The Economics of E-commerce and Technology

Monetization: Prices and Advertising
The Stages of Buying (The Marketing Funnel)

Marketing

Other Networks

Value of Consumer

Awareness

- Content
- SEO, SEM, display, email and word-of-mouth

Familiarity

- Frequency of user visits (pull)

Opinion

- Rise of third-party reviews
- Comments / message boards

Consideration

- Typically lose the user and data at this juncture as users exit the network

Intent

- Mass media broadcast frequency (push)

Shopping

- Participation in community features
- Brand affiliation

Purchase

- Content / brand affinity

- Company X can capitalize on and influence intent

Company X leverages its relationships with content providers to target a high-value user

Company X network is comprised of high-value users with expressed intent
Basic Monopoly Pricing
Monopoly Pricing: Recap

- Constant marginal cost, $c$.
- Firm chooses quantity to maximize profits
  \[ \Pi(q) = q(p(q) - c) \]
- First-order condition
  \[ MR(q) = c \]
- Inverse elasticity rule
  \[ \frac{p - c}{p} = \frac{1}{e} \quad \text{where} \quad e = -\frac{p}{q} \frac{dq}{dp} \]
Multi-product monopolist

- Microsoft sells XBox and Halo
  - If sell separately optimal prices $p_X = 300, p_H = 50$.
  - But they sell both: how should they price them?

- Walmart sells Xbox and PS3
  - If sell separately optimal prices $p_X = 300, p_{PS} = 400$.
  - But they sell both: how should they price?

- Economist sells print and online editions
  - How should they price?
Multi-product monopolist

- Firm chooses \((q_1, q_2)\) to maximize
  \[
  \Pi(q_1, q_2) = q_1(p_1(q_1, q_2) - c_1) + q_2(p_2(q_1, q_2) - c_2)
  \]

- Inverse elasticity rule for \(p_1\)
  \[
  \frac{p_1 - c_1}{p_1} = \frac{1}{e_{11}} - \frac{(p_2 - c_2)q_2}{p_1q_1e_{11}}e_{12} \quad \text{where} \quad e_{12} = -\frac{p_1}{q_2} \frac{dq_2}{dp_1}
  \]

- Substitutes: \(e_{12} < 0\)
  - Negative externality so increase \(p_1\).

- Complements: \(e_{12} > 0\)
  - Positive externality so reduce \(p_1\).
New Products and Cannibalization

- When launching new product, do cost-benefit analysis.
- But products are often complements/substitutes for old:
  - Netflix launches Video on Demand
  - Apple launches iPad
  - Amazon launches Kindle
- Relation matters:
  - If compliment then introduce product earlier
  - If substitute then delay because of cannibalization
- This relates to last slide:
  - Having a product unavailable is like price being infinity.
  - Need to take externalities into account when launching.
Price Discrimination
Three types of price discrimination

1. First-degree
   - Perfect price discrimination. Theoretical ideal.

2. Third-degree (group pricing)
   - Price as function of observables.
   - Examples: Student status, zip code, assets.

3. Second-degree (indirect price discrimination)
   - Offer menu of options and let people self-select.
   - Examples: Versioning, quantity discounts.
   - Pricing often has elements of both second- and third-degree price discrimination.
First-Degree Price Discrimination

- Suppose know customer’s demand curve, \( p(q) \).
- Firm can extract all consumer surplus
  - Let welfare maximizing quantity be \( q^* \), so that \( p(q^*) = c \).
- Three ways to extract
  1. Block pricing: sell \( q^* \) units at \( W(q^*) = \int_0^{q^*} p(q) \, dq \)
  2. Two-part tariff: price \( p = c \) and fee \( CS(q^*) = W(q^*) = \int_0^{q^*} [p(q) - c] \, dq \)
  3. Nonlinear prices: Sell \( q^{th} \) unit for price \( p(q) \).
- Big assumptions
  - Know customers demand.
  - Able to charge different prices to different customers.
- Example: Elsevier and Universities
Third-Degree Price Discrimination

- Firm can observe customer characteristics
  - Country (e.g. book prices)
  - Student status (e.g. airline tickets)
- Optimal pricing: Use inverse elasticity rule for each group.
  - Lower price to most sensitive groups.
- Assumptions
  - No resale (e.g. international editions of textbooks)
  - No cost to setting different prices
  - Cannot change characteristics (e.g. hide student card)
  - No ethical issues (e.g. racial discrimination in car sales)
  - Consumer demand and observable characteristics are correlated
- Has internet made easier or harder?
Second-Degree Price Discrimination

- Offer menu of products and see which consumers choose
  - High and low quality products (vertical differentiation).
  - Indian and American textbook (horizontal differentiation).
  - Quantity discounts.

- Big idea
  - Choose options so different types of customers self-select.
  - Want to separate groups that have different WTP.
  - Need customers with different WTP to value features differently

- Classic example: Coupons (or Groupons)
  - Put coupons in the newspaper.
  - Annoying to cut out and bring to store.
  - How does this raise profits? Why not just lower price?
A Classic Example

It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriages or to upholster the third-class seats that some company or other has open carriages with wooden benches. [...] What the company is trying to do is to prevent the passengers who can pay the second-class fare from traveling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich.

Jules Dupuit, 1849
A Modern Example

Smarter Travel Search
Better Travel Deals

Pick Two, Get One™ — save up to 40% on flights
Pick two trips. GetGoing selects one and books it for you at a discount.

Flying from
Los Angeles, CA (LAX)

Flying to
Europe

Departing
Returning
mm/dd/yyyy
mm/dd/yyyy

Travelers
1 Person

Find Flights

The most exciting way to save up to 40% on flights
How to Price Discriminate

- Theory beautiful but intricate.
  - See notes on website.

- How to approach problem in general
  - Suppose utility is $u = vx - p$, with $v \in \{v_L, v_H\}$
  - Consider selling bundles to each type, $(x_L, T_L)$ and $(x_H, T_H)$
  - Agents must choose their own bundle (incentive compatibility)

- In optimum
  - High type will be indifferent between high- and low-bundle.
  - Low type will be indifferent between low-bundle and no bundle.
  - High quality is efficient; low quality is degraded.
Naïve Price Discrimination

- What if we just ignored other goods?
  - Example: Utility $u = vx - p$, $v \sim U[0, 1]$ and $x \in \{x_L, x_H\}$.
  - Naïve pricing: $p_L = \frac{1}{2}(x_L + c_L)$ and $p_H = \frac{1}{2}(x_H + c_H)$

- What are optimal prices?
  - Demand for each good:
    
    $$q_H = 1 - \frac{p_H}{x_H} \frac{p_L}{x_L} \quad \text{and} \quad q_L = \frac{p_H}{x_H} \frac{p_L}{x_L} \frac{p_H}{x_L}$$

  - Firm’s profits: $\pi = q_L (p_L - c_L) + q_H (p_H - c_H)$.
  - Differentiating w.r.t. $(p_L, p_H)$, the naïve prices are optimal!
  - Generally, need hazard rate of demand to be affine.
Practical Issues of Versioning

- **How many versions?**
  - Want to cleanly separate consumers (e.g. business vs. leisure)
  - Cost to maintaining different product lines (e.g. airlines)
  - Customer confusion from too many options (e.g. cinemas)
  - Different options may reduce network effects. (e.g. wordpad)

- **Degraded versions**
  - Need to ensure customers cannot undo (e.g. unlock software).
  - Use degraded version to promote regular one (e.g. mathematica)

- **Framing**
  - People like “middle” option.
Bundling

- Bundling is very common
  - Bundling of functions (e.g. Excel)
  - Bundling of programs (e.g. MS Office)
  - Bundling of people (e.g. MS Office site licenses)

- Pure and Mixed Bundling
  - Pure: only sell bundle.
  - Mixed: see bundle and components separately.
Bundling and Price Discrimination

- Bundling can reduce the dispersion of consumers’ WTP.
- Ann and Bob have values for Excel and Word:

<table>
<thead>
<tr>
<th></th>
<th>Excel</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann (accountant)</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>Bob (bureaucrat)</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

- If sell separately
  - Prices: $60 for Word, $60 for Excel.
  - Profits $240.
- If sell as bundle
  - Prices: $160 for bundle.
  - Profits: $320.
Now 47: That's What I Call Music

Price: $11.88 & FREE Shipping on orders over $25. Details

AutoRip: Includes FREE MP3 version of this album. Provided by Amazon Digital Services, Inc. Terms and Conditions. Does not apply to orders.

In Stock.
Ships from and sold by Amazon.com. Gift-wrap available.

Want it Monday, Sept. 23? Order within 20 hrs 27 mins and choose One-Day Shipping Details.

Complete your purchase to save the MP3 version to Cloud Player.

Formats
<table>
<thead>
<tr>
<th></th>
<th>Amazon Price</th>
<th>New from $8.59</th>
<th>Used from $11.16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio CD, 2013</td>
<td>$11.88</td>
<td>$8.56</td>
<td>$11.16</td>
</tr>
</tbody>
</table>

Listen to Samples and Buy MP3s

View the MP3 Album.

Listen to all: Try our music sampler to hear song samples from this album.

Samples

<table>
<thead>
<tr>
<th>Song Title</th>
<th>Artist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I Love It (feat. Charli XCX)</td>
<td>Icona Pop</td>
</tr>
<tr>
<td>2. Mirrors</td>
<td>Justin Timberlake</td>
</tr>
<tr>
<td>3. #Beautiful (feat. Miguel)</td>
<td>Mariah Carey</td>
</tr>
<tr>
<td>4. Come &amp; Get It</td>
<td>Selena Gomez</td>
</tr>
<tr>
<td>5. Radioactive</td>
<td>Imagine Dragons</td>
</tr>
<tr>
<td>6. When I Was Your Man</td>
<td>Bruno Mars</td>
</tr>
<tr>
<td>8. Clarity (feat. Foxes)</td>
<td>Zedd</td>
</tr>
</tbody>
</table>
Bundling and Price Discrimination

- Bundling can reduce the dispersion of consumers’ WTP.
- This is easy to see when there are many goods
  - 1000 customers and 10 songs.
  - Each customers’ value per song is uniformly distributed on $[0,1]$
Other Reasons to Bundle

- Complimentary consumption (e.g. shoes)
- Complimentary production (e.g. CDs)
- Reduce the number of payments (e.g. newspaper articles)
- Blocking entry (e.g. Microsoft)
Price Complexity

- **Airline Pricing**
  - Airline prices used to be very complex: price depends on whether single/return, on how many flights etc.
  - Increasingly sell single tickets (e.g. Virgin America)

- **Complex prices**
  - May be optimal form of price discrimination
  - Makes price comparison hard, and softens competition

- **But…**
  - Confuses customers
  - People may think differential pricing is unfair
Framing

- Customers stick with default options (endowment effect)
  - Put object “in hands” of customer.
- Don’t overwhelm consumers (choice overload)
  - People more likely to buy nothing.
- Product positioning (reference effects, anchoring)
  - Choose middle option
  - Choose second cheapest (or second most expensive) wine
  - Choices affected by dominated alternatives
- Mental accounting
  - People subdivide expenditures (e.g. insurance on computer).
Beyond Prices
Zero Prices

- Zero prices are commonplace (but not universal)
  - Email accounts, Internet hotspots, Online newspapers

- How earn money?
  - Advertising (e.g. gmail)
  - Selling complementary goods (e.g. support with Sun’s MySQL)

- Advantages of zero price (over small prices)
  - No transactions costs (billing, usernames, passwords)
  - Create environment of experimentation
  - Maintain privacy

- Problems
  - Overconsumption if MC≠0 (e.g. data plans, email spam)
  - Hoarding (e.g. IP addresses)
Online Advertising


Data source: Barclays Capital

Newspapers
Outdoor
Online
Directories
Magazines
Direct Mail
Television

 billions of dollars

2007A
2008A
2009A
2010E
2011E
2012E

$0
$25
$50
$75
$100
$125
$150
$175
$200
$225
Motives for Advertising

- **Informative (e.g. restaurants)**
  - Inform customers of products existence
  - Advertise specific features or price
  - Signal quality through commitment to product

- **Persuasive (e.g. branded drugs)**
  - Change customer’s view of product
  - Jam their memory, so first think of your product.

- **Importance of advertising depends on type of good**
  - Search good – inform of existence, jam memory of customer
  - Experience good – persuade customer quality will be high
Intensity of Advertising

- The intensity of advertising varies a lot across industries
  - Breakfast cereals - advertising is 10% of revenue
  - Salt - advertising is essentially 0% of revenue
- Amount of advertising depends on
  - The sensitivity of demand to advertising
  - The markup
  - The efficiency of advertising
  - Whether advertising helps your firm, or helps all firm.
- The sensitivity depends on
  - The amount of product differentiation
  - Search vs. experience good
  - Market concentration
Advertising Strategy

- Single firm
  - Suppose advertising shifts the demand curve.
  - Care about the WTP of the marginal customer.
  - Analogous to vertical differentiation.
  - Like quality, advertising is also investment in brand equity.

- What if there are many firms?
  - Advertising about features can soften price competition
    - Consumers realize products differentiated.
    - Spurious product differentiation (e.g. Nutrasweet vs. generics)
  - Advertising about prices can increase price competition
    - If prices known, firms can cut price to get more customers.
Existing Data ("Secondary Research")
- Investor reports: annual report data, financial info, etc.
- Scan data, databases, set top boxes, subscriber lists, public company data

Analytics (Behavioral data)
- Internal databases
- Digital behaviors
- Trend data
- Behavioral patterns

New Data ("Primary Research")
- Quantitative – surveys, social monitoring
- Qualitative – Focus groups, online chats, in-home interviews
- Measurement – real behaviors, not self reported
Online Advertising

- Advantages of online advertising
  - Highly targeted (IP, time, registration info, previous pages, GPS)
  - Low fixed cost

- Major types of ad
  - Display ads - visual appeal, branding
  - Search ads – very contextually specific
  - Text ads – specific, unobtrusive
  - Mobile ads – time and location sensitive

- Earned media/Publicity
  - Celebrity endorsements, press releases

- Social media
  - Online word of mouth
Ad Formats Definitions: Display ads on websites look like those in newspapers and magazines. A banner is a space (usually rectangular) on a web page that shows the advertiser’s message; this category includes all display ads except for the other specialized categories listed below it. Sponsorships represent custom content and/or experiences created for an advertiser that may or may not include ad elements (for example, reskinning a section of a website with the advertiser’s branding). Rich media refers to advertisements that incorporate animation, sound, and/or interactivity in any format. Slotting fees are the fee charged for premium ad placement and/or exclusivity. Digital video format includes commercials that appear in live, archived, and downloadable streaming content. Search refers to paying Internet companies to present an advertisement linked to a specific search word or phrase. It includes paid listings (text links appear at the top or side of search results for specific keywords); contextual search (text links appear in an article based on the context of the content rather than on the basis of a user-submitted keyword); and paid inclusion (guarantees that a marketer’s URL is indexed by a search engine). Although this data source includes “contextual advertisements” in the search category, these ads are targeted display ads that are not based on the use of a search engine and are treated as part of display ads in the remainder of this paper. Contextual advertisements accounted for about 8 percent advertising revenue in 2008. “Classifieds” refer to the posting of a product or service in an online listing for a fee. “Lead generation” indicates referrals to qualified purchase inquiries. E-mail ads include banner ads, links, or advertiser sponsorships that appear in commercial e-mail communication. Interstitials are ads displayed during a transition from one Web page to the next.
Industry Structure

- Advertising on search site
  - Second price auction for adwords
  - Bids ranked, and slots allocated with highest first
  - Pay per click
  - Price depends on word ($99 for mesothelioma; typically $0.4)

- Advertising on other websites
  - Pay per view for display
  - Media site: $12 per 1000 impressions
  - Social networks historically lower: $0.5 per 1000 impressions
  - Large firms find own advertisers for display.
  - Otherwise use advertising network (e.g. Doubleclick)
Market Structure

<table>
<thead>
<tr>
<th>Advertiser</th>
<th>What</th>
<th>Who</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Producing ads</td>
<td>Advertising agencies and creative tools</td>
<td>Ominicom Group, WPP Group plc, Interpublic, Publicis</td>
</tr>
<tr>
<td></td>
<td>Managing ad campaigns, sending ads to publishers</td>
<td>Advertiser tools</td>
<td>DoubleClick, Google, aQuantive</td>
</tr>
<tr>
<td></td>
<td>Matching advertisements to inventory and setting prices</td>
<td>Intermediation, direct sales, ad networks, ad exchanges</td>
<td>Speigel’s sales force, Valueclick, Google, Right Media, DoubleClick</td>
</tr>
<tr>
<td></td>
<td>Managing publisher inventory, serving ads into ad space</td>
<td>Publisher tools</td>
<td>DoubleClick, Google, aQuantive, 24/7 Real Media</td>
</tr>
<tr>
<td></td>
<td>Attracting eyeballs with content</td>
<td>Publishers</td>
<td>Liberto.it, Spiegel.de, FT.com, engadget.com</td>
</tr>
</tbody>
</table>