“Tacit” bundling among rivals: Limited availability bargains to loss-averse consumers

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Retailers often offer deals that are subject to “limited availability” to boost their sales. (early-bird discounts, limited-time deals, first come first served offers, etc.)

Bait and Switch
**Bait and switch pricing to loss averse consumers**

**Loss aversion** ➞ Individuals weight losses relative to a reference point more than they weight gains.

**Bait** ➞ Such deals attract consumers’ interest and create an attachment effect by defining their consumption reference point.

**Switch** ➞ When the deal is not available, loss aversion leads them to ex-ante unfavorable purchases to avoid the disappointment of leaving the store empty-handed.

- e.g. buy the product at a higher price
  - buy other (substitute) products
Introduction

Heidhues and Köszegi (2014) ⇒ A monopolist commits to a price distribution, consisting of a sale and a high regular price. The sale makes consumers anchored to the idea of consuming the products. To avoid disappointment, consumers have a higher willingness to pay and end up buying the product even when the price is high.

Rosato (2016) ⇒ A seller announces a bargain price on a good that is subject to limited availability. He creates an attachment to consumption that allows him to extract consumer surplus via a high price on a substitute good (rip-off) when the bargain is not available.
Our analysis

- We introduce a bait and switch pricing model in a partially differentiated duopoly, where the joint consumption of the products is possible.

- Without any explicit exchange of information, sellers achieve to coordinate in high prices on their products and consumers still buy both products ⇒ "Tacit" bundling

- Expectation-based loss aversion hikes the prices of both products up relative to deterministic pricing.
Model

- 2 sellers A and B \( \Rightarrow \) goods a and b (partially differentiated)

  - marginal production cost \( c \geq 0 \)

- unit mass of identical consumers

- intrinsic valuations: \( v = (v_a, v_b, v_{ab}) \),
  
  where \( v_a \geq v_b > 0 \)

  \[
  v_{ab} = v_a + v_b + z \quad \text{and} \quad z < 0 \quad \text{(partial substitutes)}
  \]
Reference dependence (Kőszegi and Rabin 2006)

Overall utility = Actual utility + Gain-loss utility
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- Actual utility = \( v_i - p_i \)
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Overall utility = Actual utility + Gain-loss utility

- Actual utility = $v_i - p_i$

- Gain-loss utility

$$\mu(x) = \begin{cases} 
\eta x, & \text{if } x \geq 0 \\
\eta \lambda x, & \text{if } x < 0 
\end{cases}$$

where $\eta > 0$ is the weight attached to the extra gain or loss

$\lambda > 1$ is the coefficient of loss aversion

$x = (v_i - v^r) \text{ or } (p_i - p^r)$
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Reference points $\Rightarrow$ a pair of probability distribution $F = (F_v, F_p)$

$$U[(v_i, p_i)| (v^r, p^r)] = v_i - p_i + \int_{v^r} \mu(v_i - v^r) \, dF_v(v^r) + \int_{p^r} \mu(p_i - p^r) \, dF_p(p^r)$$
Timing

- **t=0** ⇒ Seller B announces and commits to \((p^s_b, p_b, q)\)
  Consumers form their expectations about the purchase and choose a plan the maximizes their expected utility (PPE)

- **t=1** ⇒ Seller A sets \(p_a[p^s_b, p_b, q]\)

- **t=2** ⇒ Uncertainty is resolved and consumers execute their plans.

We assume no explicit collusion between the sellers.
Consumers’ Problem

Given \((p_b^s, p_b, q)\), consumers form rational expectations concerning their purchase and make a plan.
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Potential purchase plans:

\[ \sigma \in \left[ \{\emptyset, \emptyset\}, \{a, a\}, \{b, b\}, \{b, \emptyset\}, \{b, a\}, \{ab, a\}, \{ab, b\}, \{ab, ab\}, \{ab, \emptyset\} \right] \]
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- **Personal Equilibrium** \(\Rightarrow U[\sigma] \geq U[\sigma']\) for any \(\sigma \neq \sigma'\)
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- **Personal Equilibrium** \(\Rightarrow U[\sigma] \geq U[\sigma']\) for any \(\sigma \neq \sigma'\)

In the case of multiple PEs

- **Preferred Personal Equilibrium** \(\Rightarrow\)

\[EU[\sigma] > EU[\sigma']\] for any \(\sigma\) and \(\sigma''\) that are PEs.

(Kőszegi and Rabin 2006)
Profit maximization problems

**Seller B**  \( \Rightarrow \quad \max_{p_b^s, p_b, q} \Pi_B[p_b^s p_b, q] = q p_b^s + (1 - q) p_b - c \)

s.t. \( \sigma(p_b^s, p_b, q) \) is a PPE for consumers

**Seller A**  \( \Rightarrow \quad \max_{p_a} \Pi_A[p_a] = p_a - c \)
Profit maximization problems

Seller B $\Rightarrow$ $\max_{p_b^s, p_b, q} \Pi_B[p_b^s p_b, q] = q p_b^s + (1 - q) p_b - c$

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Seller A $\Rightarrow$ $\max_{p_a} \Pi_A[p_a] = p_a - c$

Deterministic Pricing

- For $c < v_b + z$ $\Rightarrow$
  \[
  \begin{cases} 
  p_a^* = v_a + z \\
  p_b^* = v_b + z 
  \end{cases}
  \]

- For $c > v_b + z$ $\Rightarrow$
  \[
  \begin{cases} 
  p_a^* = (v_a - v_b) + c \\
  \text{Seller B stays out of the market}
  \end{cases}
  \]
Bait and Switch induces the joint consumption of the products

Potential Purchase plans

\[ \sigma : [\{\emptyset, \emptyset\}, \{a, a\}, \{b, b\}, \{b, \emptyset\}, \{b, a\}, \{ab, a\}, \{ab, b\}, \{ab, ab\}, \{ab, \emptyset\}] \]

Bait and switch: Seller B ⇒ \([b, b], \{ab, b\}\), or \([ab, ab]\) ← PPE

Eliminated by market competition

\(p_a\) such that they are not PE (and therefore not PPE)
Equilibrium Prices

\[ p_b^s = (v_b + z) \frac{1+\eta}{1+\eta} \quad \Rightarrow \text{eliminates} \quad \{\emptyset, \emptyset\}, \{a, a\} \]
Equilibrium Prices

- $p_b^s = (v_b + z) \frac{1+\eta}{1+\eta \lambda}$ \implies \text{eliminates} \{\emptyset, \emptyset\}, \{a, a\}

- The plans \{b, a\}, \{b, \emptyset\}, \{ab, \emptyset\} are not contingent.
Equilibrium Prices

- \( p_b^s = (v_b + z) \frac{1+\eta}{1+\eta} \) \ \Rightarrow \text{eliminates} \ \{\emptyset, \emptyset\}, \{a, a\}

- The plans \{b, a\}, \{b, \emptyset\}, \{ab, \emptyset\} are not contingent.

- \( p_b^* = (v_b + z) + \frac{2\eta(\lambda-1)q}{1+\eta(\lambda-1)q} \ p_b^s \) \ \Rightarrow \text{Consumers are indifferent between} \ \{ab, ab\} \text{ and } \{ab, a\}
Equilibrium Prices

- \( p_b^s = (v_b + z) \frac{1+\eta}{1+\eta\lambda} \Rightarrow \) eliminates \( \{\emptyset, \emptyset\}, \{a, a\} \)

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- \( p_b^* = (v_b + z) + \frac{2\eta(\lambda-1)q}{1+\eta(\lambda-1)q} p_b^s \Rightarrow \) Consumers are indifferent between \( \{ab, ab\} \) and \( \{ab, a\} \)

- \( p_a^* = (v_a + z) \frac{1+\eta\lambda}{1+\eta} - \frac{\eta(\lambda-1)q}{1+\eta} (p_b - p_b^s) \Rightarrow \{ab, ab\} \) is a PE

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Equilibrium Prices

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Availability level \( \Rightarrow q^* \in (0, \frac{1}{2}) \)
Equilibrium Prices

- \( p_b^s = (v_b + z) \frac{1 + \eta}{1 + \eta \lambda} \) \Rightarrow \text{eliminates} \ \{\emptyset, \emptyset\}, \ \{a, a\}

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- \( p_b^* = (v_b + z) + \frac{2 \eta (\lambda - 1) q}{1 + \eta (\lambda - 1) q} p_b^s \) \Rightarrow \text{Consumers are indifferent between} \ \{ab, ab\} \text{ and } \{ab, a\}

- \( p_a^* = (v_a + z) \frac{1 + \eta \lambda}{1 + \eta} - \frac{\eta (\lambda - 1) q}{1 + \eta} (p_b - p_b^s) \) \Rightarrow \{ab, ab\} \text{ is a PE}

Availability level \Rightarrow \ q^* \in (0, \frac{1}{2})

Consumers always buy both products
Bait and Switch vs Deterministic Pricing

Bait and switch is always preferred over deterministic pricing for relatively weak substitutes ($z \geq \hat{z}$).

Higher loss aversion makes bait and switch more likely.
Bait and Switch vs Deterministic Pricing \((c < v_b + z)\)

\[ p_a^* \text{ and } p_b^* \text{ are higher than under deterministic pricing} \]

**Tacit Bundling**

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Bait and Switch vs Deterministic Pricing \((c \geq v_b + z)\)

\[ p_a^* \text{ and } p_b^* \text{ are higher than under deterministic pricing} \]

Tacit Bundling
Conclusions

- Bait and switch pricing under imperfect competition can be a mechanism that induces collusion between rival sellers without any explicit exchange of information.

- Even though prices of both the products are high relative to deterministic pricing, consumers always buy both products $\Rightarrow$ Bundling
Thank you for your attention!