1	-0.497	0.231	0.028	0.237
	(0.150)	(0.086)	(0.008)	(0.063)
N. Brand 2	0.225	-0.448	0.025	0.197
	(0.091)	(0.152)	(0.009)	(0.059)
S. Brand 2	0.189	0.169	-0.519	0.160
	(0.055)	(0.052)	(0.134)	(0.043)
N. Brand 8	0.312	0.273	0.029	-0.615
	(0.081)	(0.069)	(0.008)	(0.152)

Posterior Mean and (SD) of Package Size Elasticities

	N. Brand 1	N. Brand 2	S. Brand 2	N. Brand 8
N. Brand 1	0.108	-0.054	-0.006	-0.048
	(0.011)	(0.015)	(0.002)	(0.013)
N. Brand 2	-0.058	0.110	-0.007	-0.045
	(0.005)	(0.009)	(0.002)	(0.014)
S. Brand 2	-0.040	-0.042	0.121	-0.039
	(0.014)	(0.015)	(0.025)	(0.014)
N. Brand 8	-0.076	-0.065	-0.008	0.149
	(0.015)	(0.015)	(0.002)	(0.012)

Conclusion

- Consumers are less responsive to package size than to package price: the demand elasticity with respect to package size is approximately one-fourth of the magnitude of the demand elasticity with respect to price.
- Manufacturers can use downsizing as a hidden price increase in order to pass through increases in production costs, i.e., cost of raw materials, and maintain or increase their profits.