Buying Patterns and Cross-Subsidization

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Cross-Subsidization

- Multi-product firms often engage in cross-subsidization
  - Pricing some products below cost
  - Covering the losses with the revenue from other products
- Commonly observed in (partially) regulated industries
  - Examples: telecoms, electricity, postal services, ...
  - “Deep pocket:” revenues from protected markets
  - Concern: can distort competition in liberalized markets

Also arises in unregulated markets

- *Loss leading* is widely adopted by large retailers
  - See e.g. UK Competition Commission (2008)

    90% of large retailers, 6% of total sales
  - Concern: survival of small retailers

    in 2000 the Bundeskartellamt ordered *Wal-Mart*, *Aldi* and *Lidl* (2000) to stop selling below cost staples such as milk and butter [overruled on appeal, sustained by the supreme court]
  - Contrasted policies: e.g., rules on below-cost resale
    - US: banned in 22 states, allowed in other states
    - EU: ban in 6 countries, restrict. in 7, OK in Netherlands and UK

Also arises in unregulated markets

- Core (bottleneck) vs (competitive) adjacent markets
  - Examples
    - platform vs applications
    - equipment vs accessories / spare parts / maintenance services
  - Below-cost pricing or bundling applications/accessories
    - browser/player integrated in OS software
    - maintenance/insurance included in equipment package
  - Concern: “monopoly leverage”
  - Contrasted policies again
    Microsoft: US vs EU

Buying patterns

- Heterogeneous buying patterns
  - Consumer face transaction costs
    shopping costs, adoption costs, ...
  - Different costs lead to different buying patterns
    one-stop shopping vs. multi-stop shopping
- Cross-subsidization as optimal price-discrimination
  - Attracting / exploiting one-stop shoppers
    - determines price for the “bundle”
  - Exploiting multi-stop shoppers
    - raise price on “strong” product
    - sell “weak” product below cost

Policy implications

- Policy implications depend on nature of competition
  - Asymmetric competition: e.g., “large” vs. “small”
    banning loss leading
    - hurts “large” firm
    - benefits rivals and consumers (multi-stop shoppers)
    - reduces distortion in distribution of buying patterns
  - Symmetric competition: different comparative advantages
    banning loss leading
    - softens competition for one-stop shoppers
    - increases profits at the expense of consumers and society

Asymmetric competition

- Loss leading
  - Existing theories
    - advertising strategy (Lal and Matutes 1994, Ellison 2005)
    - cross-subsidizing by a multi-product monopolist (Bliss 1988)
  - Ignores often-voiced antitrust concerns
    - smaller rivals' profits are squeezed
      - retailing: Competition Commission 2008
      - platform / applications: *Microsoft* saga
    - consumers face higher prices on other items (Dobson 2000)
  - Here:
    - large versus small firms
    - diversity of buying patterns

Large versus small firms

- A simple framework
  - A large firm L offers a broader range than a comp. fringe S
    - two segments (products, varieties of a product, ...): A and B
    - A is monopolized by L
    - B is competitive: offered by both L and the fringe S
  - Small firms are better in market B
    - constant returns to scale
    - unit demand, homogeneous valuations
    - welfare $w_A\ (=\ u_A - c_A)$ in market A, w_L and $w_S\ >\ w_L$ in B
  - Complete information
    - firms compete in prices
    - consumers observe prices and choose whether/where to buy

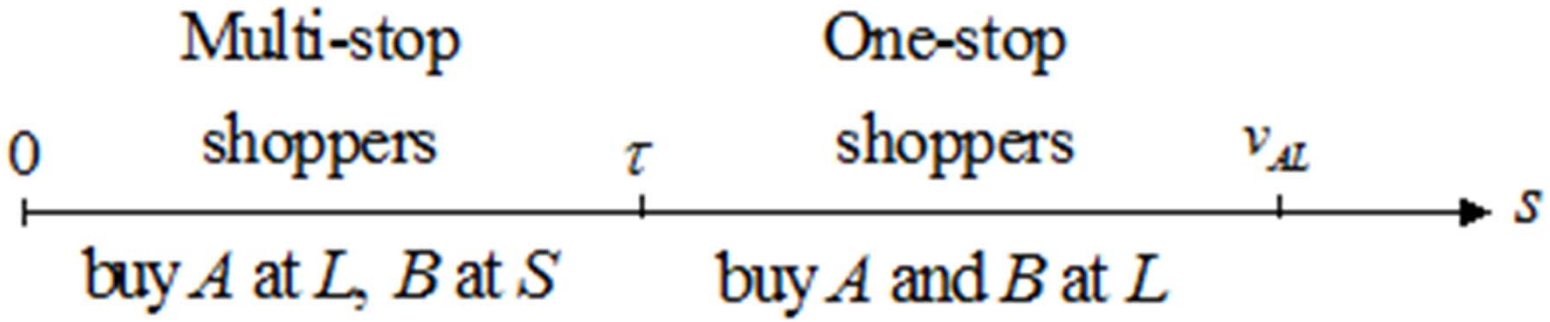
Buying patterns

- Key ingredient: (heterogeneous) transaction costs
  - Shopping costs: visiting two stores versus one
  - Learning: platform / application, pilot certification
  - Maintenance, spare parts
  - *Heterogeneity*: "shopping cost" s distributed $\sim F(s)$

- Buying patterns
  - High "shopping cost:" one-stop shoppers
    - either buy both A and B from L
    - or buy only B from S
  - Low shopping cost: multi-stop shoppers (A from L, B from S)

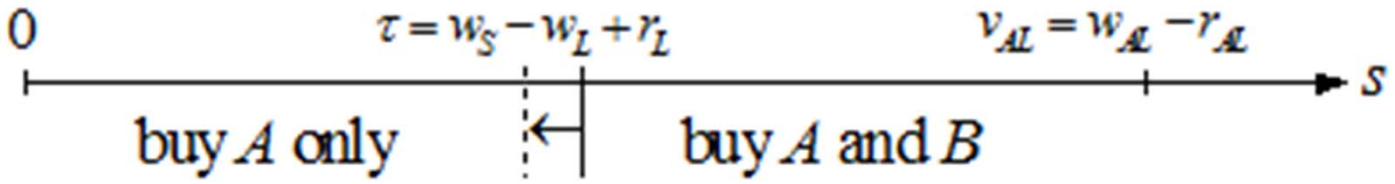
Loss leading

- Pricing
  - Competitive fringe S offers B at cost: value w_S for consumers
  - Suppose $w_{AL} = w_A + w_L > w_S$
    - L wins competition for one-stop shoppers
    - charges total margin r_{AL}, offers a value $v_{AL} = w_{AL} - r_{AL} > w_S$
    - consumers favour multi-stop shopping if $s < \tau = w_S - v_L$,
      where $v_L = w_L - r_L$ is the value that L offers on B



Loss leading

- Pricing (cont'd)
  - Suppose that L alters its prices
    - maintains total margin r_{AL}
    - increases margin on A, reduces that on B
  - Impact on L's profit
    - same margin on one-stop shoppers
    - higher margin on multi-stop shoppers
    - one-stop shoppers keep buying, some multi-stop shoppers become one-stop shoppers: sell them A on top of B



$\rightarrow$ modification is profitable as long as L makes a margin on B

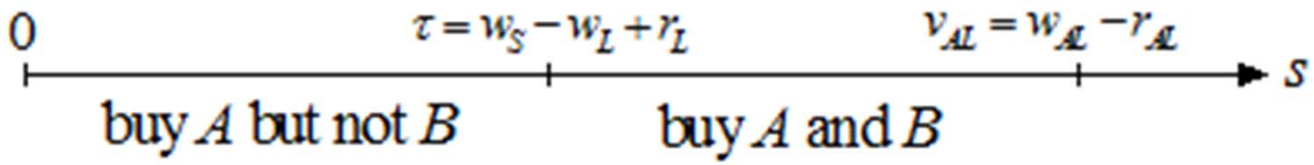
Loss leading

- Main insight: Loss leading
  - L sells B below cost

    subsidy on B $\leftrightarrow$ extra margin on multi-stop shoppers

    $$\pi_L = r_{AL}F\left(v_{AL}\right) - r_L F\left(\tau\right)$$
  - Optimal subsidy: standard trade-off margin / volume

    $$\max r_L F\left(\tau\right) = r_L F(w_S - w_L + r_L)$$



  - [If $w_{AL} = w_A + w_L < w_S$, L monopolizes A, leaves B to rivals]

Loss leading

- Remark on profits
  - Let $r_{AL}^m = \arg\max_{r_{AL}} r_{AL} F\left(w_{AL} - r_{AL}\right)$ and $v_{AL}^m = r_{AL}^m F\left(w_{AL} - r_{AL}^m\right)$,
    and suppose that $v_{AL}^m > w_S$
  - Then L earns:
    - o "monopoly profit" on all shoppers
    - o an additional profit on multi-stop shoppers
  - More generally, L earns more than the "monopoly profit" whenever $w_{AL} \gg w_S \leftrightarrow w_A \gg w_S - w_L$
  - In that case:
    - o L is "very aggressive" vis-à-vis small rivals
    - o but *benefits* from their presence

Margin squeeze

- Suppose now that S is a (strategic) rival
  - Below-cost pricing still arises as long as L has large enough comparative advantage ($w_A \gg w_S - w_L$)
  - In that case, L again earns more than "monopoly profit"
  - Hence:
    - loss leading hurts the rival
      - reduces its market share
      - reduces its margin
    - but the large firm benefits again from the presence of its rival

→ "*exploitative*" rather than "*exclusionary*" abuse

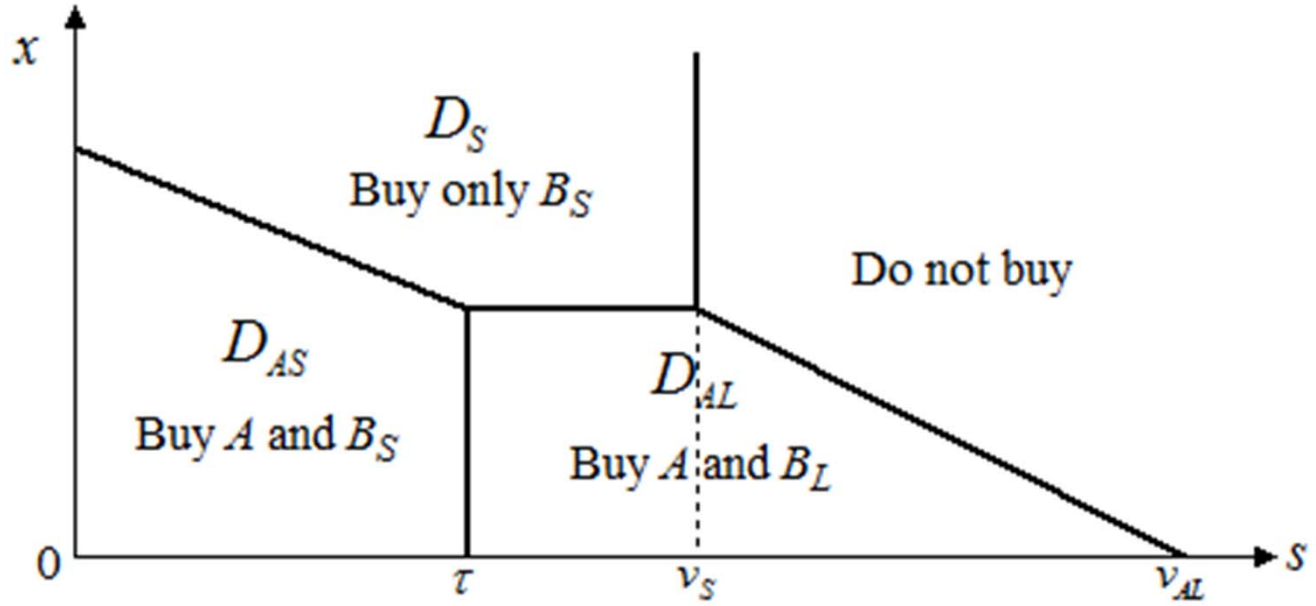
Robustness

- Readily extends to
  - Partial substitution between A and B: $u_{AB} < u_A + u_B$
  - Complementarity between A and B: $u_{AB} > u_A + u_B$
    - e.g., $u_B = 0$
    - works even better: one-stop shoppers *must* buy from L
    - illustration: platform / applications
  - Asymmetric shopping costs: s for S, αs for L
    - Carrefour has started downsizing its hypermarkets
  - Elastic demand for B (pricing below cost expands demand)
  - Bounded shopping costs (full participation)

Robustness

- Also extends to
  - Elastic demand for A

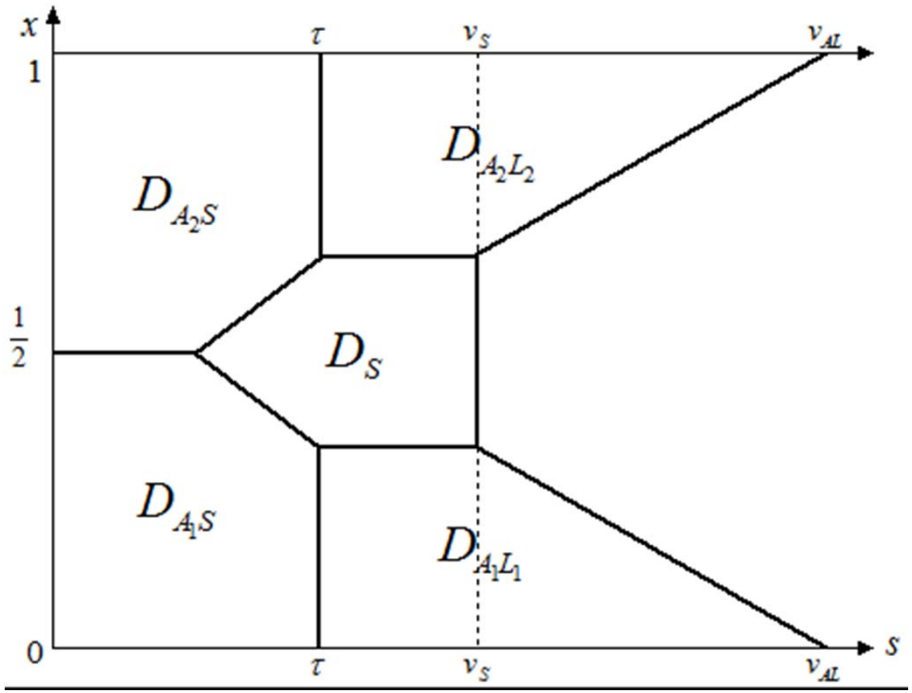
    $\rightarrow$ L faces a trade-off when raising r_A



Robustness

- Also extends to
  - Limited market power on A

    e.g., imperfect competition between L_1 and L_2 (“Hotelling”)



Policy implications

- Consider a ban on loss leading
  - Prices
    - forces L to sell B at cost ($r_L = 0$)
    - does not affect L's total margin
  - Consumers
    - one-stop shoppers are unaffected
    - multi-stop shoppers are better-off
    - transforms some one-stop shoppers into multi-stop shoppers
  - Firms
    - small firm benefits from the ban (L is less aggressive)
    - large firm is hurt (constraint on its pricing strategy)
  - Welfare increases (reduces distortion on shopping decisions)

Symmetric competition

- Common wisdom: cross-subsidies do not arise under competitive conditions

  e.g., Faulhaber (2005)

  - Constant returns to scale
  - Prices driven to marginal cost: each product covers its cost
  - No "deep pocket" in competitive markets

- Here

  - “Symmetric asymmetry:” better on different products
  - Heterogeneous buying patterns: one-stop versus multi-stop

Symmetric asymmetry

- A simple framework
  - Two firms, 1 and 2, offer same product lines: A and B
    - constant returns to scale c_{ij}
    - unit demand, homogeneous valuations u_{ij}
    - welfare: $w_{ij} = u_{ij} - c_{ij}$
  - Firm 1 has an advantage on A, and firm 2 on B
    - $w_{A1} > w_{A2}$
    - $w_{B2} > w_{A2}$
  - Symmetric advantage
    - $w_{A1} - w_{A2} = w_{B2} - w_{A2} = \delta$
    - firms thus offer same total value: $w_{A1} + w_{B1} = w_{A2} + w_{B2} = w$

Buying patterns

- In the absence of shopping costs
  - Asymmetric Bertrand competition in each market
    - the better firm wins
    - charges a price matching the rival's best value
  - Each firm earns a margin δ on its strong product
- With "high" shopping costs
  - All consumers are one-stop shoppers
  - Symmetric competition: both firms offer the bundle at cost
- Suppose now that shopping cost s is distributed $\sim F(s)$

Cross-subsidization

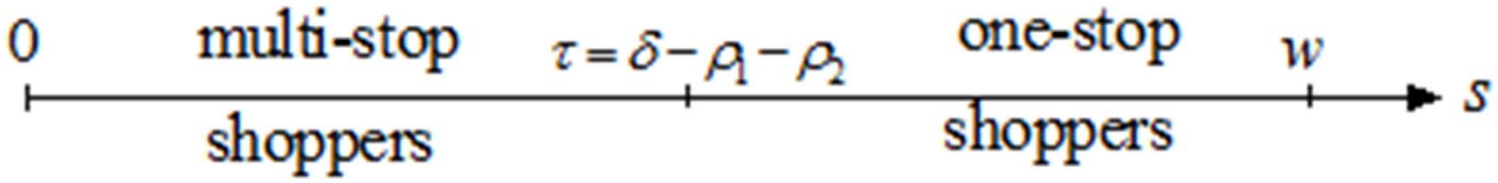
- One-stop shopping
  - One-stop shoppers
    - incur the shopping cost s once
    - firm $j = 1,2$ offers value $v_j = w_{Aj} + w_{Bj} - r_j$
  - Competition for one-stop shoppers yields $r_1 = r_2 = 0$

- Multi-stop shopping
  - Multi-stop shoppers
    - incur the shopping cost s twice
    - obtain $v_{12} = w + \delta - r_{A1} - r_{B2}$
  - Consumers favour multi-stop shopping if $s < \tau = \delta - r_{A1} - r_{B2}$

Cross-subsidization

- Main insight: cross-subsidization
  - Each firm sells its weak product below cost
    - each firm sells the bundle at cost
    - subsidy on weak product $\leftrightarrow$ margin ρ on multi-stop shoppers
  - Equilibrium: double marginalization / complements

$$\max \pi_j = \rho_j F(\tau) = \rho_j F(\delta - \rho_1 - \rho_2)$$



Robustness

- Extensions
  - Product differentiation ("Hotelling")
    - firms then earn positive profits on one-stop shoppers
    - but cross-subsidies still arise ... when competition is tough
  - Bounded range for consumers' shopping costs
    - cross-subsidization arises when there is enough heterogeneity
    - it does not arise if all consumers have same shopping pattern

Policy implications

- Consider a ban on loss leading
  - Prices
    - forces firms to sell their weak products at cost ($r_{A2} = r_{B1} = 0$)
    - tension
      - competition for OSS tends to drive total margins down to 0
      - but this cannot be an equilibrium, as slightly increasing the margin on the strong product generates a profit from MSS
      - there is thus no pure-strategy Nash equilibrium
    - there exists a mixed strategy Nash equilibrium, in which
      - firms sell weak products at cost
      - and randomize over the margins for their strong products

Policy implications

- Consider a ban on loss leading (cont'd)
  - Impact of the ban
    - firms' profits increase
    - one-stop shoppers face higher prices
    - total welfare decreases when the comparative advantage δ is small
  - Hence, the desirability of the ban much depends on the nature of competition
    - large vs small: benefits rivals, consumers, society
    - more symmetric differences: softens competition

Concluding remarks

- Cross-subsidization arises in competitive markets
  - Screening device / buying patterns
  - Exploitative abuse rather than exclusionary practice
    - different from predation
      - predation: short-term losses / long-term recoupment
      - here: persistent below-cost prices on some products
    - different from horizontal foreclosure
      - foreclosure aims at getting rid of competitors
      - dominant firm can here benefit of small rivals' presence

      … yet it hurt rivals when taking advantage of their presence
    - Article 102 vs. Section 2

Concluding remarks

- Policy implications

  Banning below-cost pricing

  - May benefits rivals, consumers and society in case of "asymmetric competition"
    - large supermarket vs. specialized retailers or hard-discounters
    - platform / applications
  - May instead soften competition at the expense of consumers and society in case of "symmetric asymmetry"

    comparative advantage on different products
    - retail banking
    - hardware / software
    - content / equipment

Concluding remarks

- Buying patterns
  - Key ingredients
    - heterogeneous transaction costs
    - diversity of buying patterns
  - Very little work (notable exceptions: C. Wey, H. Smith, …)
    - who adopts which pattern?
    - implications for marketing strategies
    - here: simple “twist” yields “competitive” cross-subsidization
  - Substitutes or complements?
    - whisky and vodka: large vs small party, price level
    - one-stop shopping: complementarity
    - implications for pricing, merger policy, collusion

References

- Based on two papers with Zhijun Chen

  - Asymmetric competition

    "Loss Leading as an Exploitative Practice", *American Economic Review*, 102(7):3462-3482, 2012

  - Symmetric asymmetry

    "Below-Cost Pricing in Multiproduct Price Competition", 2012.