



Variety Competition in Retail Food Markets

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Food Retailing

- Retailers are significant players in food markets
 - The retail sector is a major source of value-added;
 - Understanding the retail sector is important to better understanding of the processing sector.
- Trends in the food retail sector:
 - Farm commodities to differentiated products;
 - Home production to processed, ready-to-eat foods;
 - Grocery stores to supermarkets... to supercenters
 - Between 1980-99, the mean number of products stocked in U.S. supermarkets increased from 14,145 to 49,225



The Retailer as an Intermediary

- Retailers intermediate transactions between food manufacturers and consumers.
- Multi-product retail intermediation reduces transaction costs in the food system
 - When consumers purchase multiple products at a time, multi-product retailing generates economies of scale in consumer transportation cost functions;
 - “principle of bulk transactions” (Williamson 1973).
 - When consumers purchase a single product at a time, multi-product retailing reduces consumer search costs.



Elements of Retail Oligopoly

- What determines consumer choice of retailer?
 - Consumers desire convenience (i.e., proximity to retailer);
 - Consumers desire low prices;
 - Consumers desire a large range of product variety.
- Important elements of oligopoly analysis:
 - Retail price competition: low prices attract consumers;
 - Retail variety competition: the more extensive the product menu, the better the match between consumers and brands;
 - Retail entry: the greater the number of retailers, the smaller the distance (on average) consumers travel to shop.



Literature on Multi-Product Firms

- Production-side motivations for multi-product firms
 - Product breadth creates economies of scope (Baumol, Panzar, and Willig (1982)):
 - Focuses on the properties of cost functions;
 - Suppresses the effect of product variety on consumer demand;
 - Ignores strategic interactions between firms (the role of product variety in generating store traffic).



Consumption-Side Motivations

- Multi-Product Oligopoly Settings
 - Raubitschek (1987) models a 2-stage game
 - Stage 1. Centralized manager selects product variety;
 - Stage 2. Independent agents manage each brand.
 - *Ignores the coordination of pricing decisions.*
 - Anderson and de Palma (1992) nested logit demand
 - Closed-form expressions for the decision variables;
 - *Logistic function restricts aggregate demand to be independent of the breadth of retail products available.*



A Model of Retail Oligopoly

- Two types of product differentiation:
 - Heterogeneous brands within the product category;
 - Heterogeneous retailers intermediate between producers and consumers of brands.
- Retailer competition is localized:
 - Consumers make discrete choices over retail stores
- Variety competition is non-localized:
 - Within a given retail store, all brands compete for each representative consumer.



Research Questions

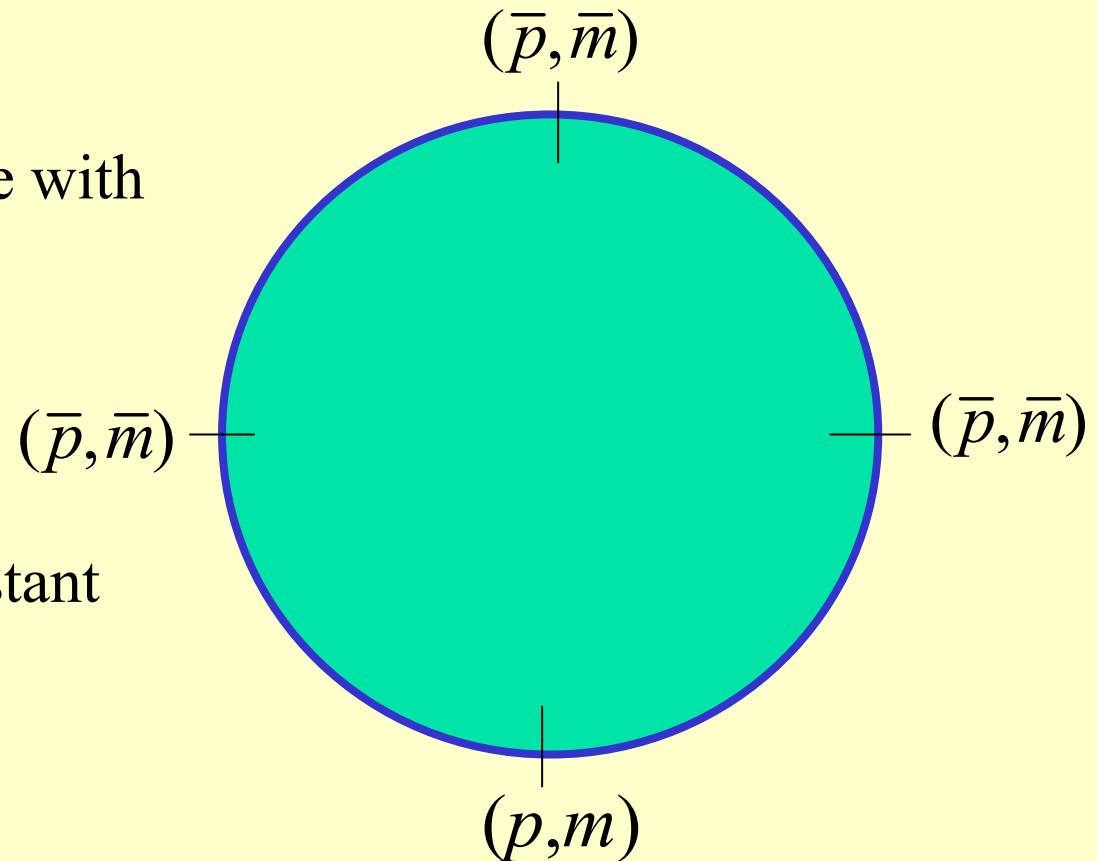
- What types of market forces are associated with product proliferation?
- What are the effects of retail entry?
 - on retail price margins?
 - on within-store product variety (brands per retailer)?
 - on total product variety (aggregated across retailers)?
- Is product variety undersupplied or oversupplied in the market equilibrium?

Retailer Competition

- Salop (1979) circle model

Consumers are uniformly distributed around a circle with unit circumference.

Retailers are located equidistant from each other and select:
prices (p); and
product variety (m)





Demand for Product Variety

- Consumer utility takes the form of Spence (1976)

$$U(x, m, x_0) = u\left(\int_{i \in m} x_i^\theta\right) + x_0$$

- Indirect utility:

$$v(p, m) = \max_x u\left(\int_{i \in m} x_i^\theta\right) - \int_{i \in m} p_i x_i$$



Store Choice

- A consumer at a distance of $\delta \in (0,1)$ from the retailer receives consumer surplus of

$$v(p,m) - \delta t$$

- With n retailers, consumer surplus from shopping with the nearest rival is

$$v(\bar{p},\bar{m}) - (1/n - \delta)t$$

- Store traffic determined by critical distance

$$\delta^*(p,m) = \frac{1}{2n} + \frac{1}{2t} \left[v(p,m) - v(\bar{p},\bar{m}) \right]$$



Retail Demand

- Retail demand for brand i :

$$X_i(p, m) = 2\delta^*(p, m)x_i(p, m)$$

- $x_i(p, m) \equiv$ individual consumer demand for brand i

- Retail demand for a menu of m brands:

$$X(p, m) = 2\delta^*(p, m) \int_{i \in m} x_i(p, m)$$



The Retailer's Problem

- Retail cost is comprised of
 - a unit wholesale price (w) for each brand;
 - a fixed set-up cost (f) to stock each brand
- Retail profit is

$$\pi(p, m) = \delta^*(p, m) \int_{i \in m} (p_i - w) x_i(p, m) - mf$$

Symmetric Equilibrium

Conditions $(p_i = p = \bar{p}, m = \bar{m})$

- Retail price per brand: $\pi_p = \mathbf{0}$

$$\frac{1}{n} \left[1 - \left(\frac{p - w}{p} \right) \varepsilon_p \right] = \frac{(p - w)mx}{t}$$

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*Greater rent from sales of
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$$\delta^*(MR_i - MC_i)$$

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*MB of a price increase:
Greater rent from sales of
the brand to inframarginal
consumers,*

$$\delta^*(MR_i - MC_i)$$

*MC of a price increase:
Lower rent from sales of all
brands due to a loss of
marginal consumers,*

$$(d\delta^*/dp_i)(TR - TC)$$



Equilibrium Conditions

- Product variety provision: $\pi_m = 0$

$$\frac{(1 - \varepsilon_m)(p - w)x}{n} + \left(\frac{\partial v(.)}{\partial m} \right) \frac{(p - w)mx}{t} = f$$



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MC of an additional variety



Invariance Result: Strategy Space

- Suppose retailers instead select the number of brands and a sales *quantity* (x_i) for each brand:
 - This has *no effect* on the oligopoly equilibrium.
- The retail equilibrium is robust to the choice of prices or quantities as the strategy space:
 - For inframarginal consumers, the retailer is a monopolist;
 - For marginal consumers, store traffic is generated by offering greater consumer's surplus than rivals.



Comparative Statics Effects

Endogenous Variables

Oligopoly

Monopolistic Competition

		p	m	N	p	n	m	N
Exogenous	w	+	$(-,0)^1$	$(-,0)$	+	$(0,+)^1$	$(-,0)^1$	$(-,0)^1$
Variables	f	$(0,+)^1$	-	-	0	$(0,+)^1$	-	-
	t	+	-	-	0	+	-	$(-,0)^1$
	E	+	-	-	0	+	-	-
	n	-	-	-				

¹ Zero if $E = 1$ ($E =$ elasticity of marginal subutility function)



Welfare Comparison Under Oligopoly

- Given an exogenous number of firms, product variety is always undersupplied in the market:
 - Output per brand (across firms) is optimal;
 - Retail prices are higher than optimal;
 - Each retailer provides insufficient product breadth.



Welfare Comparison Under Monopolistic Competition

- With free entry and CES subutility, the market equilibrium is characterized by:
 - Excessive retail entry;
 - Insufficient product breadth per firm;
 - Underprovision of total retail product variety.
- Relative to the social optimum:
 - Output per brand (across all firms) is too low;
 - Retail prices are too high.



Conclusion

- When retailers compete in prices and product variety, there are 4 types of externalities:
 - Two forms of business-stealing: (+)
 - Lower prices attract consumers;
 - Larger breadth of product variety attracts consumers.
 - Consumer surplus externality: (-)
 - The marginal contribution of a brand to profits is less than the social contribution.
 - Price effects of brand introductions: (-)
 - An increase in product variety reduces retail margins, and retailers ignore this socially beneficial effect.



Applications

- Slotting Allowances: A reduction in retail marketing costs (f) deters retailer entry
- Vertical contracts to control retail externalities?
 - Retail market effects of cost-neutral shifts between w and f : Is there a link between retailer-processor contracts and product proliferation?
- Private labels: how does introduction of a private label affect retail product breadth?