An Empirical Analysis of Manufacturer-Retailer Interaction: What Determines Wholesale Prices?

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Why does the vertical structure matter?

- Merger simulations
  - One could get different simulated effects, depending whether one accounts for the retail sector or not, and then accounting for them correctly
  - ABA Section of Antitrust Law, Econometrics (2005)
    - "*It is also essential to model retailer behavior and retailer-manufacturer interaction, which can substantially affect the retail-price effects of a manufacturing merger*."
- Testing collusive conduct
  - Finding seemingly cooperative retail prices might result from the presence of a strategic retailer even if manufacturers are not coordinating (Sudhir 2001; Choi 1991)
  - "Category" management
    - Retailer maximizes "category" profits
    - To this effect, retailer might coordinate prices of products of the same "category"

Merger effects: An example

- Suppose that we have estimated a parametric demand system
  - Linear retail demand system; $q = A + Bp$

$$B = \begin{bmatrix} -0.25 & 0 & 0 \\ 0 & -0.60 & 0.40 \\ 1.00 & 0 & -1.25 \end{bmatrix}$$

  - Assuming a monopolist retailer, manufacturers face a "derived demand"

$$B_d = B(B+B^T)^{-1}B^T = \begin{bmatrix} -0.81 & 0.27 & 1.52 \\ 0.27 & -0.41 & -0.41 \\ 1.52 & -0.41 & -3.53 \end{bmatrix}$$

- Suppose that the producers of product 1 and 2 propose to merge
  - What happens if you ignore the retail sector?
  - What happens if you account for the retail sector?

Merger effects: An example – continued

- No retail sector
  - Prices do not change
    - No (direct) substitution effect between product 1 and 2
- With retail sector
  - Suppose there is a single (monopolist) retailer
  - Prices go up
    - The retailer considers both *direct* and *indirect* effects among the products it sells
    - There is an *indirect* substitution effect between product 1 and 2
    - It can be shown that prices go up by about 12.7%, 6.6% and 5.5%, respectively

A change in retail competitiveness might have multiple effects

- When the retail sector gets more competitive, then
  - Due to the more vigorous competition *within* the retail sector, one expects the retail prices, given costs, to decrease (horizontal effect)
  - The retailers' bargaining position vis-à-vis the manufacturing sector weakens, therefore one expects the margins of manufacturers to increase (vertical effect)

Data

- Scanner data from grocery stores regarding ice cream purchases
  - 106 MSA-store pairs (29 MSAs and 47 supermarket-chains)
  - Weekly data 1999-2003 (260 weeks)
  - SKU-level data
    - For analysis, we aggregate SKUs to the brand-level
- We observe retail quantities and revenues
  - Broken into two categories
    - Sold under some promotional activity
    - Sold without promotion
- Problems
  - We do not observe wholesale prices!
    - If we did, it would be easier to sort out the opposing effects of a change in retail competitiveness
  - We do not observe slotting fees

Road Map: A Two-Stage Procedure

- First stage
  - Using structural assumptions, we back out unobserved wholesale prices
- Second stage
  - We relate the calculated wholesale prices to costs and competitive conditions
- Goal: A structure-performance analysis
  - Explore the role that competitiveness plays in the determination of prices
  - If prices are “high,” why?
  - If prices are “low,” why?

First Stage: Calculating wholesale prices

- If the following two conditions are met
  1. Demand-system is consistently estimated
  2. We know the true nature of competition among retailers
- Then we can back-up wholesale prices
  - Using the FOCs of the retailers' profit-maximization problem
- What is the pricing game that retailers play? Two possibilities are considered.
  - Each of them is a local monopolist
  - Within a given city, they are Nash-Bertrand competitors

Demand estimation

- Nested-logit demand specification

LHS: log(share) – log(outside share)	OLS		2SLS	
	Coefficient	t	Coefficient	T
Price	-0.1799	-61.05	-0.4003	-30.38
Log (within premium share)	0.9750	1636.43	0.9819	949.81
Log (within super-premium share)	0.7348	485.12	0.7457	195.47
Temperature	0.0010	9.18	0.0011	9.79
N	228,371		228,371	
R^2	0.96		0.96	

Notes

1. The two nests are premium and super-premium
2. Brand-specific, region-specific and week-specific fixed effects are included but not reported
3. In the 2SLS regression, prices, and within-group shares were instrumented by input costs and various measures of brand-specific product variety. The first stage regressions (without the terms included in the demand equation) yielded R^2s of 0.83, 0.35 and 0.32, respectively.

First Stage: Calculating wholesale prices – Results

- Retailers are assumed to be Nash-Bertrand competitors
  - (If instead we assume local monopoly, many of the calculated wholesale prices turn out to be negative or unreasonably small)

Brand	Retail Price	Wholesale Price	Retail margin
Super-premium			
Ben & Jerry's	3.25	2.33	47%
Dreamery	3.08	2.24	32%
Haagen Dazs	3.08	2.21	42%
Starbucks	2.46	1.72	45%
Premium (Light / Fat Free)			
Breyers	1.14	1.07	6%
Dreyer's	1.20	1.13	7%
Healthy Choice	1.22	1.15	7%
Private Label	0.76	0.68	15%

Brand	Retail Price	Wholesale Price	Retail margin
Premium (Regular)			
Breyers	1.16	1.10	7%
Dreyer's	1.19	1.12	7%
Blue Bell	1.25	1.17	8%
Deans	1.21	1.14	7%
Hood	0.77	0.71	9%
Mayfield	1.12	1.05	6%
Pet	0.99	0.93	8%
Turkey Hill	1.02	0.96	7%
Private Label	0.70	0.63	13%

The reported results are *average* prices and margins for the particular brand. Prices are measured as $/pint

Second stage: The effect of retail concentration on wholesale prices

- Retail concentration has two effects
  - One effect on retail margins
  - The remaining effect (after removing retail margin) is through the bargaining power of the retailers vis-à-vis the manufacturers
- Current specification
  - Cost factors
  - A measure of retail market power
    - Strength of store brand
- Alternative specification [WIP]
  - Cost factors
  - Measures of retail market power
    - Strength of store brand, Retail concentration, Dummy for vertically integrated status
  - Measures of manufacturer market power
    - Strength of national brand, Manufacturer concentration

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Second stage estimates [preliminary]

LHS: Wholesale prices	OLS		2SLS	
	Coefficient	t	Coefficient	t
Temperature	0.0004	3.96	0.0002	1.79
Butter price	0.1271	7.07	0.0608	2.67
Sugar price	-0.0073	-1.72	0.0059	1.09
Fuel price	-0.0008	-4.28	-0.0011	-4.49
Electricity price	0.0055	6.95	0.0072	7.15
PRIVATE LABEL share	-0.0000	0.20	-0.0125	-60.01
N	192,291		192,291	
R^2	0.79		0.66	

Notes

1. Only branded products are included in the regression (PL products are excluded)
2. Fixed effects for brand, city and week are included but not reported
3. In the 2SLS specification, the instrument for PL share is the store's "All Commodity Share" within the city. The first-stage regression yields an R^2 of 0.06 without the terms included in the primary regression, and 0.49 with the terms included in the primary regression.

Second stage estimates [preliminary]

LHS: Retail margin	OLS		2SLS	
	Coefficient	t	Coefficient	t
Temperature	0.0000	0.06	0.0002	1.90
Butter price	-0.0146	-1.87	0.0457	3.07
Sugar price	0.0022	1.18	-0.0098	-2.79
Fuel price	0.0004	4.50	0.0006	3.91
Electricity price	-0.0027	-7.69	-0.0042	-6.34
PRIVATE LABEL share	0.0007	43.83	0.0121	88.72
N	192,291		192,291	
R^2	0.89		0.61	

Notes

1. Only branded products are included in the regression (PL products are excluded)
2. Fixed effects for brand, city and week are included but not reported
3. In the 2SLS specification, the instrument for PL share is the store's "All Commodity Share" within the city The first-stage regression yields an R^2 of 0.06 without the terms included in the primary regression, and 0.49 with the terms included in the primary regression.

Interpretation of second stage estimates

- Measures of retail power in the regression of wholesale price
  - Informative on the effect of retail competition on wholesale margins
- Measures of retail power in the regression of retail margins
  - Informative on the effect of retail competition on retail margins
- The results indicate that
  - Retail power matters in terms of the retail margin
    - A 1% increase in the store's Private Label share increases retail margins by 1.25 cents (roughly 1.25%).
  - Retail power influences the profitability of the manufacturing sector, and the economic effect is sizable
    - A 1% increase in the store's Private Label share decreases wholesale prices by 1.21 cents (roughly 1.21%).

What can we say about a merger between manufacturers? [WIP]

- One needs to add a measure of manufacturer power to the second-stage equation
  - The sign of the variable would be informative on the effect of a manufacturer merger on wholesale prices
- How can we gain information on the effect of the merger on retail prices?
  - [WIP]

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