The Industrial Organization and Regulation of Platform Industries
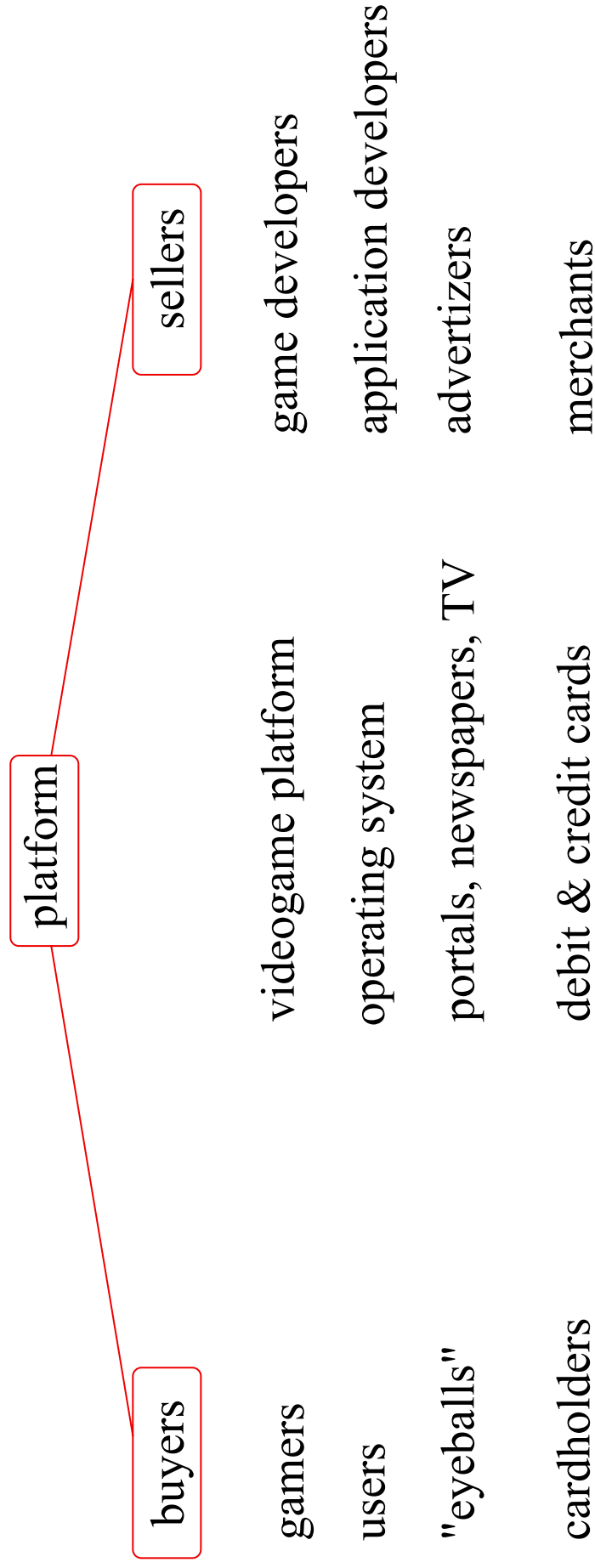
Tunis, May 25, 2005

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(largely based on joint work with Jean-Charles Rochet, IDEI).

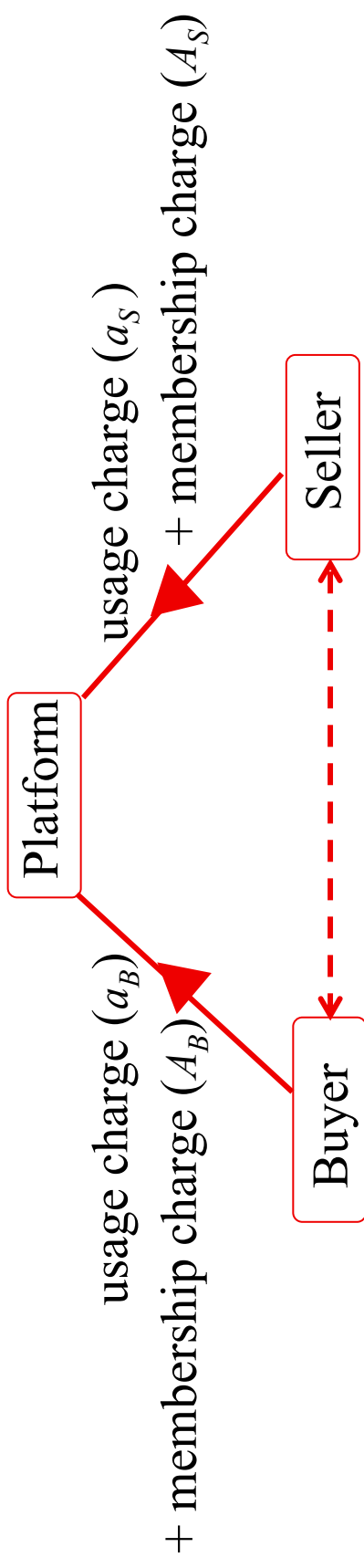# I. GETTING MULTIPLE SIDES ON BOARD

✔ Examples of *two-sided markets*:

buyers — platform — sellers

buyers	platform	sellers
gamers	videogame platform	game developers
users	operating system	application developers
"eyeballs"	portals, newspapers, TV	advertizers
cardholders	debit & credit cards	merchants

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

Two-sided markets raise new questions:

☞ Price *structure*: receives attention from

✓ managers:

- impact of elasticities and externalities,

- impact of platform competition,

- impact of multi-homing (examples: payment cards, software, real estate,....).

✓ public policymakers (termination charges, IFs):

- antitrust implications (legitimacy of cross-subsidies, impact of tying,....).

Platform enables or facilitates *B-S* interaction

Platform

usage charge (a_B)
+ membership charge (A_B)

usage charge (a_S)
+ membership charge (A_S)

Buyer

Seller

Examples of usage charges: merchant discount /cash-back bonuses.

Examples of access/membership charges: yearly fee; purchase price of software.

II. THE CHOICE OF A BUSINESS MODEL: GENERAL PRINCIPLES
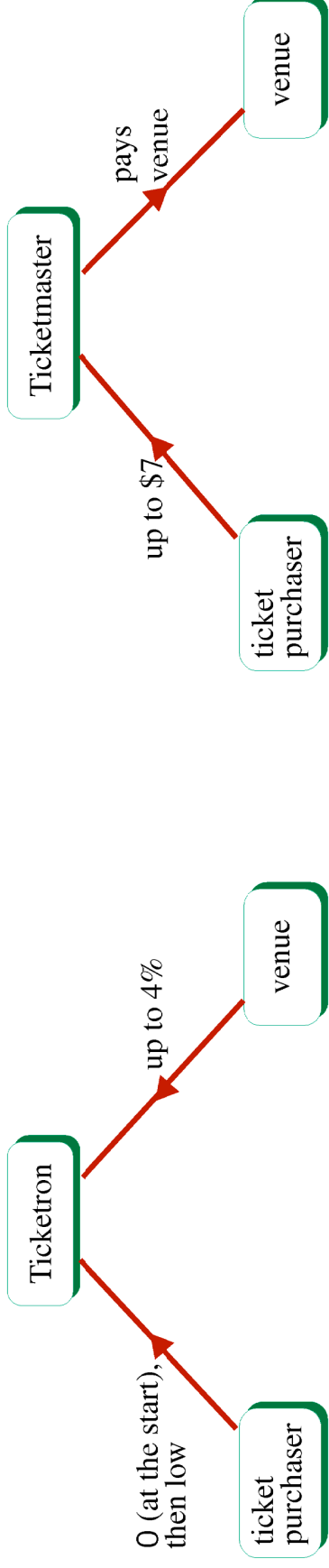
(1) *Charge according to what each side can bear*

Account for elasticities of demand on both sides: price structure should aim at getting both sides on board, not to allocate costs "fairly".

✓ *Illustration # 1:* 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 # 2: Ticketron and Ticketmaster*

Ticketron diagram:
- ticket purchaser → Ticketron: 0 (at the start), then low
- Ticketron → venue: up to 4%

Ticketmaster diagram:
- ticket purchaser → Ticketmaster: up to $7
- Ticketmaster → venue: pays venue

(alternative = venue's box office)   (+ exclusive contracts with venue)

Ticketmaster won (and bought Ticketron): Ticket purchaser needed service more than venue.

✔ *Illustration # 3: Encoding vs. reading*

- Adobe Acrobat, Text Processors, MP3 patents: free reader, charge or royalties for encoding.

- Contrast: book or movie (future platforms: Digital Rights Management platforms).

✔ *Other examples of asymmetric price structures:*

Product	loss leader/break-even segment/ subsidized segment	profit-making segment/ subsidiz- ing segment
	SOFTWARE	
Streaming media	consumers	servers
Browsers	users	web servers
Operating systems (Windows; Palm, Pocket PC)	application developers (develop- ment tools, support, functional- ity,....)	clients
DoCoMo's I - mode phone	application developers	subscribers*
	PORTALS AND MEDIA	
Portals	"eyeballs"	advertizers
Newspapers	readers	advertizers
(Charge–free) TV networks	viewers	advertizers

* based on downloaded volume.

OTHERS…

		other participants
Social gatherings	celebrities in social happenings,	other participants
Conferences, academic journals, universities	speakers, professors	audience
Shopping malls	consumers (free parking, cheap gas,…)	shops
(Legacy) Internet	websites	dial-up consumers
Real estate	buyers	sellers

LOOKING AHEAD: KEEP POSTED ON

Platform	Two sides	Instruments of cost allocation or cross-subsidization
B2B	buyers / sellers	design of auctions, information flows,…
Internet backbone services	consumers / websites	termination (settlement) charges

(2) *Mind the externalities*

Marquee buyers: increase seller charge, lower other buyers' charge.

Illustration: Amex corporate card.

(3) *Account for sequentiality*

Sometimes chicken arrive before the eggs...: applications (or games) before operating system (console) users; in either case: platform's commitment to later attract users?

✓ • subsidize developers,
  • venture capital deals,
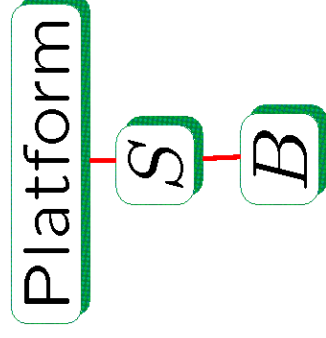 • integrate into development.

✓ royalties.

[Hagiu 2004]

The make-or-buy decision in two-sided markets

Typical cycle:

(1) vertical integration: Palm Pilot, Sun Solaris, Windows (early 90's: Wordperfect and Lotus 1-2-3 focused on OS-2), Symbian (smart phones), X-box (Halo,...),

(2) then court external developers (subsidies, open architecture, etc.)

(4) Regulation of interactions between end-users

☞ Useful benchmark: the *vertical view*

```
┌──────────┐
│ Platform │
└──────────┘
     │
   ┌───┐
   │ S │
   └───┘
     │
   ┌───┐
   │ B │
   └───┘
```

Contrast two-sided market: platform has relationship with buyer; hence, more protective of buyers' interests, less protective of sellers' interests.
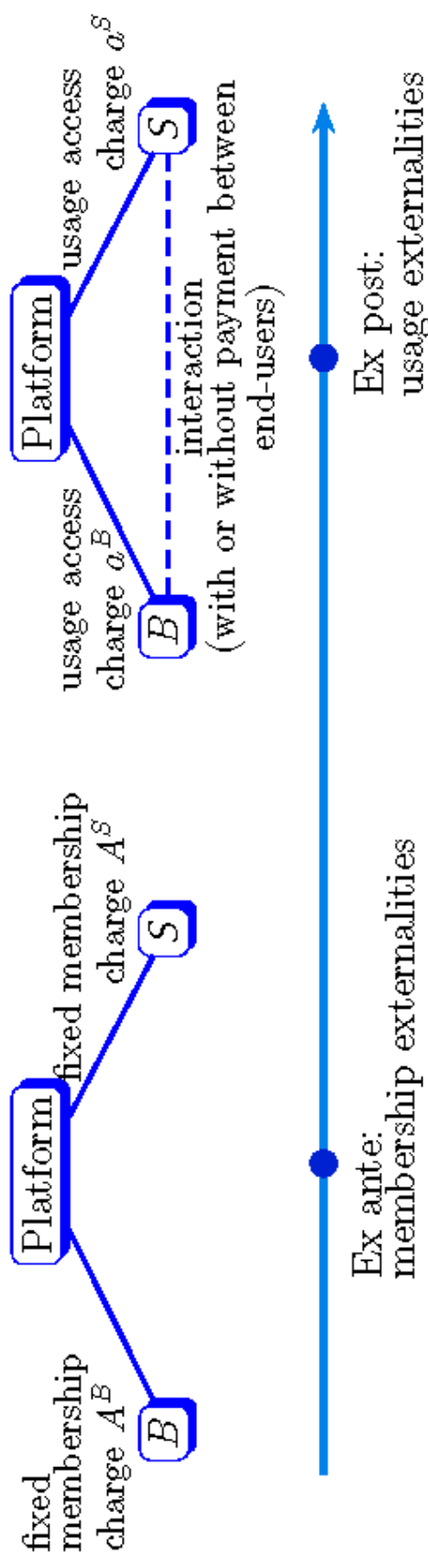
☞ *Key difference:* P willing to constrain S, as P can (partly) recoup benefits on B side. Hence, P regulates interactions whereas it would grant S commercial freedom under the vertical view.

☞ The platform as a price regulator.

(illustration: payment cards)

☞ The platform as a competition authority.

(illustrations: Macintosh-Windows; Palm OS licences)

☞ The platform as a licensing authority.

(illustrations: exchanges; dating clubs)

III. MODELLING

(An example)

✓ Monopoly platform (to start with).

✓ Two sides of the market: $i \in \{B, S\}$.

Left diagram:
fixed membership charge A^B — B — Platform — fixed membership charge A^S — S

Ex ante: membership externalities

Right diagram:
usage access charge a^B — B — Platform — usage access charge a^S — S

interaction (with or without payment between end-users)

Ex post: usage externalities

(1) *No payment between end users* (for the moment).

∨ $\begin{cases} U^i = \left(b^i - a^i \right) N^j + B^i - A^i, \\ N^i = Pr \left(U^i \geq 0 \right). \end{cases}$

b^i = per transaction benefit

B^i= fixed benefit

c= platform's per transaction cost

platform's per user cost = 0 (wlog)

∨ Per-interaction price: $p^i \equiv a^i + \dfrac{A^i}{N^j}.$

∨ Hence: $N^i = Pr \left(b^i + \dfrac{B^i}{N^j} \geq p^i \right) \equiv D^i \left(p^i, N^j \right), i \in \{B, S\}.$

∨ Solving: $\begin{cases} N^B = n^B \left(p^B, p^S \right) \\ N^S = n^S \left(p^B, p^S \right). \end{cases}$

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Platform's strategy

> $$\pi = A^B N^B + A^S N^S + \left(a^B + a^S - c\right) N^B N^S,$$

which can be transformed into

$$\pi = \left(p^B + p^S - c\right) n^B \left(p^B, p^S\right) n^S \left(p^B, p^S\right).$$

> Price structure choice:

$$V(p) = \max \left\{ n^B \left(p^B, p^S\right) n^S \left(p^B, p^S\right) \right\}$$

under the constraint $p^B + p^S = p$.

Results

✔ *Level:*
$$\frac{p-c}{p} = \frac{1}{\eta}, \quad \text{where} \quad \eta = -\frac{dV}{dp} / \frac{V}{p} \quad \text{(elasticity)}.$$

✔ *Structure:* Special cases:

(a) *Heterogeneity in per-transaction benefit* b^i (then usage pricing sufficient)

$$\frac{p^i - (c - p^j)}{p^i} = \frac{1}{\eta^i}$$

(b) *Heterogeneity in membership benefit* B^i *and* $a^S = a^B = c = 0$

$$\frac{p^i - (-b^j)}{p^i} = \frac{1}{\eta^i}.$$

[Heterogeneity in membership benefit assumption is often used: e.g., Armstrong *EJ* 1998, Laffont-Rey-Tirole *RJE* 1998a,b, Guthrie-Wright 2003, Anderson-Coate *RES* 2005.]

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When the platform charges twice for the same service...

[Rochet-Tirole *RJE* 2002.]

✓ Example (payment cards): benefits b^B and b^S known.

Buyer's WTP = v (cash) or $v + b^B$ (card) → merchant's WTP = $b^S + b^B$.

• Platform charges $A^S = (b^S + b^B)\ N^B$ to merchants (fixed or variable, does not matter).

• Platform charges $A^B = b^B\ N^S$ (fixed)

→ total tax = $\boxed{(2\ b^B + b^S\ )N^B\ N^S}$ > ($b^B + b^S$)$N^B\ N^S$!

✓ Variants of argument in which only per-transaction pricing to buyers (but heterogeneity in per-transaction benefit).

✓ Merchants pay too much.

(2) *Payments between end-users*

Illustration: videogames.

Suppose per-transaction benefit b^i drawn from $F^i(b^i)$ after the end-user becomes a member.

✓ *Coasian bargaining* (trade iff $b^B + b^S \geq a^B + a^S = a$)

➡ optimum : $a = c$.

Intuition: (1) create efficient trade, (2) then back to pure membership model; choose price structure (p^B, p^S).

Illustration: i-pod ($a^B = 0$, $a^S \simeq 0$: 99c go mainly to music publisher).

✓ *Price setting by seller or Myerson-Satterthwaite (1983) efficient bargaining*: $a < c$.

In either case, back to canonical model.

(3) *So, what is a two-sided market?*

(a) *Per transaction prices* (a^B, a^S).

Definition: market is one-sided if volume V depends only on level

$$a = a^B + a^S,$$ and not on its structure. Otherwise, market is

two-sided.

✓ If market is one-sided, business and public policy attention to
price structure is misguided.

✓ Examples of charges in one-sided markets:

• VAT,

• Injection / withdrawal fees in electricity markets,

• telecom charges when caller and receiver side contract.

For a market to be two-sided, the Coase theorem must not apply (asymmetric information does not suffice : allocation of a irrelevant in bargaining games).
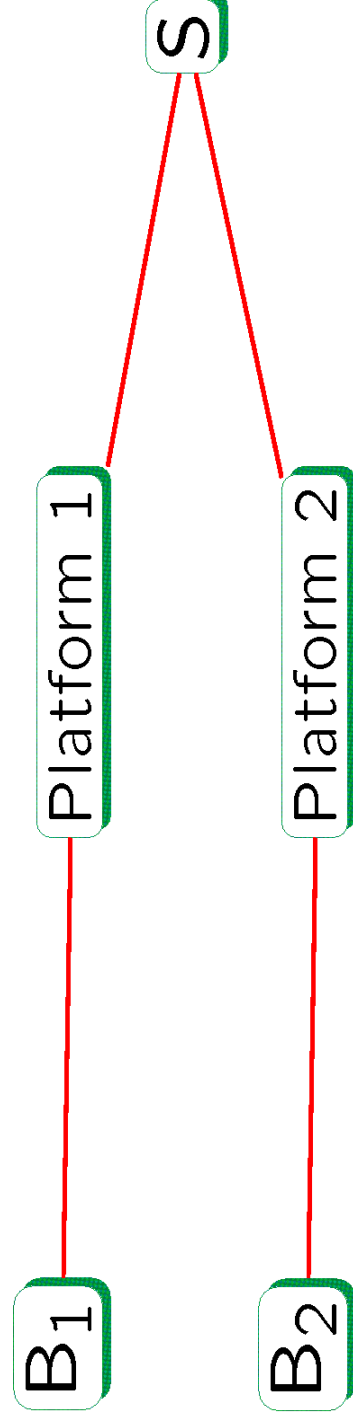
Factors conducive to two-sidedness:

✔ transaction costs (telecom, websites, card / cash payments,...),

✔ platform-imposed constraints on end-user bargaining (no surcharge rule),

✔ transaction-insensitive end-user costs (fixed membership fee + fixed cost): no ex ante bargaining among N^B N^S participants.

IV. PLATFORMS' COMPETITIVE STRATEGIES
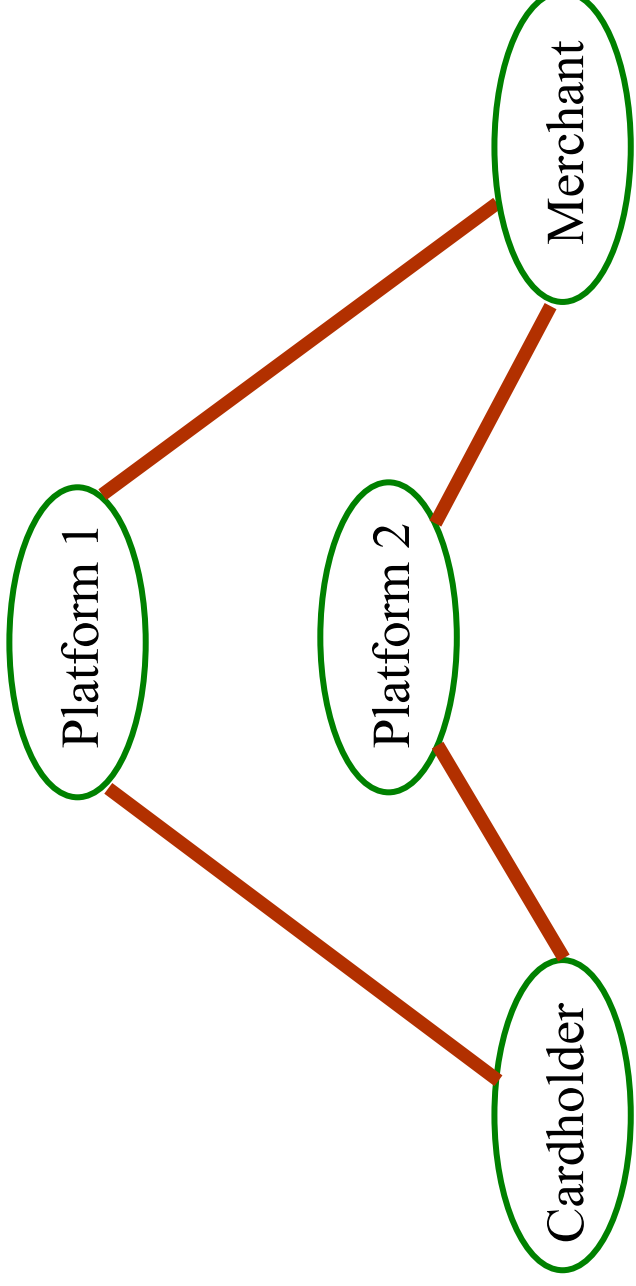
(1) *Key new factor: multi-homing.*

Suppose for example that buyers single-home while sellers multi-home

Charge monopoly prices in multi-homing market and low prices (zero?) in single-homing one.

Illustration #1: advertizers multi-home. Eyeballs don't (and even if they do, rehearsal effect)

Illustration #2: Steering: the story of the decrease in merchant discounts
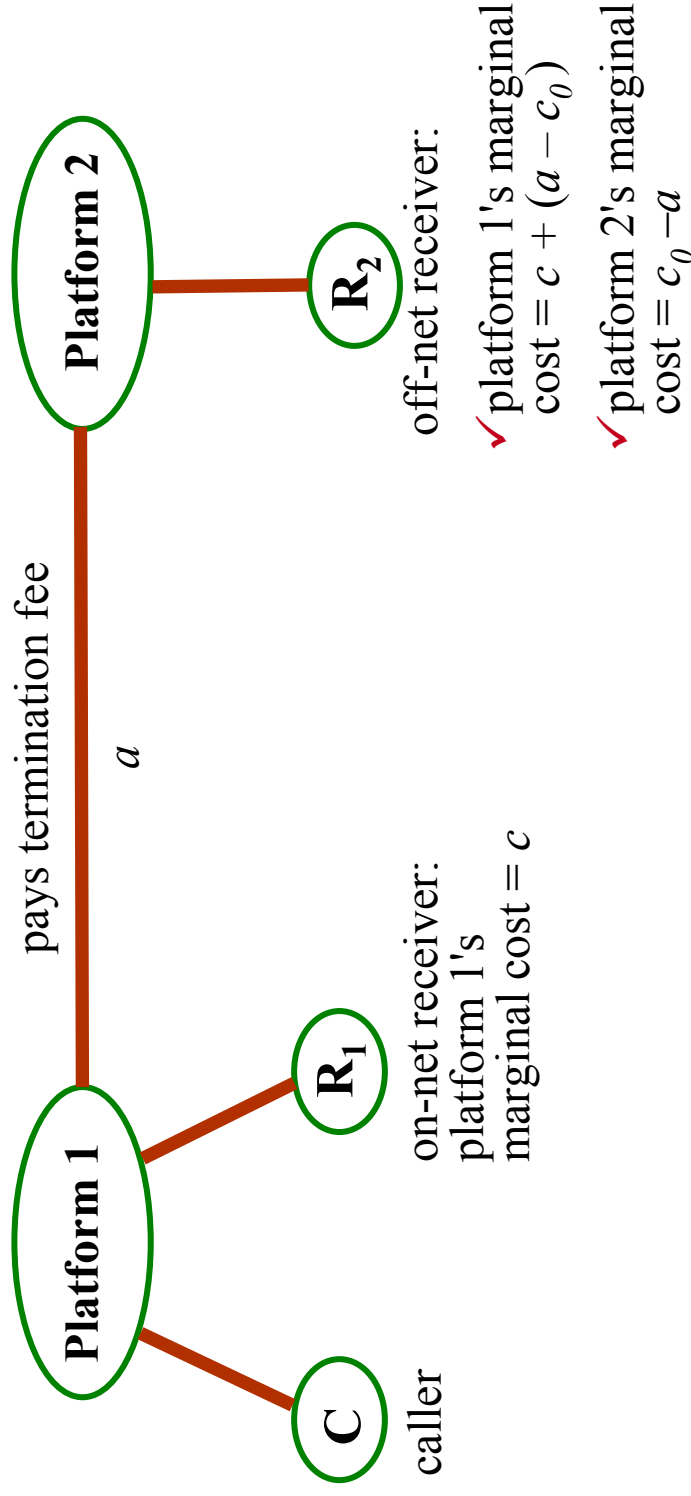

Merchant has "first-veto right" → platforms court merchants much more than under cardholder single-homing

Price structure is now too favorable to merchants.

(2) *Platform interconnection* (telecoms, Internet)

✓ Two ways of achieving connectivity (reaping network externalities):

• end user multihoming,

• platform interconnection.

✓ Latter conducive to single-homing

➡ competitive bottlenecks (termination)

C — caller

Platform 1

R₁ — on-net receiver: platform 1's marginal cost = c

pays termination fee a

Platform 2

R₂ — off-net receiver: ✓platform 1's marginal cost $= c + (a - c_0)$ ✓platform 2's marginal cost $= c_0 - a$

c = total cost per minute, includes c_0 = cost of termination.

Suppose heterogeneity in fixed term only (B^i); known downward sloping demands for variable consumption. Illustration: caller $u(q)$, receiver $\beta\, u(q)$ for call of length q (not crucial).

Implication: transactions priced at (opportunity) cost, markup on membership.

a^C = per minute caller charge, a^R = per minute receiver charge.

(a) *Monopoly or social planner (same price structure)*

❯ *Samuelson rule for public goods:*

$$a^C + a^R = c$$

❯ *Efficient allocation between the two sides:*

$$a^R = \beta\, a^C$$

(b) *Competing platforms*

Off-net-cost pricing rule: in equilibrium, traffic is priced *as if it were off net*:

$$a^C = c + a - c_0$$

$$a^R = c_0 - a$$

Note: satisfies the Samuelson rule.

Need for regulation (or antitrust scrutiny)

✔ of termination charges of course (don't let platforms tax their rivals),

✔ of network-based price discrimination (may lead to de facto breakdowns of connectivity even among equals).

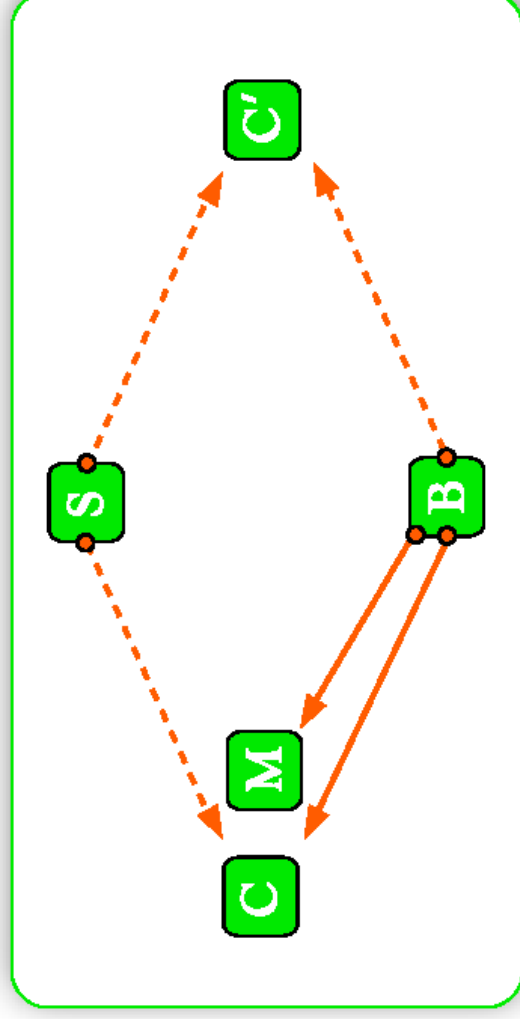(3) *Entry strategies in the absence of interconnection*

[Caillaud-Jullien *RJE* 2003.]

Per transaction charges (no fixed fee) good strategy for an entrant.

V. ANTITRUST ASPECTS

(1) Defining relevant markets.

(2) Prices:

  ✓ Predation tests.

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

  ✓ Collusion on one side of market only (& merger analysis)

  ✓ Not-for-profit intermediaries.

(3) Tying:

VI. LOOKING AHEAD: MARKET DESIGN

(1) *Matching markets* (schools, entry-level labor markets)

Stable matching in deferred acceptance marriage market: Best for men = men propose; best for women = women propose.

[Concrete problem: recent antitrust suit against National Resident Matching Program (Gale-Shapley type): Hospitals make offers, rank residents. Wage suppression. Bulow-Levin 2005.]

Competitive pressure: alternative platform emerges; side offers (unraveling).

(2) *Auction markets*

Example: second-price auction with affiliated values and symmetric bidders: Seller revenue maximized (buyer revenue minimized) when release of "public information":

- disclosure of seller's information (provided it is irrelevant to efficient allocation),

- auction design (all bidders learn whenever any bidder drops out vs. minimum information).

[Revealing the seller's information also increases prices in first-price auction; prices are higher in second-price auctions.]

[Milgrom 2004.]

Competitive pressure: Internet platforms; stock exchange.