TWO SIDED MARKETS

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GETTING MULTIPLE SIDES ON BOARD

buyers	B2B platform	suppliers
gamers	videogame platform	game developers
"eyeballs"	portals, newspapers, TV	advertisers
cardholders	debit & credit cards	merchants

Chicken and egg problem. Must get both sides on board/court each side while making money overall.

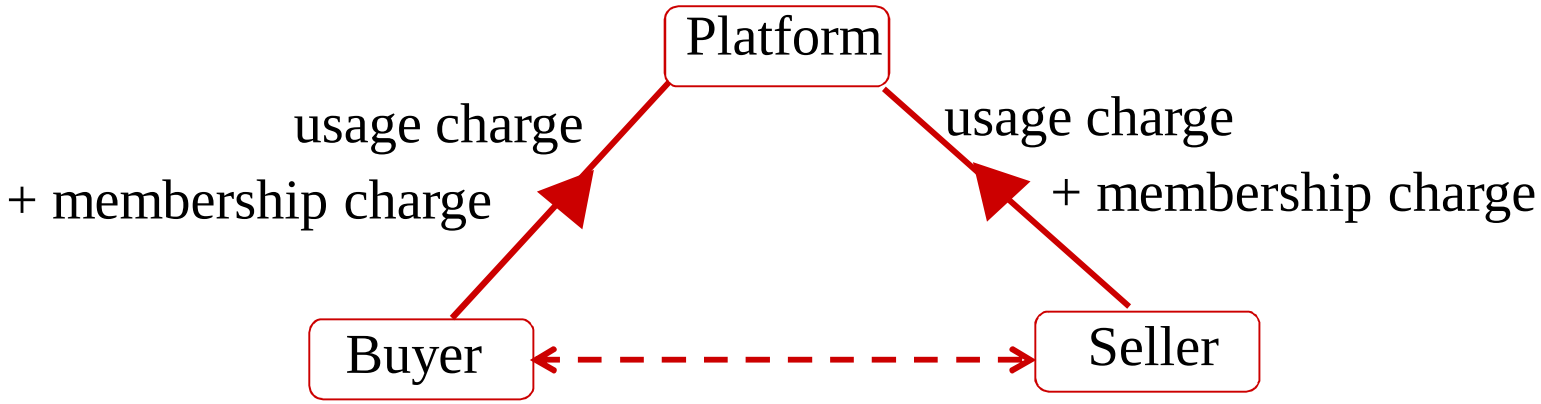
1 INTRODUCTION

2 MONOPOLY
–Fixed fees, Armstrong
-Usage fees, Rochet&Tirole

3 COMPETITION

4 REMARKS

Platform enables or facilitates interaction between "buyers" and "sellers"



Industry	Usage fee	Membership fee
payment cards	B: cash-back bonuses	B: yearly fee
	S: merchant discount	
e-Bay	transaction fee	
		S: listing fee
operating systems		B: OS price
		S: development kit price (APIs free)

Some Two Sided Platforms

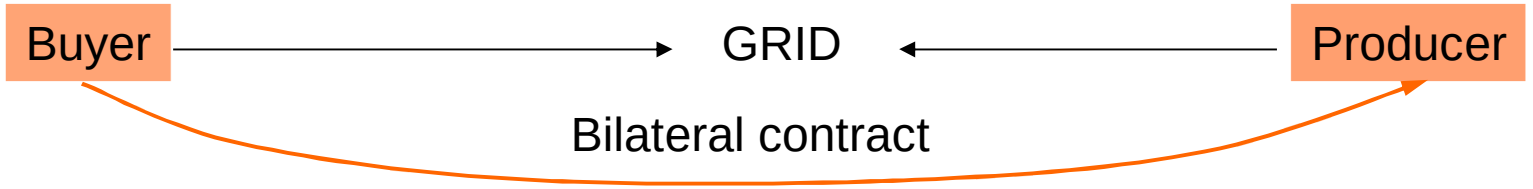
- *Exchanges*
  - ✓ Exchanges/auctions (eBay, Amazon).
  - ✓ B2B.
  - ✓ Employment agencies.
  - ✓ Dating services.
  - ✓ Real-estate agencies.
  - ✓ Futures and securities exchanges
- *Communications*
  - ✓ Telecoms.
  - ✓ Internet backbone services.
- *But also...*
  - ✓ Academic journals.
  - ✓ Shopping malls.

What are two-sided markets?

- ✓ Externality: Participants on one side care about the level of participation and usage of the other side
- ✓ Differentiated treatment of each side
- ✓ The profit and the allocation depends on the structure of price not only on the total price.

- ✓ Not all platforms are 2SM

Example: electricity

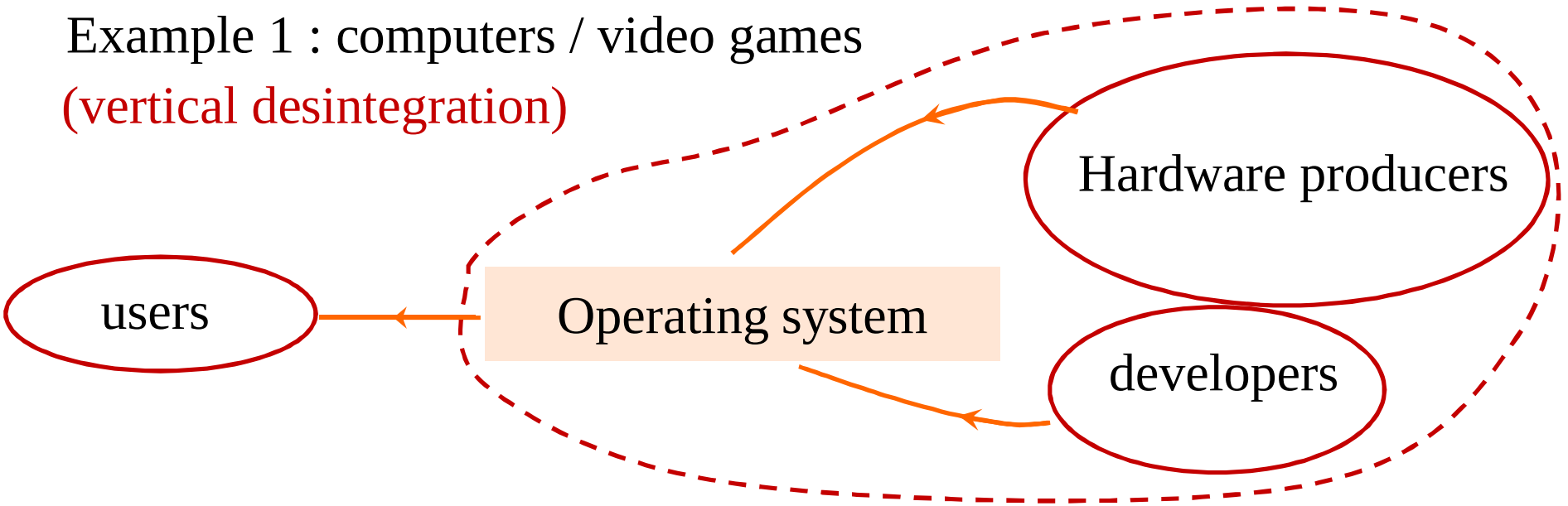


Only the total price charged on the two sides matters, as they negotiate how to share it: similar to tax neutrality

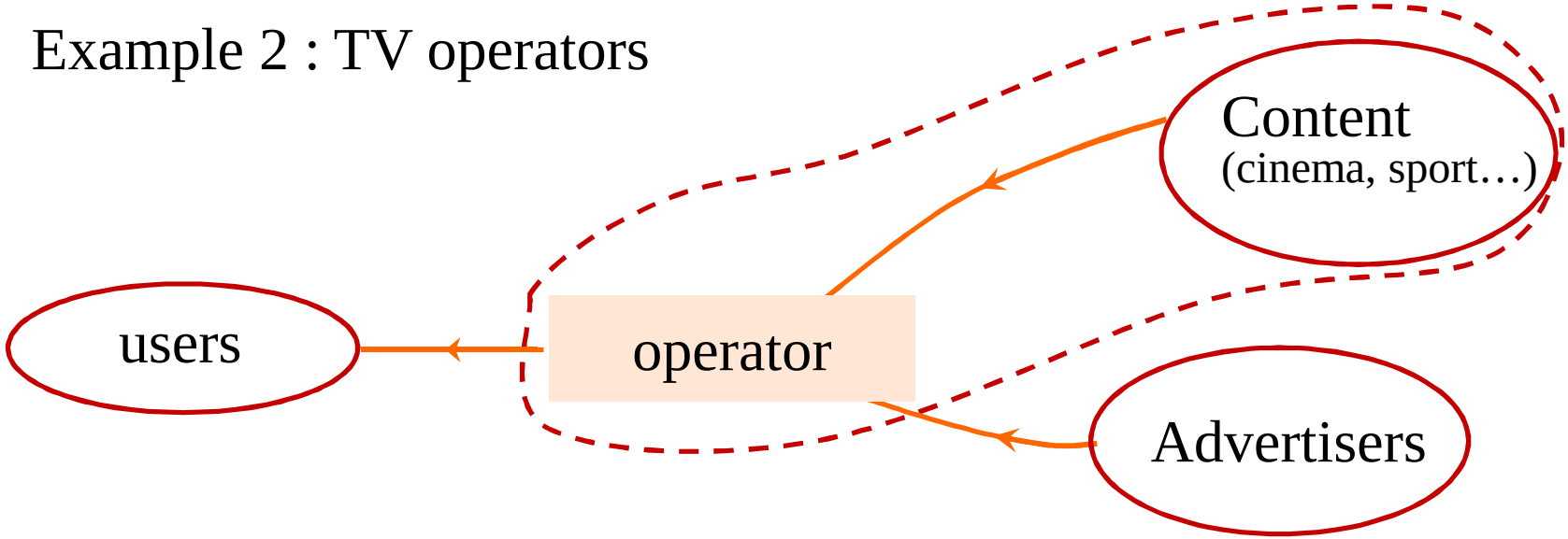
A « classical » industry may become a 2SMs

Example 1 : computers / video games

(vertical desintegration)



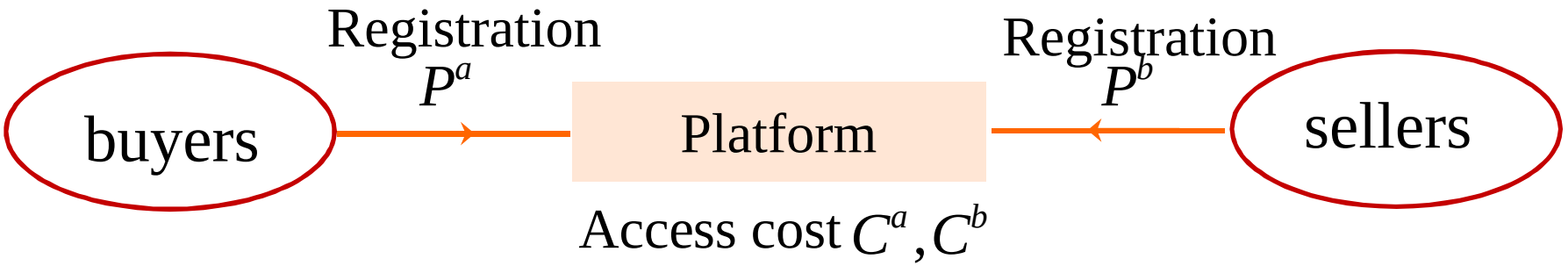
Example 2 : TV operators



Often results in very *skewed pricing pattern*

- ✓ *Illustration* : Encoding vs. reading
  - Adobe Acrobat, Text Processors: free reader, charge or royalties for encoding.
  - Contrast: books.
- ✓ *Illustration* : why did credit cards and debit cards adopt so markedly different business models?
  - *Credit* (Visa, MasterCard, Amex): high merchant discount, low (negative) cardholder price.
  - *On-line debit*: low merchant discount.
- ✓ *Illustration* : Videogame platforms.
  - Sell console at or below cost, royalties on games

MONOPOLY



$$\Pi = (P^a - C^a)n^a + (P^b - C^b)n^b + (p^a + p^b - c)I(n^a, n^b)$$

Let's first look at the platform's behaviour when transaction fees are absent (Armstrong 2006) and then when fixed registration fees are absent (Rochet & Tirole 2003). Rochet& Tirole 2004 integrates these.

Armstrong 2006

$$u_1 = \alpha_1 n_2 - p_1; \quad u_2 = \alpha_2 n_1 - p_2,$$

$$n_1 = \phi_1(u_1); \quad n_2 = \phi_2(u_2)$$

$$\pi(u_1, u_2) = \phi_1(u_1)\,[\alpha_1 \phi_2(u_2) - u_1 - f_1] + \phi_2(u_2)\,[\alpha_2 \phi_1(u_1) - u_2 - f_2]\,. \tag{2}$$

Let the aggregate consumer surplus of group $i = 1, 2$ be $v_i(u_i)$, where $v_i(\cdot)$ satisfies the envelope condition $v_i'(u_i) \equiv \phi_i(u_i)$. Then welfare, as measured by the unweighted sum of profit and consumer surplus, is

$$w = \pi(u_1, u_2) + v_1(u_1) + v_2(u_2).$$

It is easily verified that the welfare-maximizing outcome has the utilities satisfying

$$u_1 = (\alpha_1 + \alpha_2) n_2 - f_1; \quad u_2 = (\alpha_1 + \alpha_2) n_1 - f_2.$$

From expression (1), the socially optimal prices satisfy

$$p_1 = f_1 - \alpha_2 n_2; \quad p_2 = f_2 - \alpha_1 n_1.$$

Price below cost, Ramsey pricing...

From expression (2), the profit-maximizing prices satisfy

$$p_1 = f_1 - \alpha_2 n_2 + \frac{\phi_1(u_1)}{\phi_1'(u_1)}; \quad p_2 = f_2 - \alpha_1 n_1 + \frac{\phi_2(u_2)}{\phi_2'(u_2)}.$$

Proposition 1. Write

$$\eta_1(p_1 \mid n_2) = \frac{p_1\phi_1'(\alpha_1 n_2 - p_1)}{\phi_1(\alpha_1 n_2 - p_1)}; \quad \eta_2(p_2 \mid n_1) = \frac{p_2\phi_2'(\alpha_2 n_1 - p_2)}{\phi_2(\alpha_2 n_1 - p_2)}$$

for a group's price elasticity of demand for a given level of participation by the other group. Then the profit-maximizing pair of prices satisfy

$$\frac{p_1 - (f_1 - \alpha_2 n_2)}{p_1} = \frac{1}{\eta_1(p_1 \mid n_2)}; \quad \frac{p_2 - (f_2 - \alpha_1 n_1)}{p_2} = \frac{1}{\eta_2(p_2 \mid n_1)}. \tag{4}$$

$$\frac{\text{price} - \text{marginal cost}}{\text{price}} = \frac{1}{\text{elasticity of demand}}$$

Elasticity = % variation in demand for 1% decrease in price.

Remarks

-Price on one side may be subsidized, zero, even negative, if its elasticity of demand is high or benefit to other side is large

For your information from here

Rochet & Tirole 2003

oly platform. There are network externalities in that the surplus of a buyer with gross per transaction surplus b^B, $(b^B - p^B)N^S$, depends on the number of sellers N^S, but the buyers' "quasi-demand function":[6]

$$N^B = \Pr(b^B \geq p^B) = D^B(p^B)$$

is independent of the number of sellers. Similarly, let

$$N^S = \Pr(b^S \geq p^S) = D^S(p^S)$$

A private monopoly chooses prices so as to maximize total profit:

$$\pi = (p^B + p^S - c)\, D^B(p^B)\, D^S(p^S).$$

Assuming that D^B and D^S are log concave, it is easy to see that π is also log concave (jointly in (p^B, p^S)). Its maximum is characterized by the first-order conditions:

$$\frac{\partial(\log \pi)}{\partial p^B} = \frac{1}{p^B + p^S - c} + \frac{(D^B)'}{D^B} = 0,$$

$$\frac{\partial(\log \pi)}{\partial p^S} = \frac{1}{p^B + p^S - c} + \frac{(D^S)'}{D^S} = 0.$$

In particular:

$$(D^B)' D^S = D^B (D^S)'.$$

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prices has to be the same on both sides. If we introduce the elasticities of quasi-demands:

$$\eta^B = -\frac{p^B (D^B)'}{D^B} \qquad \text{and} \qquad \eta^S = -\frac{p^S (D^S)'}{D^S},$$

the private monopoly prices can be characterized by a two-sided formula that is reminiscent of Lerner's formula:

$$p^B + p^S - c = \frac{p^B}{\eta^B} = \frac{p^S}{\eta^S}. \qquad (1)$$

PROPOSITION 1. (*i*) *A monopoly platform's total price,* $p = p^B + p^S$, *is given by the standard Lerner formula for elasticity equal to the sum of the two elasticities,* $\eta = \eta^B + \eta^S$:

$$\frac{p - c}{p} = \frac{1}{\eta}. \tag{2}$$

(*ii*) *The price structure is given by the ratio of elasticities* (*and not inverse elasticities*):

$$\frac{p^B}{\eta^B} = \frac{p^S}{\eta^S}. \tag{5}$$

Remarks

-Higher relative price at the more elastic market
Increasing price lowers participation less, revenue from other side suffers less
The 'partial' Lerner formula contains the other price

✓ Example: price to buyers.

Cost = *opportunity cost*, smaller than cost incurred in serving buyer

[attracting extra buyers generates revenue on seller side either through usage charges or by being able to increase sellers' membership fees.]

✓ Price will be low/zero/negative if

- presence of buyer generates substantial revenue on seller side,
- buyer side reluctant to get on board (elastic demand).

Comments :

- The non adjusted margin is lower on the side where the elasticity is the highest and/or the externality created is larger.

- In some cases prices may be negative (if possible, otherwise gifts, tying…) or null (free newspapers)

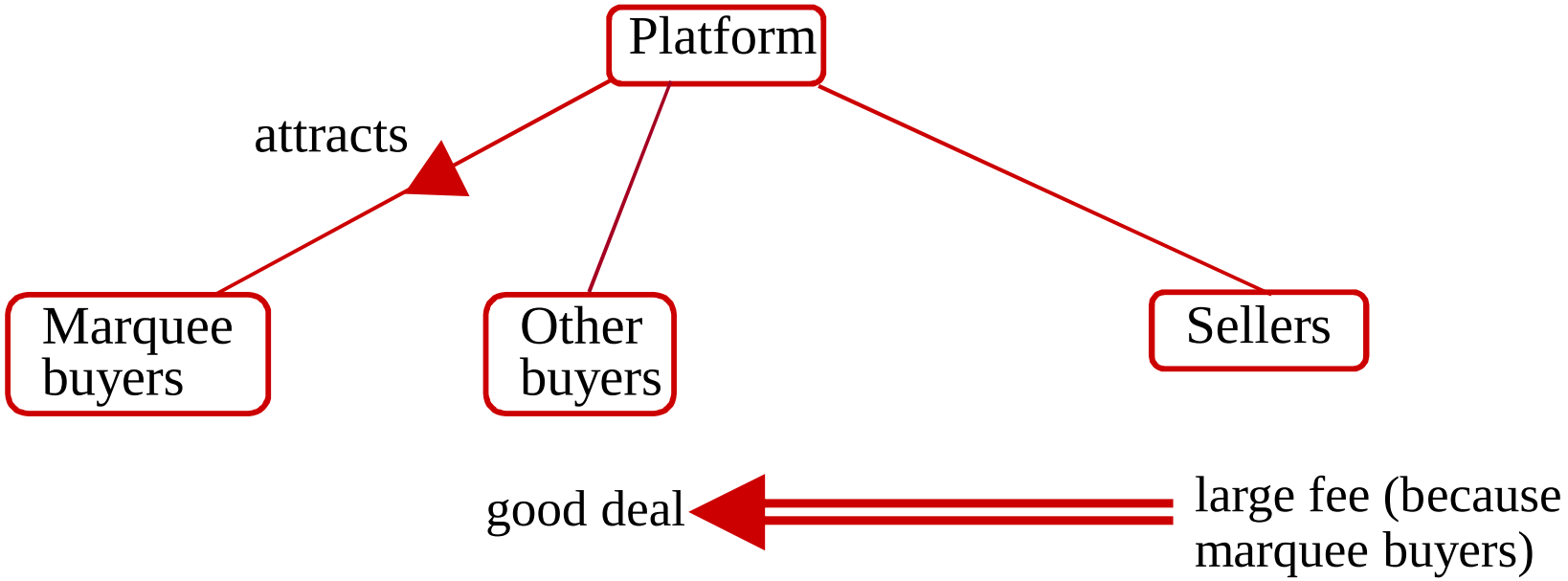
- If one side is captive, the price is higher on this side and smaller on the other side (debit cards).

Other examples of skewed pricing patterns:

Product	loss leader/break-even segment	profit-making segment
	SOFTWARE*	
Browsers	clients	web servers (Netscape)
Operating systems (Windows, Palm, Pocket PC)	application developers (development tools, support, functionalities,...)	clients
DoCoMo's i - mode phone	content providers	subscribers (based on downloaded volume)
	PORTALS AND MEDIA	
Portals	"eyeballs"	advertisers
Newspapers	readers	advertisers
(Charge-free) TV networks	viewers	advertisers
Yellow pages	consumers	advertisers

Mind the cross-group externalities

✓ More complex story: within-side externality



Illustrations:

- Amex corporate card.
- Killer application/game.
- Key store in shopping mall.

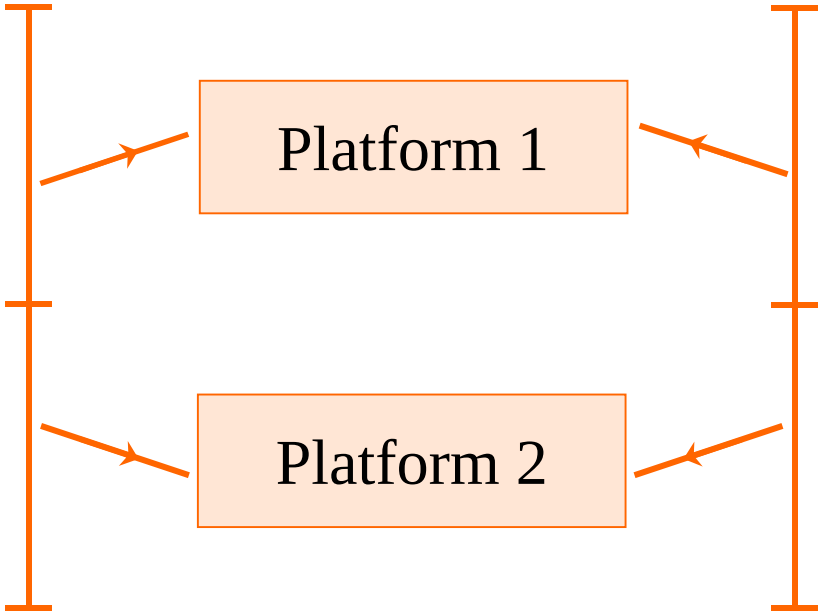
Monopoly, summary

- ✓ Competitive access (marginal cost pricing) is not efficient
- ✓ One price should be below access cost (if no fixed cost), it may be negative.
- ✓ Monopoly may be more efficient than competitive access

  → Optimal market structure?

COMPETITION

Variant 1 : single-homing bilateral



- price smaller on both sides
- expectations of users play an important role (multiplicity of possible equilibria)
- "divide and et conquer"

Single-homing and competition

- ✓ Two identical platforms
- ✓ Participants register with only one

- ✓ Competitive benchmark
  - ✓ If usages can be fully taxed in a non-distortionary way and negative registration prices are feasible, then in equilibrium
    - ✓ Only one platform is active
    - ✓ Zero profit
  - ✓ But conditions are very restrictive!

- ✓ In general a positive profit equilibrium is possible, unless there is enough homogeneity within sides and coordination between sides

Armstrong 2006

utilities $\{u_1^i, u_2^i\}$ are determined in a similar manner to the monopoly model expressed in (1): if platform i attracts n_1^i and n_2^i members of the two groups, the utilities on this platform are

$$u_1^i = \alpha_1 n_2^i - p_1^i; \quad u_2^i = \alpha_2 n_1^i - p_2^i, \tag{5}$$

When group 1 is offered a choice of utilities u_1^A and u_1^B from the two platforms and group 2 is offered the choice u_2^A and u_2^B, suppose the number of each group who join platform i is given by the Hotelling specification

$$n_1^i = \frac{1}{2} + \frac{u_1^i - u_1^j}{2t_1}; \quad n_2^i = \frac{1}{2} + \frac{u_2^i - u_2^j}{2t_2}. \tag{6}$$

Putting (6) together with (5), and using the fact that $n_1^j = 1 - n_1^i$, gives the following implicit expressions for market shares:

$$n_1^i = \frac{1}{2} + \frac{\alpha_1(2n_2^i - 1) - (p_1^i - p_1^j)}{2t_1}; \quad n_2^i = \frac{1}{2} + \frac{\alpha_2(2n_1^i - 1) - (p_2^i - p_2^j)}{2t_2}. \tag{7}$$

Keeping its group-2 price fixed, expression (7) shows that an extra group-1 agent on a platform attracts a further α_2/t_2 group-2 agents to that platform.

Suppose platforms A and B offer the respective price pairs (p_1^A, p_2^A) and (p_1^B, p_2^B). Given these prices, solving the simultaneous equations (7) implies that market shares are

$$n_1^i = \frac{1}{2} + \frac{1}{2}\frac{\alpha_1(p_2^j - p_2^i) + t_2(p_1^j - p_1^i)}{t_1 t_2 - \alpha_1\alpha_2}; \quad n_2^i = \frac{1}{2} + \frac{1}{2}\frac{\alpha_2(p_1^j - p_1^i) + t_1(p_2^j - p_2^i)}{t_1 t_2 - \alpha_1\alpha_2}. \tag{9}$$

As with the monopoly model, suppose each platform has a per-agent cost f_1 for serving group 1 and f_2 for serving group 2. Therefore, platform i's profit is

$$(p_1^i - f_1)\left[\frac{1}{2} + \frac{1}{2}\frac{\alpha_1(p_2^j - p_2^i) + t_2(p_1^j - p_1^i)}{t_1 t_2 - \alpha_1\alpha_2}\right] + (p_2^i - f_2)\left[\frac{1}{2} + \frac{1}{2}\frac{\alpha_2(p_1^j - p_1^i) + t_1(p_2^j - p_2^i)}{t_1 t_2 - \alpha_1\alpha_2}\right].$$

This discussion is summarized by an annotated version of formula (10):

$$p_1 = \underbrace{f_1}_{\text{cost}} + \underbrace{t_1}_{\text{market power}} - \underbrace{(\alpha_2/t_2)}_{\substack{\text{extra group-2}\\ \text{agents}}} \times \underbrace{(\alpha_1 + p_2 - f_2).}_{\substack{\text{profit from an extra}\\ \text{group-2 agent}}} \tag{11}$$

Proposition 2. Suppose (8) holds. Then the model with two-sided single-homing has a unique equilibrium that is symmetric. Equilibrium prices for group 1 and group 2 are given respectively by

$$p_1 = f_1 + t_1 - \alpha_2; \quad p_2 = f_2 + t_2 - \alpha_1. \tag{12}$$

Thus, a platform will target one group more aggressively than the other if that group is (i) on the more competitive side of the market and/or (ii) causes larger benefits to the other group than vice versa.[5]

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group 1 and group 2 respectively. Thus, expression (12) may be rewritten as

$$\frac{p_1 - (f_1 - 2\alpha_2 n_2)}{p_1} = \frac{1}{\eta_1}; \quad \frac{p_2 - (f_2 - 2\alpha_1 n_1)}{p_2} = \frac{1}{\eta_2}.$$

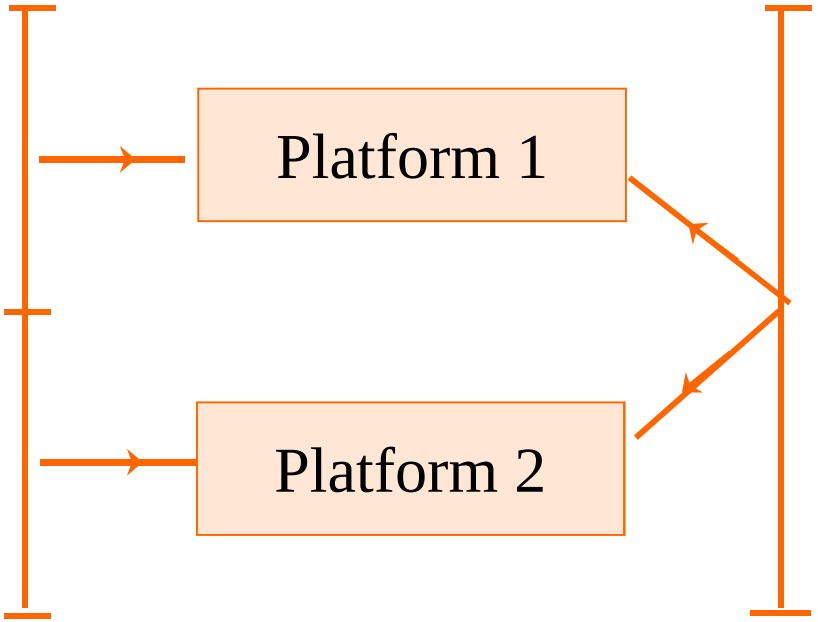
Comparing these expressions with the monopoly formulas (4) shows that a duopolist puts twice as much emphasis on the external benefit from one group when it sets its price to the other group.

From (12), in equilibrium each platform makes profit

$$\pi = \frac{t_1 + t_2 - \alpha_1 - \alpha_2}{2}. \tag{13}$$

Assumption (8) guarantees that this profit is positive. Positive cross-group externalities act to reduce profit compared to the case where $\alpha_1 = \alpha_2 = 0$, since platforms have an additional incentive to compete hard for market share. Next, I discuss an extension where platforms can

Competitive bottleneck



buyers
(single-homing)

sellers
(multi-homing)

- lower prices for buyers
- higher prices for sellers

Regulation of interactions between end-users

2SP performs balancing act through other instruments than membership and usage fees:

The platform as a competition authority.

The platform as a price regulator.

(illustration: no surcharge for payments with card)

The platform as a licensing/certification authority

(illustrations: exchanges: solvency requirements, prohibition of front-running; dating clubs; Nintendo's mid 80s decision to control quality of third-party games)

The platform as a supplier of information and enforcement.

(illustrations: auto auctions arbitration processes, eBay’s feedback forum)

COMPETITION POLICY

- ✓ The issue is the lack of clear benchmark
- ✓ Efficiency is not achieved at price equal marginal cost (or TLIC)
- ✓ Efficiency may require cross-subsidies, or direct subsidy
  - ✓ Two violations of anti-trust: “dumping” on one side, excessive price on the other side

Market definition

- Changing the tariff on one side affects the demand and the profit generated on the other side:
  - SNIP test?
  - Estimation of demand elasticity must account for the presence of the other side : due to feedback effects, the elasticity at fixed participation of the other side is not equal to the apparent elasticity

- One or two markets ?
  - Change the evaluation under dominance criterion
  - Yellow pages , medias : two markets, readers and advertising
  - M2M termination charges: two markets (origination, termination) + regulation of termination (one market should lead to no regulation under EC rules)
  - Credit cards: one market with 2 sides

Price abuse

- ✓ High price-cost margins do not imply market power even if they are low-fixed costs.

- ✓ Competitive cross-subsidy
  - ✓ Competition leads to more cross-subsidy
  - ✓ Competition leads to more price-discrimination

- ✓ Another efficiency defence for price below costs

- ✓ Predation tests: accounting for both sides
  - → Measure of “total price”
  - → Switch to effect based approach?

COMPETITION POLICY

- ✓ Should we regulate?
  - ✓ No clear distortion
  - ✓ No clear guidelines for regulation
  - ✓ No rational for cost based regulated price
  - ✓ Large informational requirement
- ✓ The regulatory response may be worse than the (imperfect) market response
- ✓ Partial regulation (platform neutrality, reciprocal termination charge, …) ?