Market Share and Pricing Determination in the Ready-to-Eat Cereal Industry

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May 1st, 2018

Introduction

- Grocery is generally characterized as retail/imperfectly competitive by Economists
- Cereal has one of the highest price-cost margins in the grocery store
- This calls into question the use of price collusion which would indicate an Oligopoly structure
- This research aims to create a regression model to give insights to determining market power in the cereal industry

Data

- Data was given by Dr. M.J. Kim from a previous research collaboration.
- The data frame covers over 45,000 records products with 134 variables, and 18 parent companies
- It spans a 95 week time period between 2001 and 2003
- The final model will be aggregated over the 95 week period using products from the 4 largest parent brands

Method

- All empirical exercises were done in R
- Equations are aggregated by product description (i) per week (t)
- Variables contributing to market share were determined through:
  - Visualizations like ggplot and summary statistics
  - Findings from the literature review
  - Correlation testing
  - Simple linear regressions between pairings of variables
- First, a regression model was run to determine a price estimate
  - Variables used: product characteristics and cost inputs
- Second, a regression was run to determine market share
  - Variables used: predicted price from the first regression and product characteristics

Method

Pricing Estimation Model

$$\widehat{P_{it}} = \beta_1 X_{calories} + \beta_2 X_{carbs} + \beta_3 X_{protein} + \beta_4 X_{size} + \beta_5 X_{sugar} + \alpha_1 C_{corn} + \alpha_2 C_{gas} + \alpha_3 C_{wheat} + \alpha_4 C_{sugar} + \alpha_5 C_{electricity} + \alpha_6 C_{labor}$$

Method

Market Share Equation

$$MS_{it} = log(UnitSales_{it}/Population_t) - log((Population_t - UnitSales_{it})/Population_t)$$

Market Share Prediction Model

$$MS_{it} = \beta_1 X_{calories} + \beta_2 X_{carbs} + \beta_3 X_{protein} + \beta_4 X_{size} + \beta_5 X_{sugar} + \alpha_1 \widehat{P_{it}}$$

Findings

Table: Pricing Regression Results

	Dependent variable:
	Pricing
Calories	0.0005^{***} (0.0002, 0.001)
Carbs	0.007^{***} (0.006, 0.009)
Protein	-0.014^{***} (-0.019, -0.009)
Box Size	0.063^{***} (0.061, 0.064)
Sugar Content	-0.005^{***} (-0.007, -0.003)
Corn (Input)	0.108 (-0.065, 0.280)
Gas (Input)	-0.160^{**} (-0.280, -0.041)
Wheat (Input)	-0.030 (-0.075, 0.016)
Sugar (Input)	-0.034^{***} (-0.044, -0.023)
Electrictiy (Input)	-0.058 (-0.150, 0.035)
Labor	0.360^{***} (0.219, 0.502)
Constant	-3.459^{**} (-5.677, -1.240)
Observations	37,047
R^2	0.142
Adjusted R^2	0.142
Note:	*p$<$0.1; **p$<$0.05; ***p$<$0.01

Findings

Table: Market Share Regression Results

	Dependent variable:
	Yit
Calories	-0.001***
	(0.0004)
Carbs	0.031***
	(0.002)
Protein	-0.071***
	(0.007)
Box Size	0.103***
	(0.008)
Sugar	0.051***
	(0.003)
Price	-2.684***
	(0.124)
Constant	-1.940***
	(0.182)
Observations	37,047
R^2	0.064
Adjusted R^2	0.064
Residual Std. Error	2.533 (df = 37040)
F Statistic	420.199*** (df = 6; 37040)
Note:	*p<0.1; **p<0.05; ***p<0.01

Conclusion

- As expected, price and market share have an inverse relationship
- Price and market share have different relationships with some product characteristics
- While few inputs for price estimation are not significant, all regression results for Market Share are statistically significant
- The model generated for market share from this research can be used to predict market share for a new product entering the market
- Can also be used to explore how the cereal industry has moved from imperfect competition to an oligopoly structure