

Beyond Plain Vanilla: Modeling Joint Product Assortment and Pricing Decisions

Michaela Draganska

GSB, Stanford University

Michael Mazzeo

Kellogg School of Management

Katja Seim

Wharton School of Business

Introduction

- › Product assortment adjustments important by-product of changes in market structure (due to, e.g., mergers)

›

Model Overview

- › Two-stage game
 - › Stage 1: B brands (firms) decide which flavors (products) to offer
 - › Stage 2: conditional on flavor choices, brands set prices
- › Demand
 - › Discrete choice model to obtain consumer preference parameters based on brand-flavor utility.
 - › Random-coefficients specification
 - › Logit demand shock
 - › Control for unobservable attributes of flavors with market characteristics and time & flavor effects.

Model Overview, II

- › Costs
 - › Brand-specific marginal costs are common knowledge
 - › Fixed costs of offering assortment are private information
 - ›

Two-firm/Two-flavor Example

Overview of Estimation Algorithm

- › For a given set of parameters:
 - › Calculate predicted market shares and prices.
 - › Recover shocks to marginal cost from shares and prices at observed assortment using pricing FOC.
 - › Calculate variable profits for all possible assortments.
 - › Compute Perfect Bayesian Nash equilibrium as fixed point in probabilities.
- › Combine moment conditions into objective and minimize to update parameters.

Monte Carlo Simulation

	truth	mean	bias	std. dev.	RMSE
<i>Mean</i>					
brand 1, flavor 1	0.0100	0.0086	-1.36E-03	6.32E-03	6.47E-03
brand 1, flavor 2	0.0250	0.0220	-2.95E-03	1.65E-02	1.68E-02
brand 2, flavor 1	0.0100	0.0110	1.01E-03	7.14E-03	7.22E-03
brand 2, flavor 2	0.0200	0.0170	-3.05E-03	1.24E-02	1.27E-02
<i>Standard deviation</i>					
brand 1, flavor 1	0.1000	0.1061	6.13E-03	4.22E-02	4.26E-02
brand 1, flavor 2	0.2500	0.2758	2.58E-02	1.47E-01	1.49E-01
brand 2, flavor 1	0.1000	0.1052	5.19E-03	4.77E-02	4.80E-02
brand 2, flavor 2	0.2000	0.2133	1.33E-02	9.76E-02	9.85E-02

- 100 runs, 256 simulated markets
- Estimation recovers fixed cost parameters



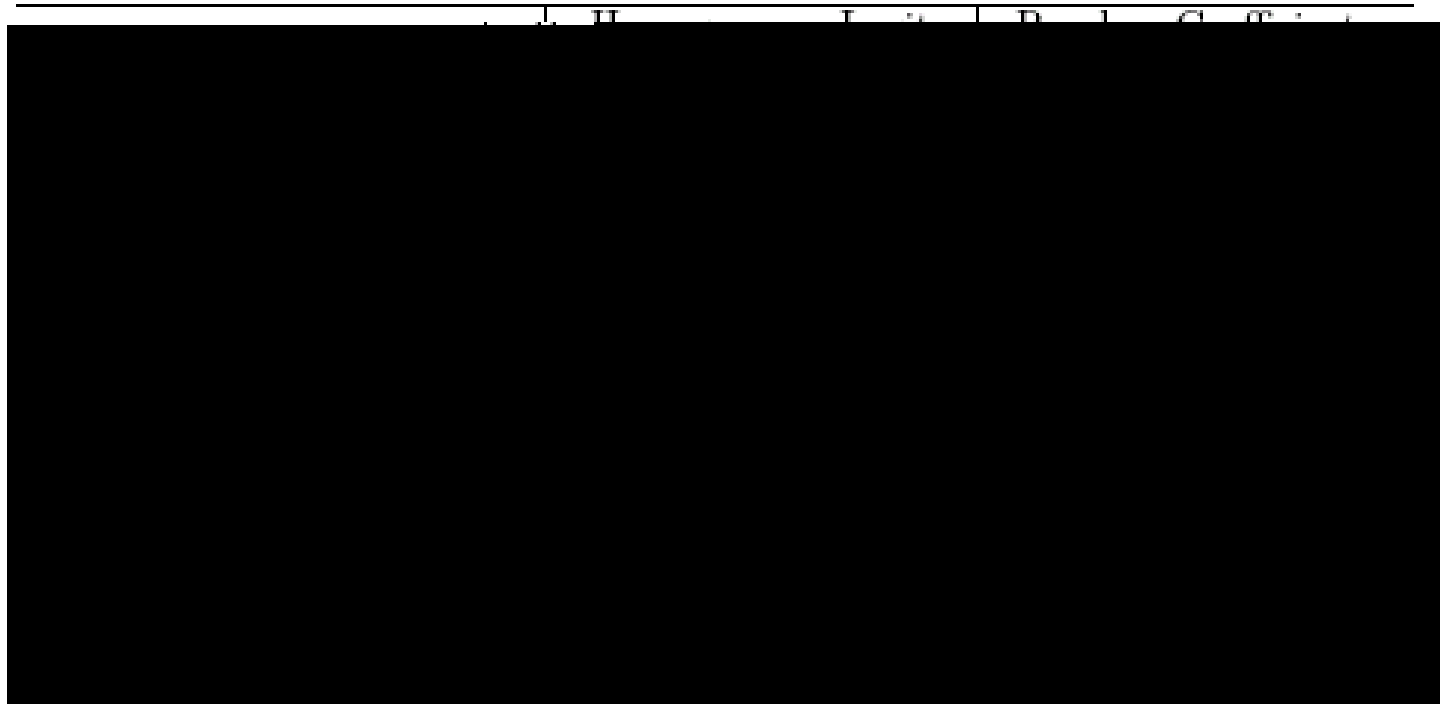


Our Focus

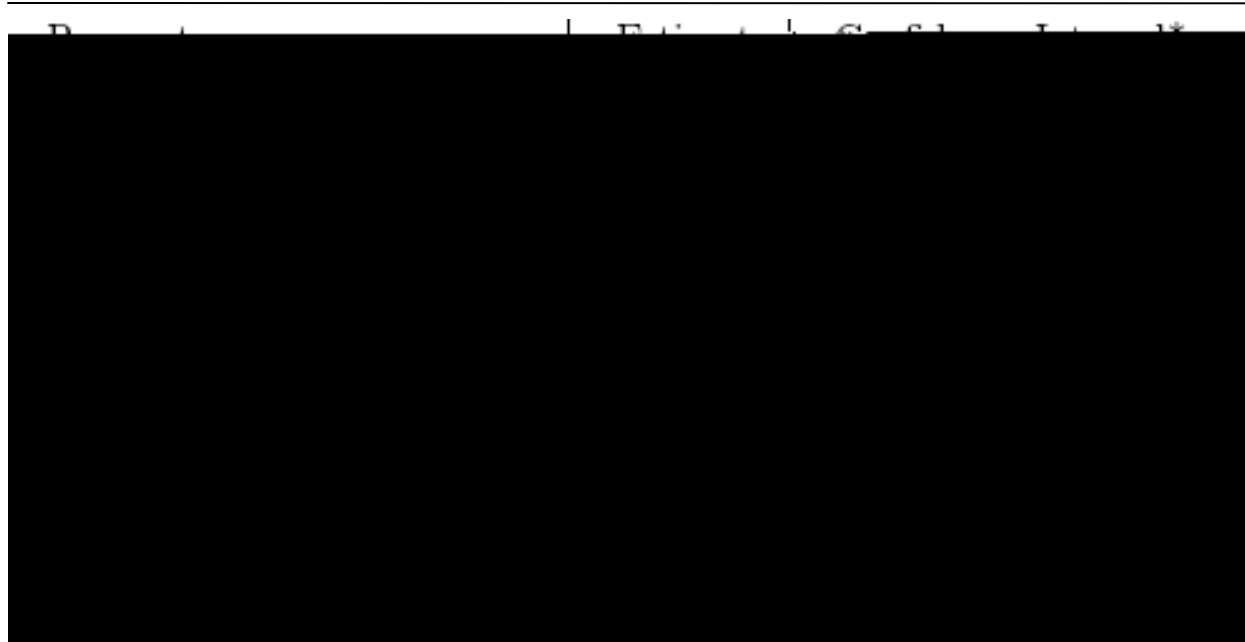
- › Demand is modeled for all brands in the market.
- › Decisions of Breyers and Dreyers considered in the product choice stage.
- › Offering of optional flavors versus staples.

Demand Estimates

Marginal Cost Estimates



Fixed Cost Estimates – Implied Moments



Merger Analysis

	All Flavors & Firms		
	Duopoly	Merged Firm	
		Fixed Products	Endog. Choices
Price, Breyers	3.785	3.846	3.846
Price, Dreyers	3.427	3.530	3.530
Total profits, Breyers	8.379	8.392	8.392
Total profits, Dreyers	8.379	8.392	8.392
Number of flavors offered	1,999	1,999	1,999
Share of home offered:			
1,862 Natural Vanilla	0.865	0.865	0.865
1,619 Homemade Vanilla	0.628	0.628	0.628
1,498 Vanilla Custard	0.587	0.587	0.587
1,628 Consumer surplus	14.730	14.651	14.651

Small effects due to:

- š Share of vanilla (and especially optional vanilla) flavors small in potential ice cream market
- š Relatively low cost of offering flavor

Conclusion

- › Model allows us to evaluate empirically both price and product variety effects of mergers.
- › Value of jointly modeling product market competition and entry decisions:
 - › Consumer surplus changes represents net effect of price and assortment effects.
 - › Under reasonable conditions, consumer welfare increases because of increased variety.
- › Future work:
 - › Here, assortment choices driven by cost considerations
 - › Alternative model focuses on selection