

# Market Dominance and Behavior-based Pricing under Horizontal and Vertical Differentiation

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# Motivation and Purpose (1/3)

## Basic Observations

- In today's business environment firms have access to technologies which enable them to efficiently implement behavior-based price discrimination based on customers' purchase histories.
- Behavior-based pricing (BBP) is widely observed in, both, product and service industries.
- Firms devote resources to discover consumers' purchase history.
- Switching costs are observed in a wide variety of industries.

## Motivation and Purpose (2/3)

We investigate the following issues:

1. Does the business practice of behavior-based price discrimination serve as a strategic device to enhance market dominance?
2. Can behavior-based price discrimination serve as an instrument whereby a dominant firm could induce exclusion of a smaller competitor?
3. What is precisely the relationship between behavior-based prices and uniform prices?
4. How does an inherited market share asymmetry affect this relationship?
5. Can an incumbent firm make strategic use of behavior-based price discrimination as a mechanism to deter entry?
6. Do results depend on whether firms sell horizontally- or vertically-differentiated brands?

# Motivation and Purpose (3/3)

## Major innovations of the present paper:

- Investigate persistence of market dominance under BBP.
- Combine BBP, brand differentiation, and switching costs, all within a single model.
- Analyze and compare industries with vertically-differentiated brands to horizontally-differentiated brands.

# Results

## Horizontal product differentiation

1. **BBP by itself does not lead to exclusion of the small firm.**
2. **Market dominance can be maintained only if the large firm is protected by significantly-higher switching costs relative to the small firm.**

## Entry under horizontal product differentiation

In the absence of switching costs, an incumbent firm cannot maintain its dominance even if it competes against an entrant (with no purchase history) who cannot implement behavior-based pricing strategies.

## Vertical product differentiation

1. Behavior-based pricing increases the market share of the firm producing the high-quality brand.
2. If the high-quality firm has a dominant position, behavior-based pricing further enhances its market share.

# What is Behavior-based Pricing?

## Behavior-based pricing: A Definition

Consumers are priced according to their history of purchase.

## What do we mean by “history of purchase?”

History of purchase as firms are able to record it.

## Examples of “history of purchase”

**Former buyers:** Firms can identify former and repeated buyers.

**Volume:** Firms keep precise record of actual purchases of each buyer.

**Non-buyers:** Firms spy on consumers buying from competitors.

# Overview of “History-based” Pricing Methods

## I. Prices Based on Consumer Identification

### How can firms recognize “loyal” consumers?

1. Establish “loyalty” programs. For example:
  - Consumers attempting to earn “points” (airlines, hotels).
  - Internet-based stores and service providers with online registration.
  - Distribute “bonus” cards.
2. Provide upgrading and trade-in sales programs.

### Pricing methods under consumer recognition

**Poaching:** Offer discounts to new customers; in this case we say that firms levy loyalty premia. Subsidize switching costs.

**Examples include:** Long-distance providers, banks, insurance companies.

**Loyalty rewards:** New consumers pay a higher price than returning customers.

# Overview of “History-based” Pricing Methods

## II. Prices Based on Volume

### Information collected by firms

Maintain precise record of sales of each consumer.

### Pricing methods based on volume discounts:

1. Multipart tariff.
2. All-unit discount with quantity thresholds.

# Overview of “History-based” Pricing Methods

## III. Firms spy on consumers buying from competitors

- Firms devote resources to obtain lists of “potential” consumers.
- *Example:* Microsoft’s Windows operating system monitors which browser is used and “offers” customers to switch.
- Firms buy lists of consumers purchasing complementary products and services.
- *Example:* Consumers subscribing to aviation and financial magazines may find clothing catalogs in their mailboxes.
- This is accomplished by “buying” customers’ names from other firms selling complementary products.

# Market Dominance

## I. Why bother analyzing dominant position?

- There is nothing in the law against a firm holding a dominant position. It is perfectly legal for a firm to be a monopoly.
- So why bother analyzing market dominance?
- European antitrust policy centers around Articles 81 and 82 of the EC Treaty.
- Should price schemes targeted to loyal customers be viewed within the framework of Article 82? “Any abuse by one or more undertakings of a dominant position...” is prohibited.
- The U.S. equivalent would be a charge for “attempting to monopolize,” or
- the Robinson-Patman Act which prohibits sales that discriminate in price on the sale of goods to equally-situated distributors when the effect of such sales is to reduce competition. (Not applicable to direct sales?)

# Market Dominance

## II. Concentration measures cannot determine a firm's dominant position

- This paper investigates the conditions under which BBP enhances a firm's **dominant position**.
- But, how a firm's dominant position can be measured?
- Let  $s_1 \geq s_2 \geq \dots \geq s_N$  denote percentage market shares.
- *Note:* The Four-Largest Firm Concentration Index  $I_4 = \sum_{i=1}^4 s_i$  and the Herfindahl-Hirschman Index  $I_{HH} = \sum_{i=1}^N (s_i)^2$  are **measures of a market** (not measures of a firm's dominant position!)
- *Thus*, both, the  $I_4$  and the  $I_{HH}$  are *not suited* for measuring market dominance of a single firm.

# Market Dominance

## III. A measure of a firm's dominance

Melnik, Shy, and Stenbacka (*JEBO*, Forthcoming), propose a **measure of market dominance**. Formally, firm 1 is said to be dominant if  $s_1 > s_D$ , where the threshold  $s^D$

$$s^D \stackrel{\text{def}}{=} \frac{1}{2} \left[ 1 - \gamma (s_1 - s_2) \left( 1 - \sum_{i=3}^N s_i \right) \right] = \frac{1}{2} [1 - \gamma (s_1^2 - s_2^2)].$$

- Hence, firm 1 has a dominant position if  $s_1 > 50\%$  (when  $s_1 = s_2$ ),
- but, it becomes lower than 50% as  $s_1^2 - s_2^2$  increases.
- The parameter  $\gamma$  can be adjusted to be industry specific.
- We recommend setting  $\gamma = 1$  as a benchmark.

# Market Dominance

## IV. Dominance in the real world: Europe's banana import market

Market shares of the largest banana importers in Europe in the 1970s.

Company	Market Share ( $s_i$ )	$s^D$ ( $\gamma=\frac{1}{2}$ )	$s^D$ ( $\gamma=1$ )	$s^D$ ( $\gamma=2$ )
<b>United Brands</b>	0.45	0.455–0.459	<b>0.410–0.418</b>	<b>0.320–0.337</b>
Castle & Cook	0.15–0.20			
Del Monte	0.10–0.12			
Alba & Bruns	0.03–0.06			
Belhoba	0.03–0.06			
Geest	0.03–0.06			
SMO	0.03–0.06			

United Brands is a dominant firm for  $\gamma = 1$  and  $\gamma = 2$ .

# Market Dominance

## V. Dominance in the real world: The Volvo-Scania merger case

Dominance tests of hypothetical mergers between Volvo and other European truck manufacturers in 1998.

Company	Market Share ( $s_i$ )	$s_i + s_V$	$s^D$ ( $\gamma=\frac{1}{2}$ )	$s^D$ ( $\gamma=1$ )	$s^D$ ( $\gamma=2$ )
Volvo	0.15	n/a	n/a	n/a	n/a
Scania	0.16	0.31	0.487	0.474	0.448
Renault	0.12	0.27	0.493	0.486	0.471
Man	0.13	0.28	0.491	0.483	0.466
Iveco	0.11	0.26	0.494	0.488	0.477
Daimler	0.21	0.36	0.474	0.448	0.396
Daf	0.11	0.26	0.494	0.488	0.477

According to our measure, merger does not lead to dominance if entire Europe is taken to be the relevant market (EC focused on the Swedish market).

# Literature Review

## I. Behavior-based pricing and Market Dominance

### Dominance with sheltered markets

*Note:* Sheltered markets means that some consumers cannot switch.

- Armstrong & Vickers *JIE* 1993.
- Chen *JIE* Forthcoming
- Bouckaert, Degryse, and van Dijk (2007)

Our paper differs from the above in that

- (a) It focuses on market share dominance and persistence of market dominance.
- (b) There are no sheltered markets, hence *all* consumers can potentially switch brands.

# Literature Review

## II. Behavior-based pricing: Poaching and Loyalty Discounts

- Fudenberg and Villas-Boas *Handbook Econ. & Info. Sys.* 2006: A survey of consumer recognition and BBP.
- Thisse and Vives *AER* 1988: Consequences of price discrimination under oligopoly differ dramatically from those under monopoly.
- Caminal & Matutes *IJIO* 1990: Loyalty discounts generate endogenous switching costs.
- Fudenberg and Tirole (2000), A general analysis of behavior-based pricing. Analyze short-term and long-term service contracts.
- Chen *JIE* 1997: Demonstrates the competitive effects of BBP under homogenous products (hence, switching is undesirable).
- Taylor *RAND* 2003; Gehrig and Stenbacka *JEMS* 2004 & *EER* 2007; Caminal and Claiici *IJIO* 2007.

# Literature Review

## III. Our contribution relative to existing literature

1. Investigate whether behavior-based pricing may lead to persistence market dominance.
2. Compare industries with horizontally-differentiated brands to industries with vertically-differentiated brands.
3. We analyze behavior-based pricing, switching costs, and brand differentiation in a single model.

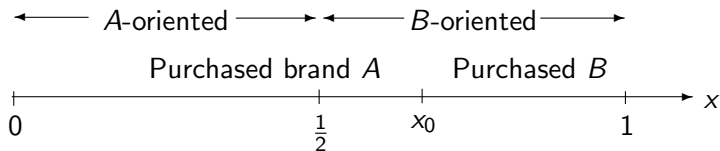
# Behavior-based Pricing under Horizontal Differentiation

## Goods and firms

- Two firms, two differentiated brands,  $A$  and  $B$ .
- Hotelling environment:  $A$  locates at  $x = 0$ ,  $B$  at  $x = 1$ .
- Set all production costs to equal zero.

## Consumers

- Continuum, uniformly distributed and indexed by  $x \in [0, 1]$ .
- $x = 0$  are the most  $A$ -oriented,  $x = 1$  are the most  $B$ -oriented.
- Each consumer  $x$  buys one unit of  $A$  or  $B$  (but not both).



# Behavior-based Pricing under Horizontal Differentiation

## Consumers' history of purchase

- The function  $h(x) : [0, 1] \rightarrow \{A, B\}$  maps each consumer  $x$  to the consumer's previously-purchased brand.
- Example:  $h(0.25) = B$  means that consumer  $x = \frac{1}{4}$  purchased brand  $B$  in an earlier period.

## Consumer (exogenous) switching costs

- A consumer with a history  $h(x) = A$  who now buys brand  $B$  bears a cost of  $\sigma_{AB} \geq 0$ .
- A consumer with a history  $h(x) = B$  who now buys brand  $A$  bears a cost of  $\sigma_{BA} \geq 0$ .
- *Assumption:* The average switching cost is bounded. Formally,  $(\sigma_{AB} + \sigma_{BA})/2 < \tau$ , where  $\tau$  is the transportation cost parameter to be defined below.

# Behavior-based Pricing under Horizontal Differentiation

## Prices and Utility

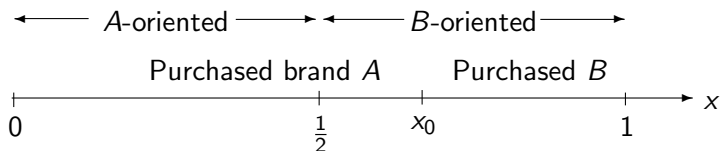
- $p_A$  and  $p_B$  denote prices paid by “loyal” consumers, by firms  $A$  and  $B$ .
- $q_A$  and  $q_B$  denote prices paid by consumers switching from competing brands.
- Thus,  $q_A$  and  $q_B$  are *poaching* prices.
- The utility of a consumer  $x$ , with a history  $h(x)$  is

$$U(x) \stackrel{\text{def}}{=} \begin{cases} \beta - p_A - \tau x & \text{if } h(x) = A \text{ and buys } A \\ \beta - q_B - \tau(1-x) - \sigma_{AB} & \text{if } h(x) = A \text{ and now switches } B \\ \beta - p_B - \tau(1-x) & \text{if } h(x) = B \text{ and buys } B \\ \beta - q_A - \tau x - \sigma_{BA} & \text{if } h(x) = B \text{ and now switches to } A, \end{cases}$$

where  $\beta > 0$  measures consumers' “basic” satisfaction, and  $\tau > 0$  the “transportation” cost (taste) parameter.

# Firms' inherited market shares

- Let  $x_0$  be exogenously given.
- *Assumption:* Firm  $A$ 's inherited market share includes all consumers indexed by  $x \in [0, x_0]$ .
- *Assumption:* Firm  $B$ 's inherited market share includes all consumers indexed by  $x \in (x_0, 1]$ .
- *Assumption:*  $x_0 > \frac{1}{2}$  which captures that firm  $A$  is dominant.



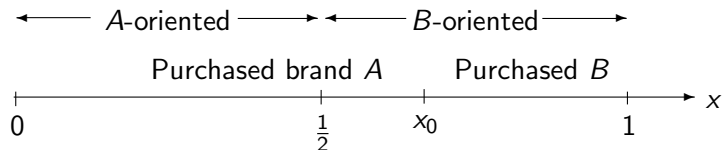
# Classifications of market dominance

The purchase history  $x_0$  exhibits **weak dominance** if

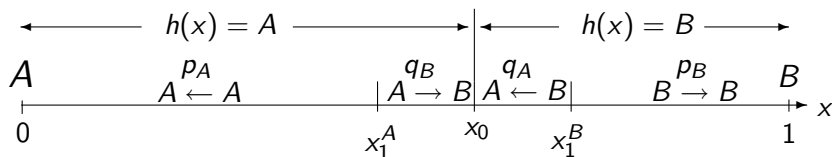
$$\max \left\{ \frac{\sigma_{AB} + \tau}{4\tau}, \frac{1}{2} \right\} \leq x_0 \leq \frac{3\tau - \sigma_{BA}}{4\tau}$$

and **strong dominance** if

$$x_0 > \frac{3\tau - \sigma_{BA}}{4\tau}.$$



# Equilibrium Under Weak Dominance



Firms  $A$  and  $B$  solve the following profit maximization problems:

$$\max_{p_A, q_A} \pi_A(p_A, q_A) \stackrel{\text{def}}{=} p_A x_1^A + q_A (x_1^B - x_0)$$

$$\max_{p_B, q_B} \pi_B(p_B, q_B) \stackrel{\text{def}}{=} p_B (1 - x_1^B) + q_B (x_0 - x_1^A).$$

Solving, the equilibrium market shares are

$$m_1^A = x_1^A + (x_1^B - x_0) = \frac{2 - x_0}{3} + \frac{\sigma_{AB} - \sigma_{BA}}{6\tau},$$

$$m_1^B = 1 - x_1^B + x_0 - x_1^A = \frac{1 + x_0}{3} - \frac{\sigma_{AB} - \sigma_{BA}}{6\tau}.$$

# Equilibrium Under Weak Dominance

Results:

## New versus inherited market shares

1.  $m_1^A$  declines with  $x_0$ .
2.  $m_1^B$  increases with  $x_0$ .

Why? High initial market share  $x_0$  means that firm  $A$  was selling to “many”  $B$ -oriented consumers.

## Persistent dominance: Definitions

1. Firm  $A$ 's market dominance **persists** if  $m_1^A > \frac{1}{2}$ .
2. Market dominance is **reversed** if  $m_1^A \leq \frac{1}{2}$ .

# Equilibrium Under Weak Dominance

Results (con'd)

## Persistent dominance: Results

Let  $\Delta\sigma \stackrel{\text{def}}{=} \sigma_{AB} - \sigma_{BA}$ . Under behavior-based pricing,

- (a) Market dominance persists if  $\Delta\sigma > 2\tau(x_0 - \frac{1}{2})$ .
- (b) Market dominance is reversed if  $\Delta\sigma \leq 2\tau(x_0 - \frac{1}{2})$ .

**Examples:** (a) Verizon. (b) Word and Word Perfect, Excel and Lotus.

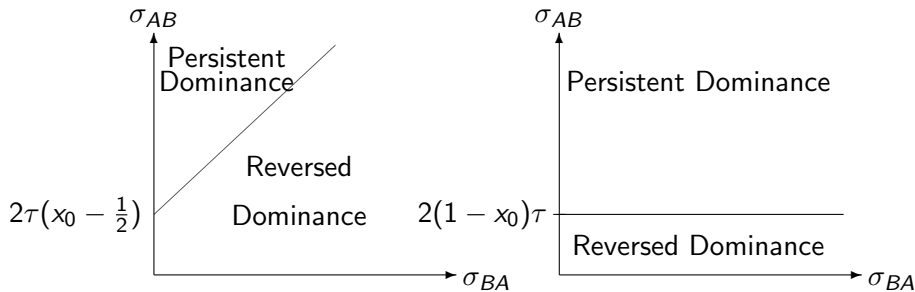
## Persistent dominance: Interpretation

Let  $\Delta\sigma \stackrel{\text{def}}{=} \sigma_{AB} - \sigma_{BA}$ . Under behavior-based pricing,

- High switching-cost advantage is necessary for persistent dominance.
- Otherwise, say if  $\sigma_{AB} \approx \sigma_{BA}$ , market dominance is reversed, the dominant firm cannot preserve its dominance under BBP.

# Equilibrium Under Weak Dominance

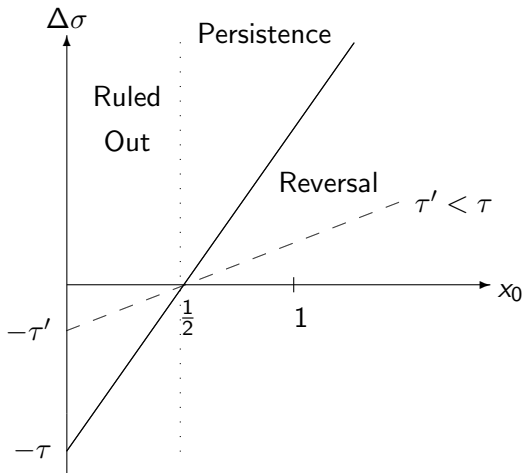
Graphic illustrations



- Ignore the graph on the right (strong dominance).
- Persistent dominance can occur only for sufficiently high switching cost advantage,
- and sufficiently small initial market share advantage (small  $x_0$ ).

# Equilibrium Under Weak Dominance

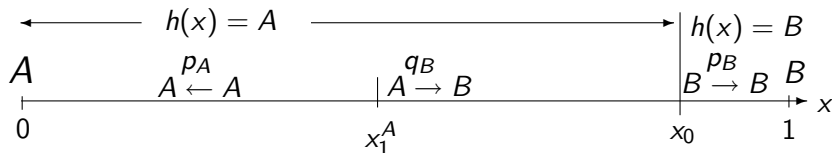
Graphic illustrations (con'd)



Persistence of market dominance is more likely to be observed when:

1. High SC advantage, and/or
2. low inherited market share.
3. Low transportation cost.

# Equilibrium Under Strong Dominance



- A's inherited market share  $x_0$  is "large."
- A is unable to poach even if it sets  $q_A = 0$ .
- Only B can poach some of A's customers

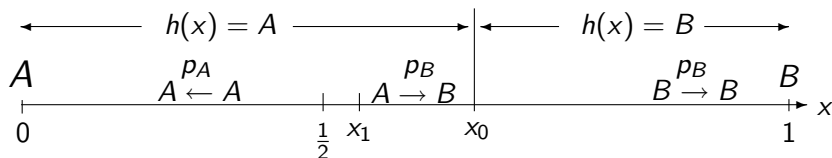
$$m_1^A = x_1^A = \frac{(2x_0 + 1)\tau + \sigma_{AB}}{6\tau} \quad m_1^B = 1 - m_1^A = \frac{(5 - 2x_0)\tau - \sigma_{AB}}{6\tau}.$$

- *Result:* Unlike the weak dominance case, here A's market share  $m_1^A$  increases with its inherited market share  $x_0$ .
- *Result:* The firm with inherited strong dominance is bound to lose its dominance ( $m_1^A \leq \frac{1}{2}$ ) if and only if  $\sigma_{AB} \leq 2(1 - x_0)\tau$ .

# Uniform Pricing under Horizontal Differentiation

## Model and equilibrium

- To assess the degree of competitiveness of BBP, we need a benchmark.
- Let's take uniform pricing as a benchmark.
- Uniform pricing: No price discrimination so
- firm  $A$  sets  $p_A$  only, firm  $B$  sets  $p_B$  only.



Here consumers switch only in one direction ( $A$  to  $B$ ) only. The small firm poaches some of the dominant's customers.

# Uniform Pricing under Horizontal Differentiation

## Results

$$p_A^u = \tau + \frac{\sigma_{AB}}{3}, \quad p_B^u = \tau - \frac{\sigma_{AB}}{3}, \quad x_1 = \frac{1}{2} + \frac{\sigma_{AB}}{6\tau} > \frac{1}{2},$$

- *Result:* Under uniform pricing, the firm with the inherited market dominance continues to maintain its dominance.
- *Remark:* Under BBP dominance persists only for sufficiently large  $\Delta = \sigma_{AB} - \sigma_{BA}$ . Otherwise, dominance is reversed.
- *Result:* The dominant firm maintains a larger market share under uniform pricing than under behavior-base pricing.
- *Result:* All consumers generally pay lower prices under behavior-based price discrimination than under uniform pricing.

Formally,  $p_A^u > p_A$ ,  $p_A^u > q_A$ , and  $p_B^u > q_B$ .

Furthermore,  $p_B^u > p_B$  as long as  $2\tau x_0 < \sigma_{AB} + \sigma_{BA} < 2\tau$ .

- *Remark:* Overall, BBP seems to improve consumer welfare under horizontal differentiation.

# Entry and Behavior-based Pricing

## Introduction

- So far, we have shown that if *both* firms use BBP, dominance cannot be maintained unless the firm is “protected” by high switching cost.
- But, what happens if one firm is a new entrant
- which cannot use BBP
- since the entrant does not have any purchase history?

# Entry and Behavior-based Pricing

## Model I: Entry into $A$ 's and $B$ 's market

- Incumbent firm inherits the market  $[0, x_0]$ .
- A fraction  $\phi$  of consumers are replaced by a new cohort uniformly distributed on  $[0, 1]$ .
- A fraction  $1 - \phi$ , uniformly distributed on  $[0, x_0]$ , are  $A$ 's loyal consumers.
- $\sigma_{AB}$  = switching cost from the incumbent  $A$  to the entrant  $B$ .
- Incumbent sets  $p_A$  to loyal customers, and  $q_A$  to newly-entering consumers.
- Entering firm sets  $p_B$  only (no purchase history).
- $x_1$  denotes a (formerly-loyal-to- $A$ ) consumer who is indifferent between buying  $A$  and  $B$ .
- $x_1^n$  denotes a new consumer who is indifferent between  $A$  and  $B$ .

# Entry and Behavior-based Pricing

## Model I: Equilibrium and results

- Incumbent chooses  $p_A, q_A$  to maximize  $\pi_A = q_A \theta x_1^n + p_A(1 - \theta)x_1$ .
- Entrant chooses  $p_B$  to maximize  $\pi_B = p_B[\theta(1 - x_1^n) + (1 - \theta)(1 - x_1)]$ .

$$p_A = \tau + \frac{(2 + \theta)\sigma_{AB}}{6} > q_A = \tau - \frac{(1 - \theta)\sigma_{AB}}{6} > p_B = \tau - \frac{(1 - \theta)\sigma_{AB}}{3}.$$

*Result:* The entrant's price is below the incumbent's poaching price.

$$m_1^A = \theta x_1^n + (1 - \theta)x_1 = \frac{1}{2} + \frac{(1 - \theta)\sigma_{AB}}{6\tau} \geq \frac{1}{2}.$$

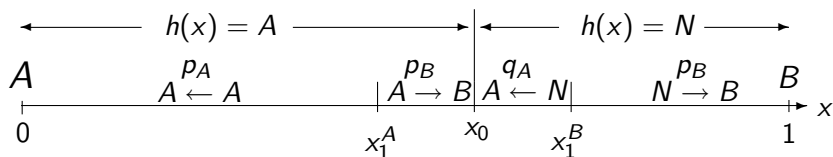
*Result:* The incumbent maintains dominance as long as it is protected by some switching cost.

*Remark:* Under  $p_A = q_A = p_A^U$  (uniform pricing),  $p_A > p_A^U$ ,  $q_A < p_A^U$ ,  $p_B = p_B^U$ , and  $m_1^A = m_A^U$ , implying that the incumbent maintains the same degree of market dominance.

# Entry and Behavior-based Pricing

## Model II: Entry into $B$ 's market

- Now suppose  $B$  enters into “its own market”  $(x_0, 1]$
- but with no purchase history.
- The entrant, firm  $B$ , cannot distinguish between new and  $A$ 's loyal consumers, therefore sets one price  $p_B$  to all consumers.
- The incumbent  $A$  can distinguish between loyal customers  $[0, x_0]$  and new consumers  $(x_0, 1]$ .



# Entry and Behavior-based Pricing

## Model II: Equilibrium and results

Incumbent's market share is:

$$m_1^A = x_1^A + (x_1^B - x_0) = \frac{2 - x_0}{3} + \frac{\sigma_{AB}}{6\tau} \geq \frac{1}{2} \quad \text{if and only if} \quad \sigma_{AB} \geq \tau(2x_0 - 1).$$

*Result:* the incumbent firm maintains its dominance only if it is protected by sufficiently high switching costs.

*Remark:* The US Congress has enacted in 1992 a uniform rate requirement in Section 623(d) of the Communications Act, where a “cable operator shall have a rate structure, for the provision of cable service, that is uniform throughout the geographic area...” Here we suggest that this Act may not be needed.

# Vertical Product Differentiation

Equilibrium in the absence of BBP

## Vertical product differentiation: A definition

The brands are *vertically* differentiated if at equal prices,  $p_A = p_B$ , all consumers prefer brand  $B$  over brand  $A$ .

The utility of consumer  $x \in [0, 1]$  is:

$$U(x) \stackrel{\text{def}}{=} \begin{cases} \alpha x - p_A & \text{if buys brand } A \\ \beta x - p_B & \text{if buys brand } B, \end{cases} \quad \text{where } \beta > \alpha > 0,$$

With uniform prices, the unique Nash-Bertrand equilibrium is:

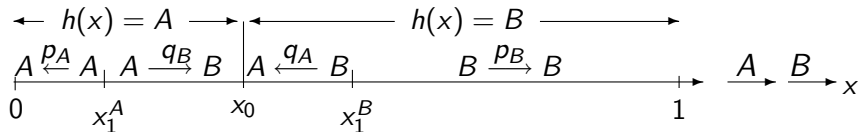
$$p_A = \frac{\beta - \alpha}{3}, \quad p_B = \frac{2(\beta - \alpha)}{3} \quad \hat{x} = \frac{1}{3}$$

The high-quality firm, firm  $B$ , captures 2/3 market share (dominant).

Can  $B$ 's dominance be further enhanced by the use of BBP?

# Vertical Product Differentiation

A model with BBP



$$U(x) \stackrel{\text{def}}{=} \begin{cases} \alpha x - p_A & \text{if } h(x) = A \text{ and continues to purchase brand } A \\ \beta x - q_B & \text{if } h(x) = A \text{ and switches to brand } B \\ \beta x - p_B & \text{if } h(x) = B \text{ and continues to purchase brand } B \\ \alpha x - q_A & \text{if } h(x) = B \text{ and now switches to brand } A, \end{cases}$$

# Vertical Product Differentiation

## Equilibrium under BBP

$$x_1^A = \frac{x_0}{3}, \quad x_1^B = \frac{x_0 + 1}{3}, \quad m_1^A = \frac{1 - x_0}{3}, \quad m_1^B = \frac{x_0 + 2}{3};$$

*Results:* Behavior-based pricing

- (a) increases the market share of the high-quality firm, firm *B*.
- (b) increases the market share of the dominant firm, if  $\frac{1}{4} < x_0 < \frac{1}{2}$ .

### Example

- Starting with an equilibrium in the absence of BBP:  $m_1^A = x_0 = \frac{1}{3}$ .
- Introducing BBP yields

$$m_1^A = \frac{2}{9} < \frac{1}{3} \quad \text{and} \quad m_1^B = \frac{7}{9} > \frac{2}{3}$$

# Vertical Product Differentiation

## Welfare analysis

- We have shown that BBP increases dominance of the high-quality producer.
- Clearly, social welfare increases (as more consumers buy the HQ good).
- But, what happens to consumer welfare?

Consumer welfare before and after BBP is implemented:

$$CW_0 \stackrel{\text{def}}{=} \int_0^{\frac{1}{3}} (\alpha x - p_A) dx + \int_{\frac{1}{3}}^1 (\beta x - p_B) dx = \frac{11\alpha - 2\beta}{18}.$$

$$CW_1 \stackrel{\text{def}}{=} \int_0^{\frac{1}{9}} (\alpha x - p_A) dx + \int_{\frac{1}{9}}^{\frac{1}{3}} (\beta x - q_B) dx \\ + \int_{\frac{1}{3}}^{\frac{4}{9}} (\alpha x - q_A) dx + \int_{\frac{4}{9}}^1 (\beta x - p_B) dx = \frac{70\alpha + 11\beta}{162}.$$

# Vertical Product Differentiation

## Welfare analysis (con'd)

The change in welfare associated with the implementation of the dominance-increasing BBP is:  $CW_1 - CW_0 = 29(\beta - \alpha)/162 > 0$ . Hence,

### Welfare result

Aggregate consumer welfare is enhanced with the increase in market dominance of the high-quality seller associated with BBP.

Note that despite the fact that the increase in dominance by itself is not harmful to consumers, the regulator may still want to monitor the dominant firm to ensure that it does not abuse its dominant position to lessen competition (antitrust perspective).