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10: Platforms

Games, Competition and Markets 2024/25

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Overview

1. Where We Stand
2. Two-sided markets
3. Intermediaries
4. The choice of content

Where We Stand

Topics

1. Preliminaries

Introductory lecture. Review of game-theoretic concepts. Some basic models of competition.

2. Consumer Search

What if consumers have to engage in costly search to find out about products and/or prices?

3. Advertising

What if producers have to inform consumers about their products and/or prices?

4. Menu Pricing

What if firms design different products and different prices for different consumers?

5. Durable Goods

What if a monopolist sells a durable good and cannot commit to future quantities?

6. Switching Costs

What if consumers have to pay extra if they switch suppliers?

7. Behavior-Based Price Discrimination

What if firms can base their prices on a consumer's past behavior?

8. Vertical control

What if firms sell products to retailers who then sell it to final consumers?

9. Bundling

What if firms can sell bundles of products?

10. Network externalities and compatibility

What if products exhibit network effects: they becomes more (or sometimes less) useful if more consumers use it. Also: when do firms want to make their products compatible with that of their competitor?

11. Platform competition

What if online platforms bring buyers and sellers together? Or consumers and advertisers?

Introduction

- We study markets where there is some party that intermediates between two sides of the market.
- To help agents find a good match.
- Or to allow them to interact.
- This is all very vague
- Dating sites, Amazon, eBay, Bol...
- Credit cards, media, brokers...
- But also Thuisbezorgd.nl, Booking.com, Marktplaats.nl.

Three models

1. A platform that brings together buyers and sellers (Rochet/Tirole, 2003).
2. A price comparison website (Baye and Morgan, 2001).
3. Competing platforms that want to attract consumers and advertisers (Haan et al., 2025).

Two-sided markets

- This is based on Rochet and Tirole (2003).
- Suppose that buyers and sellers interact through a platform (e.g. credit cards)
- Assume that each buyer interacts with each seller.
- For each interaction a buyer has, the monopolist will charge it p_B.
- For each interaction a seller has, the monopolist will charge it p_S.
- Buyer i obtains benefit b_B^i per interaction. Seller j obtains b_S^j.
- This yields downward sloping demand $D_B(p_B)$ for buyers, $D_S(p_S)$ for sellers.
- Marginal costs: c per transaction.
- Total profits: $\pi = (p_B + p_S - c)D_S(p_S)D_B(p_B)$.

Two-sided markets

- Total profits: $\pi = (p_B + p_S - c)D_S(p_S)D_B(p_B)$.
- FOCs:

$$D_S D_B + (p_B + p_S - c)D_S D_B' = 0,$$
$$D_S D_B + (p_B + p_S - c)D_S' D_B = 0.$$

- Elasticity of demand for buyers: ε_B. For sellers: ε_S.
- Note: this is quasi-demand for platform services.
- We get

$$\frac{p_B - c}{p_B} = \frac{1 - \varepsilon_S}{\varepsilon_B}.$$
$$\frac{p_S - c}{p_S} = \frac{1 - \varepsilon_B}{\varepsilon_S}.$$

Two-sided markets

- We get

$$\frac{p_B - c}{p_B} = \frac{1 - \varepsilon_S}{\varepsilon_B}.$$
$$\frac{p_S - c}{p_S} = \frac{1 - \varepsilon_B}{\varepsilon_S}.$$

- Lerner Index for one side is affected by elasticity of the other side!
- If elasticity from buyers is high, you charge a lower price to sellers.
- That is then a more cost-efficient way to get buyers on board.
- Prices may even be below marginal cost.

Example

- You run an auction site.
- Number of sellers that subscribes: $q_S = 100 - 100p_S$.
- Number of buyers: $q_B = 100 - 200p_B$.
- Sellers are more eager to join.
- Without interaction, we would get $p_S = 1/2$ and $p_B = 1/4$.
- Now profits are

$$\pi = (p_B + p_S) \cdot q_B \cdot q_S = (p_B + p_S)(100 - 200p_B)(100 - 100p_S).$$

- FOCs: $p_S = (1 - p_B)/2$ and $p_B = (1 - 2p_S)/4$.
- Hence $p_S = 1/2$ and $p_B = 0$

Price Comparison Sites

- This is based on Baye and Morgan (2001).
- Underlying question: do we get rid of price dispersion if we have price comparison sites on the internet?
- There are two local markets.
- On each, there is a single firm and a unit mass of consumers.
- Zero costs
- Each consumer has demand $q(p) = 2 - p$.
- Consumers only have access to their own local market.
- $\pi(p) = p(2 - p)$, so $p^m = 1$ and $\pi^m = 1$.
- It costs a consumer $z < 1/2$ to visit a local store.
- Consumer surplus at price 1 is exactly $1/2$.

Price Comparison Sites

- Now suppose an intermediary opens a price comparison site on the internet.
- It charges an access fee M_s to firms, and M_b to consumers.
- For each M_s and M_b, we look for an equilibrium: consumers'decision whether to subscribe, firms' decision whether to subscribe, and a distribution of prices.
- The platform then sets M_s and M_b to maximize profits.
- In equilibrium, nonsubscribing consumers shop at their local store.
- Subscribing consumers visit the website and purchase at the lowest price there.
- Thus: if you only observe the other firm's price, you don't check your local store.
- Argument: similar to Stahl.

Firm behavior

- Suppose that on each local market, a fraction λ of consumers subscribe.
- Each firm does with probability α. Posted prices drawn from $F(p)$.
- Expected profits of a nonposting firm: $E\pi_i^N = (1-\alpha) + \alpha(1-\lambda)$.
- Expected profits of a posting firm:

$$\begin{aligned} E\pi_i^P &= (1-\lambda)\pi(p) + 2\lambda\left[(1-\alpha) + \alpha(1-F(p))\right]\pi(p) - M_s \\ &= (1+\lambda)\pi(p) - 2\alpha\lambda F(p)\pi(p) - M_S \end{aligned}$$

- Firms must be indifferent between the two options.

$$F(p) = \frac{(1+\lambda)p(2-p) + \alpha\lambda - 1 - M_s}{2\alpha\lambda p(2-p)},$$

with lower bound

$$p_0 = 1 - \sqrt{\frac{\lambda - M_s + \alpha\lambda}{1+\lambda}}.$$

Firm behavior (ctd)

- $E\pi_i^P = (1+\lambda)\,\pi\,(p) - 2\alpha\lambda F(p)\pi(p) - M_S$
- Highest price charged is 1. That yields $E\pi_i^P = 1 + \lambda - 2\alpha\lambda - M_S$.
- This should equal $1 - \alpha\lambda$, hence $\alpha^* = \max\{0, 1 - M_s/\lambda\}$.
- Price dispersion in equilibrium!

Consumers

- Denote $v(p)$ consumer surplus of a consumer at price p.
- Denote $h_2(p)$ the lowest-order statistic of two draws from F, so $h_2(p) = 2(1 - F(p))f(p)$
- Then the value of subscribing

$$V^I = \alpha^2 \int_{p_0}^{1} v(p) h_2(p) dp + (1-\alpha)^2 \left(\frac{1}{2} - z\right) + 2\alpha(1-\alpha) \int_{p_0}^{1} v(p) f(p) dp - M_b.$$

- A non-subscriber has

$$V^U = \alpha \int_{p_0}^{1} v(p) f(p) dp + (1-\alpha) \frac{1}{2} - z$$

- Denote by $\beta(M_s, \lambda^I)$ the value of M_b that equates $V^I = V^U$.

Equilibrium

- Given M_s and M_b, we can have two types of equilibria:
  1. No participation.
  2. Some firms participate, some consumers do.
  3. Some firms participate, all consumers do. (hence $\alpha^* = 1 - M_s$).
- The intermediary sets fee to maximize

$$E\Pi = 2\alpha M_s + 2\lambda M_b - K$$

- It turns out that it is most profitable to have full consumer participation.
- Note: it cannot be in the interest of the intermediary to have full firm participation *and* full consumer participation.

Platform content

- This is based on Haan et al. (2024).
- Cartoon version: `https://www.youtube.com/watch?v=GId5khBtLj0`
- We allow for **multihoming**: a market participant may use multiple platforms.

Model: consumer side (Gentzkow 2007)

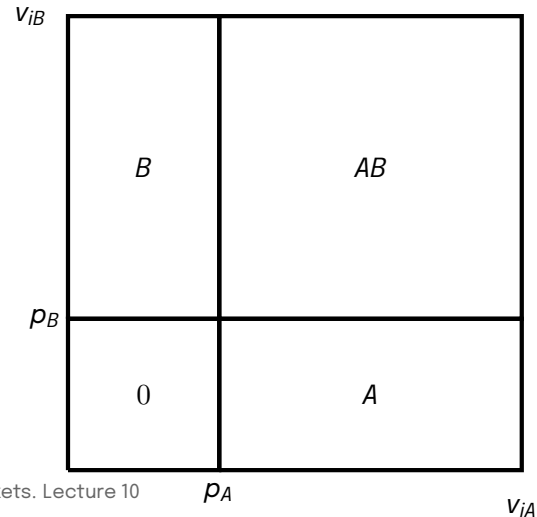
- Platforms A and B set prices $p_A, p_B \geq 0$, zero costs.
- Unit mass of consumers.
- Consumer utility:

$$u_{iA} = v_{iA} - p_A, \text{ with } v_{iA} \sim F(v) \text{ on } [0,1]$$
$$u_{iB} = v_{iB} - p_B, \text{ with } v_{iB} \sim F(v) \text{ on } [0,1]$$
$$u_{iAB} = v_{iA} + v_{iB} - p_A - p_B - \Gamma$$

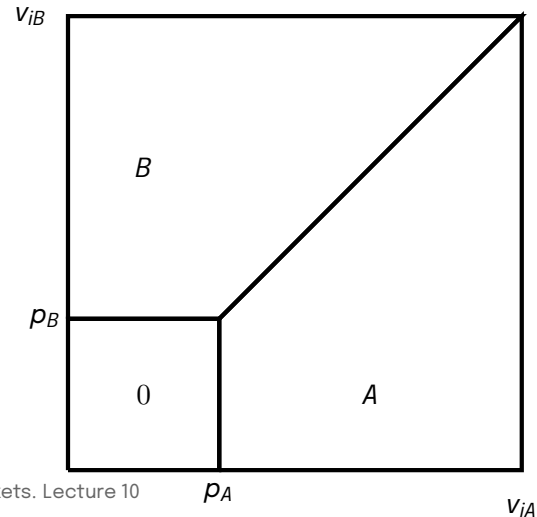
$\Gamma \geq 0$ measures substitutability

- $\Gamma = 0$: Goods are independent
- $\Gamma = 1$: Goods are substitutes
- For second product, demand curve shifts down by Γ.

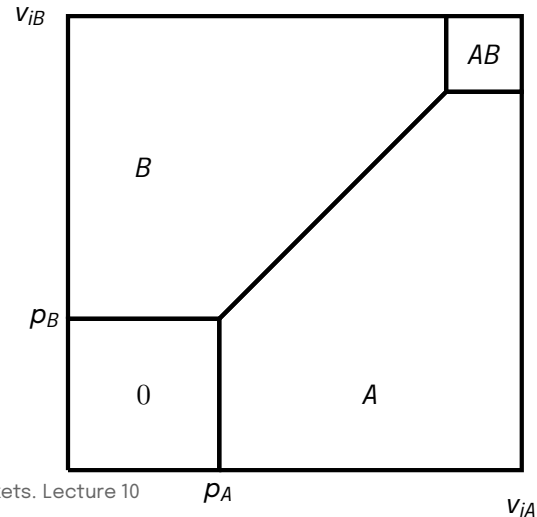
Model: consumer side, $\Gamma = 0$



Model: consumer side, $\Gamma = 1$



Model: consumer side, intermediate Γ



Model: Advertising side

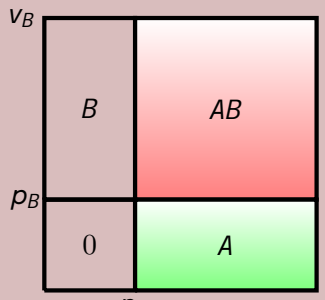
- Suppose a platform can earn π^{single} per single-homing consumer from advertisers.
- It can earn $\pi^{\text{multi}} < \pi^{\text{single}}$ per multi-homing consumer.
- Reduced form; just insert your favorite advertising model.

Excess rents *R* extracted per single-homer:

$$R = \pi^{\text{single}} - \pi^{\text{multi}}$$

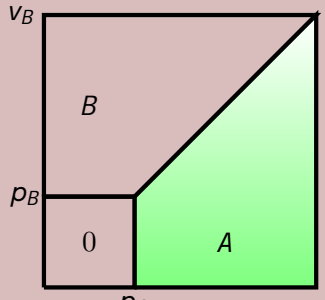
- For simplicity: assume $\pi^{\text{multi}} = 0$.
- For simplicity consumers get no (dis)utility from advertising.

Independent



$\Gamma = 0$

Substitutes



$\Gamma = 1$

Profits for A

$$\pi_A = p_A \cdot (A + AB) + R \cdot A$$

What if $\Gamma = 1$ (with uniform distributions)?
A consumer will use platform A whenever

$$v_{iA} - P_A \geq v_{iB} - P_B$$
$$v_{iA} - P_A \geq 0$$

Assume wlog $P_A \geq P_B$. Then

$$\pi_A = (P_A + R) \int_{P_A}^{1} \int_{0}^{v_A + P_B - P_A} dv_B dv_A$$

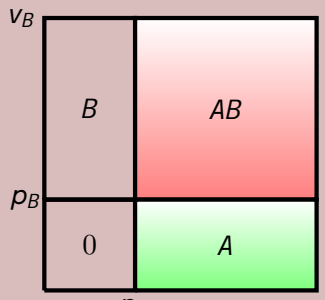
$$P^* = \sqrt{2}\sqrt{1-R} - 1.$$

Only feasible with $R \leq 1/2$: otherwise corner solution at $P = 0$.
Equilibrium profits for the case $R \leq 1/2$

$$\pi^* = (1-R)\left(3 - R - 2\sqrt{2}\sqrt{1-R}\right).$$

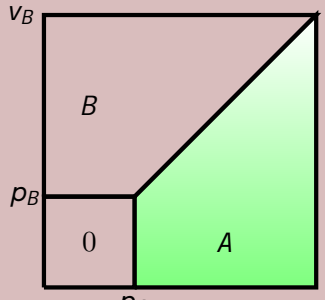
With $R > 1/2$, $\pi^* = \frac{1}{2}R$.

Independent



$\Gamma = 0$

Substitutes



$\Gamma = 1$

Profits for A

$$\pi_A = p_A \cdot (A + AB) + R \cdot A$$

Analysis: $\Gamma = 0$ (with uniform distributions)

A consumer will use platform A whenever

$$v_{iA} - P_A \geq 0$$

Now

$$\pi_A = (1 - P_A) P_B (P_A + R) + (1 - P_A)(1 - P_B) P_A$$

$$P^* = \frac{1}{2 + R}.$$

Note: prices never go down to zero.
Total profits

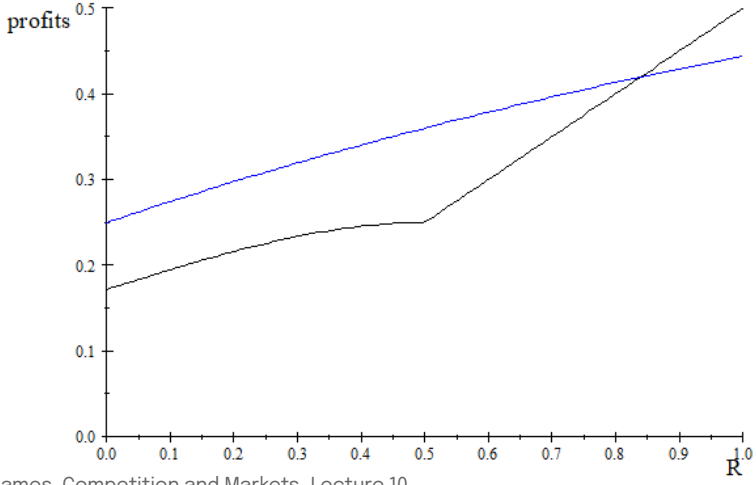
$$\pi_A = \left(\frac{1 + R}{2 + R} \right)^2,$$

Suppose platforms would be able to choose Γ

- Stage 1: Platform *A* chooses any design (no costs, symmetric)
- Stage 2: Platform *B* chooses design with substitution parameter Γ from *A*'s choice
- Stage 3: Price competition

How does equilibrium depend on single-homing rents *R*?

Choice of Γ



Remark

- Of course, we also allow firms to set any intermediate Γ.
- Yet, that does not add much to the analysis.
- Firms almost always choose $\Gamma = 0$ or $\Gamma = 1$.
- Only for particular values of R a Γ pretty close to but not equal to 1.

Platform design

Interpretation

Small R: largest rents are available on the consumer side:

- strive to monopolize those by making products independent.
- for advertisers: platforms become strong substitutes in reaching consumers.

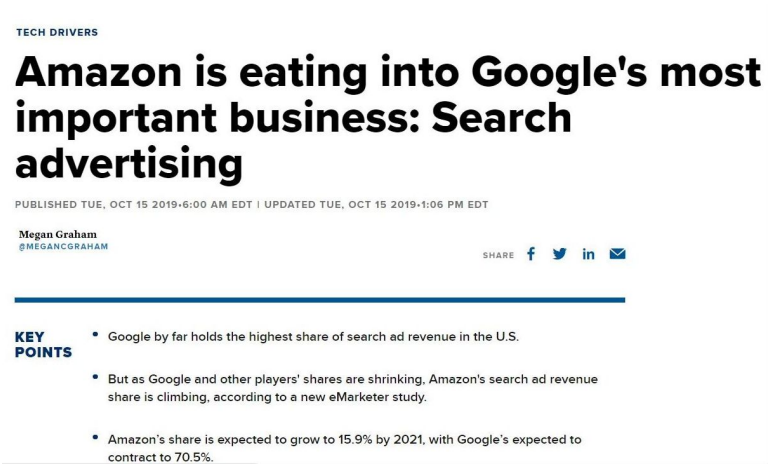
Large R: largest rents are available on the advertising side

- Making products into substitutes makes platforms' access to consumers independent.
- For advertisers, platforms become independent: each platform monopolizes access to its consumers.

Moving online

- We believe that our model not only applies to newspapers, but also (perhaps even more so) to online platforms.
- Google, Amazon, Facebook, Microsoft are historically very diverse companies.
- Yet they are moving ever closer together.
- They all provide their own ecosystem, trying to make multihoming as unattractive as they can.

Example



TECH DRIVERS

Amazon is eating into Google's most important business: Search advertising

PUBLISHED TUE, OCT 15 2019•6:00 AM EDT | UPDATED TUE, OCT 15 2019•1:06 PM EDT

Megan Graham
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SHARE

KEY POINTS

- Google by far holds the highest share of search ad revenue in the U.S.
- But as Google and other players' shares are shrinking, Amazon's search ad revenue share is climbing, according to a new eMarketer study.
- Amazon's share is expected to grow to 15.9% by 2021, with Google's expected to contract to 70.5%.

Example


Facebook Inc
+ Add to myFT
Facebook takes on Amazon with online shopping venture
Feature will allow businesses to set up digital storefronts and sell directly to users on platform

Example

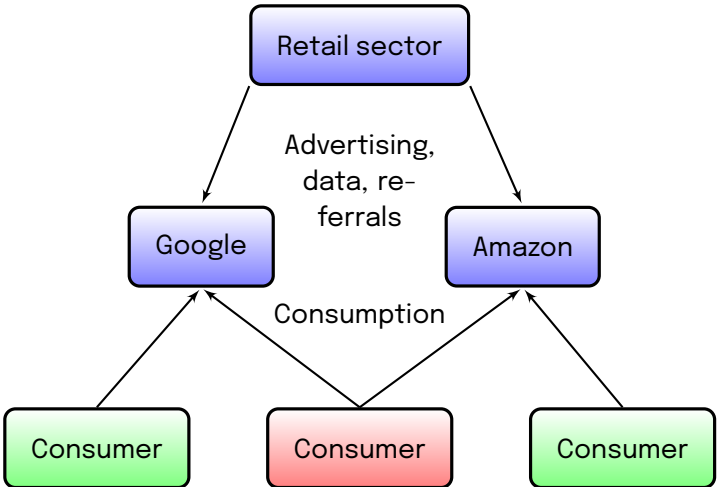
How to earn Microsoft Rewards points

Applies to: Microsoft account

It's easy to rack up Microsoft Rewards points and earn your way toward great rewards like gift cards, movies, games, nonprofit donations, and more. Stay signed in with your Microsoft account and you'll earn points for doing the things you already do. Here are some of the ways you can earn Microsoft Rewards points:

- Search with Bing (level up faster by searching with Bing on Microsoft Edge).
- Search the web through the search box on the taskbar on your Windows 10 device.
- Buy stuff from Microsoft Store online (from your mobile device, on Xbox One, in the Microsoft Store app on your Windows 10 or Windows 8.1 device, or via the web). For more info, see Shop and earn Microsoft Rewards points.
- Use Cortana to search with Bing.*
- Explore the earn page and the points breakdown page. Opportunities to earn points, like taking quizzes or playing trivia games, are updated daily, so check in often!
- Play selected games or complete selected quests on Xbox One. Launch the Rewards app to get started. For more info, see Earn rewards on Xbox.

Platforms and multi-homing versus single-homing



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Thank you for your attention

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