Competition in Food Retailing

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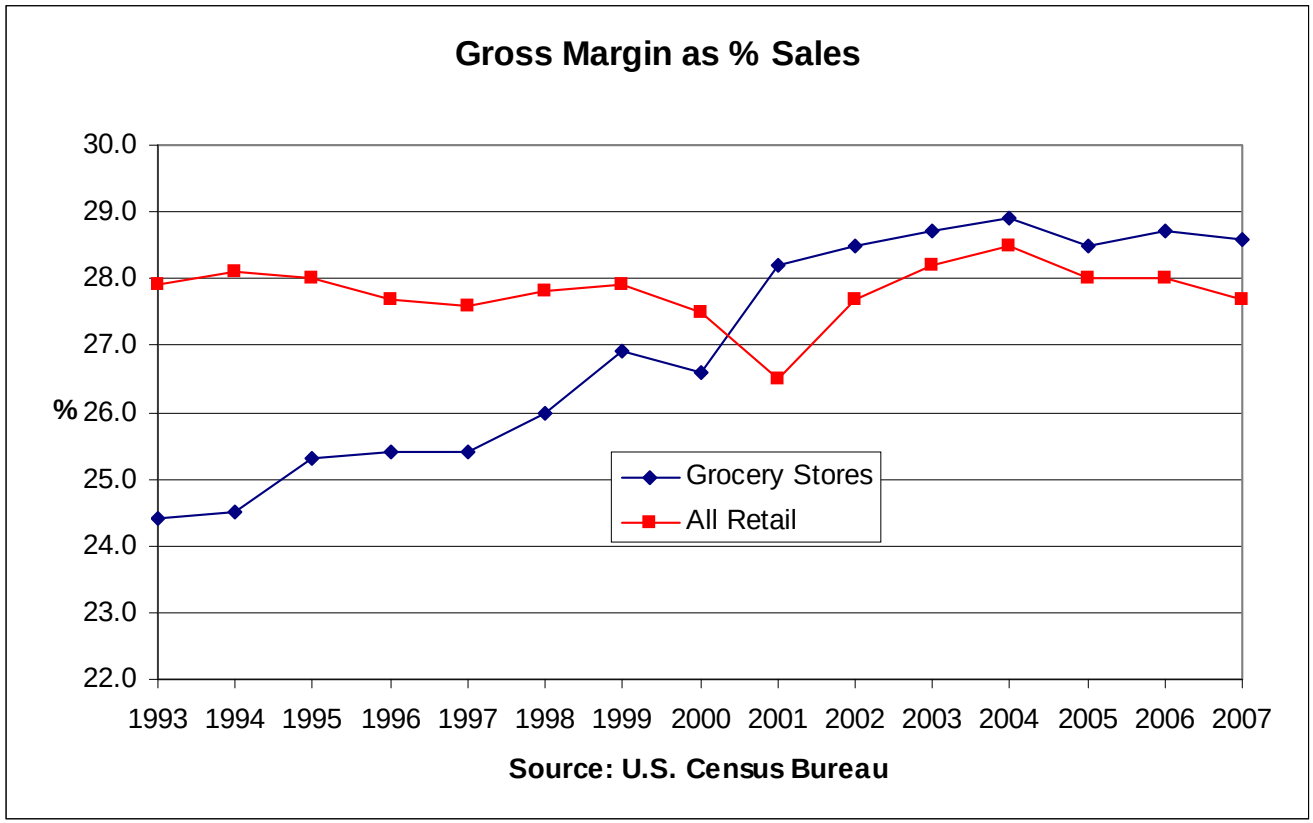
4th December 2009

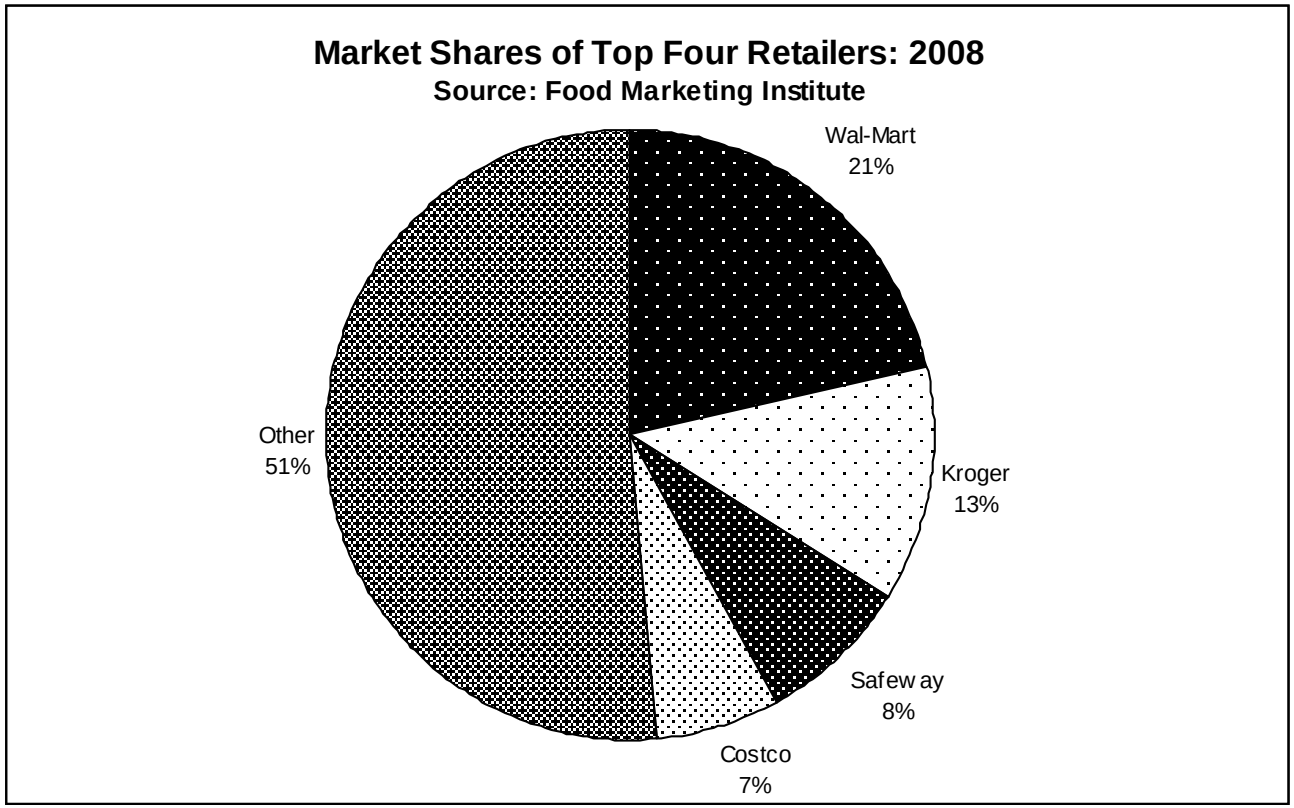
Market Structure of Food Retailing

Grocery Retailing Becoming More Profitable



Market Structure of Food Retailing

National Concentration Relatively Low



Market Structure of Food Retailing

Retail Markets are Local

Measure	Atlanta	Chicago	Dallas	Los Angeles
Supermarkets	698	1,160	881	2,376
Convenience Stores	3,528	3,624	4,963	6,168
Mass Merch.	635	721	932	810
Wholesale Clubs	31	37	33	101
Chain Share (%)	93.5	82.5	95.5	90.0
Supermarket %	83.5	87.2	87.1	87.1
Chain 1 (share %)	Kroger (30.2)	SuperValu (33.6)	Wal-Mart (31.3)	Ralphs (19.3)
Chain 2 (share %)	Publix (20.2)	Dominick's (10.4)	Kroger (12.4)	Vons (16.8)
Chain 3 (share %)	Wal-Mart (27.4)	Cent. Coop (10.0)	Assc. Whls. (12.1)	Un. Western (13.0)
Chain 4 (share %)	Ingles (4.1)	Cert. Grocers (6.0)	Brookshires (7.9)	SuperValu (10.0)
CR4	81.9%	60.0%	63.7%	59.1%

Note: Data are from A. C. Nielsen Trade Dimensions Market Scope: 2008 Westport, CT. 2007.

Today's Talk

- Summary of Three NEIO Papers
  - "Network Externalities in Food Retailing"
  - "Commodity Prices and Food Inflation"
  - "Retail and Wholesale Market Power in Organic Apples"
- Format of Each Discussion
  - Introduction - Problem and Objective
  - Theoretical Framework and Hypotheses
  - Description of Econometric Model
  - Data and Estimation Method
  - Results and Implications for Retail / Wholesale Competition
- Synthesis of Findings from Papers

Paper #1: "Network Externalities in Food Retailing"

Observations

- SKU Count Rose by 52% from 1990 to 2004
- Big Box Retailers Now Dominate Many Categories
- Scale Economies in Food Retailing Small
- Change in Retailing Structure From Demand-Side

Objectives

- To Examine:
  - Network Externalities in Supermarket Pricing
  - Impact of Two-Sided Demand on Retail / Wholesale Pricing
  - Relationship Between Network Size and Margins
- To Estimate Degree of Competitiveness Among
  - Retailers
  - Wholesalers

Theoretical Framework

- Retailers are Platforms with Two-Sided Demand
  - Consumers Demand Variety of Products (Larger Network)
  - Suppliers Demand Shelf-Space (Access to Consumers)
- Suppliers "Multi-Home," Consumers Do Not
- Retailers Internalize Network Externalities
- Hypothesis
  - Total Demand Rises with Network Size
  - Retail Margins Rise
  - Supplier Margins Fall

Econometric Model

- Structural Model of Retail / Manufacturer Margins
  - Consumer Demand
  - Retailers Choose Prices and Variety to Max Profit
  - Manufacturers Choose Wholesale Prices
  - Vertical Stackelberg / Horizontal Bertrand-Nash
- Consumer Demand is Hierarchical
  - Discrete Choice of Supermarket
  - CES Model of Expenditures in Chosen Store
- Wholesale Prices Not Observed
  - Differentiate Retail First-Order Conditions
  - Impose Bertrand-Nash Competition
  - Recover Expression for Retail and Wholesale Margins
  - Retailing and Mfg Cost Estimated from Implied Margins

Econometric Model

- Estimate Effect of Network Size on Margins
- Introduce Conduct Parameters

  ϕ = Deviation of Retail Margins from Competition

  θ = Deviation of Supplier Margins from Competition

  $\phi = \theta = 0$ Implies Perfect Competition

  $\phi = \theta = 1$ Implies Bertrand-Nash Rivalry
- Conduct Depends on Network Size

  $\phi = \phi_0 + \phi_1 N_j$

  $\theta = \theta_0 + \theta_1 N_j$

  $\phi_1 > 0$ Implies Retail Margins Rise in Network Size

  $\theta_1 > 0$ Implies Supplier Margins Rise in Network Size

Data Description

- Store-level Scanner Data
  - 104 Weeks from May 2003 - June 2005
  - All Stores in Visalia California (6, from 4 chains)
  - No Wal*Mart in Visalia
  - All Stores are HI-LO
  - Accounts for all of Visalia Supermarket Spending
- Shopping Basket of Top 10 Categories
  - Low Fat Milk, Regular Soft Drinks, Beer, Bread, etc.
  - CES Price Index for Each
  - Variation in SKUs over Time and Store

Estimation Method

- Two-Stage Estimation
  - Consumer Demand with GMM
  - Retail / Wholesale Margins with GMM
- Panel Data over Store / Category / Time
- Prices and Variety Endogenous
  - Identify Demand with Category-Specific Input Prices
  - Identify Supply with Category-Specific Demand Shifters

Results

- Specification Tests
  - Nested Logit / CES Model Preferred to Simple Logit
  - Supermarkets not Local Monopolists
  - Demand Rises in Network Size
- Retail Conduct

  $\phi = 0.785$

  $\phi_1 = 0.002$
- Supplier Conduct

  $\theta = 0.175$

  $\theta_1 = -0.002$
- All Parameter Estimates Statistically Significant

Results

- Retailer Margins Closer to Bertrand
- Supplier Margins Nearly Competitive
- Retail Margins Rise in Network Size
- Supplier Margins Fall in Network Size
- Results Consistent with Network Externalities
  - Retailers Internalize Network Effects, Raise Margins
  - Suppliers Unable to Internalize, Reduce Margins
- Opposite to Kaiser and Wright (2006, *IJIO*)
  - German Advertisers Value Readers more than Readers Value Ads
  - Subscription Prices Low, Ad Rates High
  - Value of Variety $>$ Value of Distribution
  - Consumers Pay High Margins, Retailers Reduce Supplier Margins

Paper #2: "Commodity Prices and Food Inflation"

Observations and Objective

- Commodity Price Inflation in 2007 - 08
- Fears of Food Inflation by Policymakers
- Commodity Price Deflation in 2008 - 09
- Media Reports of Slow Retail Price Adjustment
- Objective:
  - Estimate Extent of Pass-Through for Two Commodities
  - Explain Relationship Between Input Inflation and Market Power
  - Explain Pass-Through at Retail and Wholesale Levels

Theoretical Framework

- Pass-Through Depends on Many Factors
  - Market Power Downstream (Bulow and Pfleiderer, 1983)
  - Market Power Upstream (Hamilton and Sunding, 1997)
  - Substitutability of Inputs (Gardner, 1975)
  - Rising or Falling Input Prices (Borenstein, et al., 1997)
  - Consumer Price Expectations (Benabou and Gertler, 1996)
  - Number of Products Sold (Hamilton, 2009)
- Contribution: Market Power Depends on Inflation

Theoretical Framework

- Hypotheses:
  - H_1 : Retail Market Power Rises with Inflation
  - H_2 : Retail Market Power Falls with Inflation
  - H_3 : Wholesale Market Power Rises with Inflation
  - H_4 : Wholesale Market Power Falls with Inflation
- Expectation versus Market Share Effect

Econometric Model

- Structural Model of Retail / Wholesale Margins
  - Consumer Demand
  - Wholesaler Stackelberg Model
  - Wholesalers Set Prices and Retailers Follow
  - Solve by Backward Induction: Retailers then Wholesalers
  - Pricing at Each Level Bertrand-Nash
- Consumer Demand is Hierarchical
  - Choose to Buy from Supermarkets or Other Outlet
  - Choose Among Brands or Varieties
- Wholesale Prices not Observed
  - Derive Wholesale Prices by Differentiating Retail FOC

Econometric Model

- Deviation from Bertrand due to Input Inflation
- Define Regimes of Inflation and Deflation:

$$\phi_j = \phi_0 + \phi_1 \pi_j^+ + \phi_2 \pi_j^-$$
$$\theta_j = \theta_0 + \theta_1 \pi_j^+ + \theta_2 \pi_j^-$$

$\phi_1 > 0$ Implies Retail Margins Rise in Inflationary Periods
$\phi_2 < 0$ Implies Retail Margins Rise in Deflationary Periods
$\theta_1 > 0$ Implies Wholesale Margins Rise in Inflationary Periods
$\theta_2 < 0$ Implies Wholesale Margins Rise in Deflationary Periods

- Vice Versa for Narrowing Margins
- Simulate Pass-Through by Solving for Retail Price

Data Description

- Two Products: Unprocessed and Processed
  - Fluid Milk
  - Fresh Potatoes
- Potato Data:
  - Aggregate (Chain-level) Scanner Data
  - 143 Weeks (Jan. 2006 - Sept. 2008)
  - Five Markets: Atlanta, Chicago, Dallas, Los Angeles, New York
- Fluid Milk Data:
  - Aggregate (Chain-level) Scanner Data
  - 104 Weeks (Mar. 2007 - Feb. 2009)
  - Ten Largest U.S. Markets
  - 18 Top Brands in Each Market by Share
- Input Prices from USDA / BLS

Estimation Method

- Demand Model Estimated by SML
- Pricing Model Estimated by GMM
- Instrument Endogenous Prices With:
  - Market-Specific Binary Variables Interacted with Input Prices
  - Product-Specific Binary Variables
- Estimate Model in Two Stages:
  - Consumer Demand Model in First Stage
  - Retail / Wholesale Pricing Model in Second Stage

Results

Potato Model Margin Equation

- Specification Tests:
  - Retail / Wholesale Model Preferred to Retail Only
  - Asymmetric Response of Conduct to Input Inflation
  - Partial Pass-Through of 89.6%
- Conduct Parameters:
  - Retail: $\phi = 0.828$
  - Wholesale: $\theta = 0.248$
  - Implies Retail Nearly Bertrand, Wholesale Nearly Competitive
- Effect of Input Price Inflation:
  - Retail: $\phi_1 = -0.037$ and $\phi_2 = -0.510$
  - Wholesale: $\theta_1 = -0.215$ and $\theta_2 = -0.170$

Results

Potato Model Margin Equation

- Retail Interpretation:
  - Retail Margins Narrow During Inflation
  - Implies Competitive Market Share Effect
  - Retail Margins Widen in Deflation
  - Implies Non-Competitive Expectation Effect
- Wholesale Interpretation:
  - Wholesale Margins Narrow During Inflation
  - Reflects Competitive, Market Share Effect
  - Wholesale Margins Widen in Deflation
  - Reflects Retailers' Concerns in Media

Results

Fluid Milk Model Margin Equation

- Specification Tests:
  - Retail / Wholesale Model Preferred to Retail Only
  - Asymmetric Response of Conduct to Input Inflation
  - Partial Pass-Through of 3.4%
- Conduct Parameters:
  - Retail: $\phi = 0.289$
  - Wholesale: $\theta = 0.542$
  - Retail More Competitive than Wholesale
  - Both More Competitive than Bertrand
- Effect of Input Price Inflation:
  - Retail: $\phi_1 = -0.138$ and $\phi_2 = 0.091$
  - Wholesale: $\theta_1 = -1.181$ and $\theta_2 = 0.244$

Results

Fluid Milk Model Margin Equation

- Retail Interpretation:
  - Margins Narrow During Inflation
  - But, Margins Narrow in Deflation
  - Cost-Price Squeeze when Prices Rising
  - Consumers Expect Prices to Fall Faster
- Wholesale Interpretation:
  - Wholesale Margins Narrow During Inflation
  - Margins Narrow in Deflation
  - Wholesalers Absorb More of Price Rise
  - Retailers Expect Production Costs to Fall Faster

Conclusions

- Retail / Whls Market Power Product-Specific
- Retail More Competitive for Processed Product
- Retail / Whls More Competitive than Bertrand
- Pass-Through Higher for Minimally Processed

Paper #3: "Market Power in Organic Apples"

Problem and Objective

- Organic Foods Growing Rapidly
  - $13.8 B - $21.1 B from 2005 - 2008
  - Fruits and Veg 43% in 2003
- Reports of Shortages of Organic Product
- Organics Sell for Premium at Retail
- Question Whether Premium Due to:
  - High Production Costs
  - Grower Market Power due to Shortages
- Objective:
  - Test for Grower / Retailer Market Power in Organics
  - Test for Trends in Grower / Retailer Margins

Theoretical Framework

- Suppliers Possess Market Power When:
  - Retailers Promote Product (Richards and Patterson, 2005)
  - Short Harvest (Sexton and Zhang, 1996)
  - Scale, Assortment, Experienced (Draganska and Klapper, 2007)
- Retailer Has Market Power When:
  - Concentrated Market (Inderst and Shaffer, 2007)
  - It is Wal*Mart (Volpe and Lavoie, 2007)
  - Supplier Market in Surplus

Theoretical Framework

- Hypotheses:
  - H_1 : Retail Market Power Lower for Organics
  - H_2 : Retail Market Power Rising over Time
  - H_3 : Wholesale Market Power Higher for Organics
  - H_4 : Wholesale Market Power Falling over Time

Econometric Model

- Deviation from Maintained Game
  - Organic / Not Organic
  - Organic Attribute Interacted with Time Trend
- Conduct Parameters for Retail / Wholesale:

$\phi_j = \phi_0 + \phi_1 O_j + \phi_2 O_j t$
$\theta_j = \theta_0 + \theta_1 O_j + \theta_2 O_j t$
$\phi_1 > 0$ Means Higher Margins for Organic at Retail
$\phi_2 < 0$ Means Organic Margin Declines with Time
$\theta_1 > 0$ Means Higher Margins for Organic Suppliers
$\theta_2 < 0$ Means Organic Margin Declines with Time

- If Growers Profit, Margin Should Fall

Data Description

- Retail Scanner Data for Apples
  - 156 Weeks (Jan. 2005 - Dec. 2007)
  - Five Markets: Atlanta, Chicago, Dallas, Los Angeles, New York
  - Six Varieties / Organic and Non-Organic for Each
- Grower Price Data:
  - Washington Growers Clearing House
  - Organic and Non-Organic Prices for Each Variety
  - Not Matched with Retail Markets, so Not Wholesale Price
- Input Prices from USDA / BLS

Estimation Method

- Demand Model Estimated by SML
- Pricing Model Estimated by GMM
- Instrument Endogenous Prices With:
  - Product-Specific Binary Variables Interacted with Input Prices
  - Market-Specific Binary Variables
- Estimate Model in Two Stages:
  - Consumer Demand Model in First Stage
  - Retail and Wholesale Pricing Models in Second Stage

Results

- Conduct Parameters:
  - Retail: $\phi_R = 0.395$ and $\phi_O = 0.056$
  - Wholesale: $\theta_R = 0.078$ and $\theta_O = 1.216$
  - Where R Subscript is Regular, O is Organic
- Effect of Organic and Trend:
  - Retail: $\phi_1 = -0.451$ and $\phi_2 = -0.001$
  - Wholesale: $\theta_1 = 1.137$ and $\theta_2 = -0.012$

Results

- Retail Conduct:
  - Non-Organic Retail Prices Less Competitive than Organic
  - Retail Margins Lower for Organics
  - Retail Organic Margins Declining Over Time
- Wholesale Interpretation:
  - Organic Margins Much Wider than Non-Organic
  - Wholesale Margins Wider for Organics
  - Wholesale Organic Margins Narrow Over Time

Conclusions

- Organic Retailing Highly Competitive
- Non-Organic Retail Prices Less than Bertrand
- Organic Whls Less Competitive than Bertrand
- Non-Organic Wholesalers Very Competitive
- Organic Effect on Market Power Declining

Synthesis

- Product / Market Heterogeneity in Retail Power
- Retailers Less Competitive than Suppliers
- Retailers More Competitive in Processed Goods
- Retailers More Competitive for High Demand Items
- Retailers Take Advantage of Declining Prices