U. Porto – Doctoral Programme in Economics

The Economics of Two-sided Markets

1. Overview of basic concepts

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Map of the course

- 1. Overview of basic concepts (± 2 hours)
  - Various groups of participants interact via a platform
  - Cross-side (or inter-group) effects are present.
  - Platforms are often actively managed.
  - Few platforms are active in a single market.
- 2. Platform competition (± 3 hours)
  - Viability of competition in two-sided markets
  - Effects of competition in two-sided markets
  - Competition in two-part tariffs
  - Dynamic issues

Map of the course (2)

- 3. Application to specific industries (± 3 hours)
  - Media markets
  - Software platforms
  - E-commerce, B2B and matching platforms.
  - Mobile telephony
  - Payment cards
- 4. Competition policy and regulation (± 2 hours)
  - Exercise of unilateral market power
  - Mergers
  - Coordinated practices
  - Regulation
- Assessment: final exam, open book, 2 hours

Overview of basic concepts

Learning objectives

- At the end of this lecture, you should be able to…
  - Understand what is a two-sided platform.
  - Identify the various externalities that are at play on such platforms.
  - Understand how prices are set by a monopoly platform.

- Background readings
  - Evans, D.S. (2011). *Platform Economics: Essays on Multi-Sided Businesses*. Competition Policy International. **Chapters 1 to 3**.
  - Belleflamme, P. and Peitz, M. (2010). *Industrial Organization. Markets and Strategies*. Cambridge: Cambridge University Press. **Chapter 22**. **Section 3.**

Multi-sided platform markets: Definition (Evans, 2011)

- Multi-sided platforms coordinate the demand of distinct groups of customers who need each other in some way.
- There is an opportunity for a platform to increase social surplus when 3 necessary conditions are true:
  - There are distinct groups of customers.
  - A member of one group benefits from having his demand coordinated with one or more members of another group.
    - Presence of indirect network effects
    - Cross-side or inter-group externalities
  - An intermediary can facilitate that coordination more efficiently than bilateral relationships between the members of the group.
    - Transaction costs and free-riding problems make it difficult for members of distinct customer groups to internalize the externalities on their own.

Multi-sided platform markets: Typology (Evans, 2011)

- Exchanges
  - Help ‘buyers’ and ‘sellers’ search for feasible contracts and for the best prices.
  - Market is two-sided if the Coase theorem does not apply to the transaction between the two sides.
  - Examples
    - Match-making activities: dating services, employment agencies.
    - Traditional exchanges: stock exchange, auction houses, B2B, B2C and C2C web sites
    - Brokerage services: publishers (readers and authors), literary agents (authors and publishers), travel services (travelers and travel-related businesses), ticket services (people who go to events, and people who sponsor events).

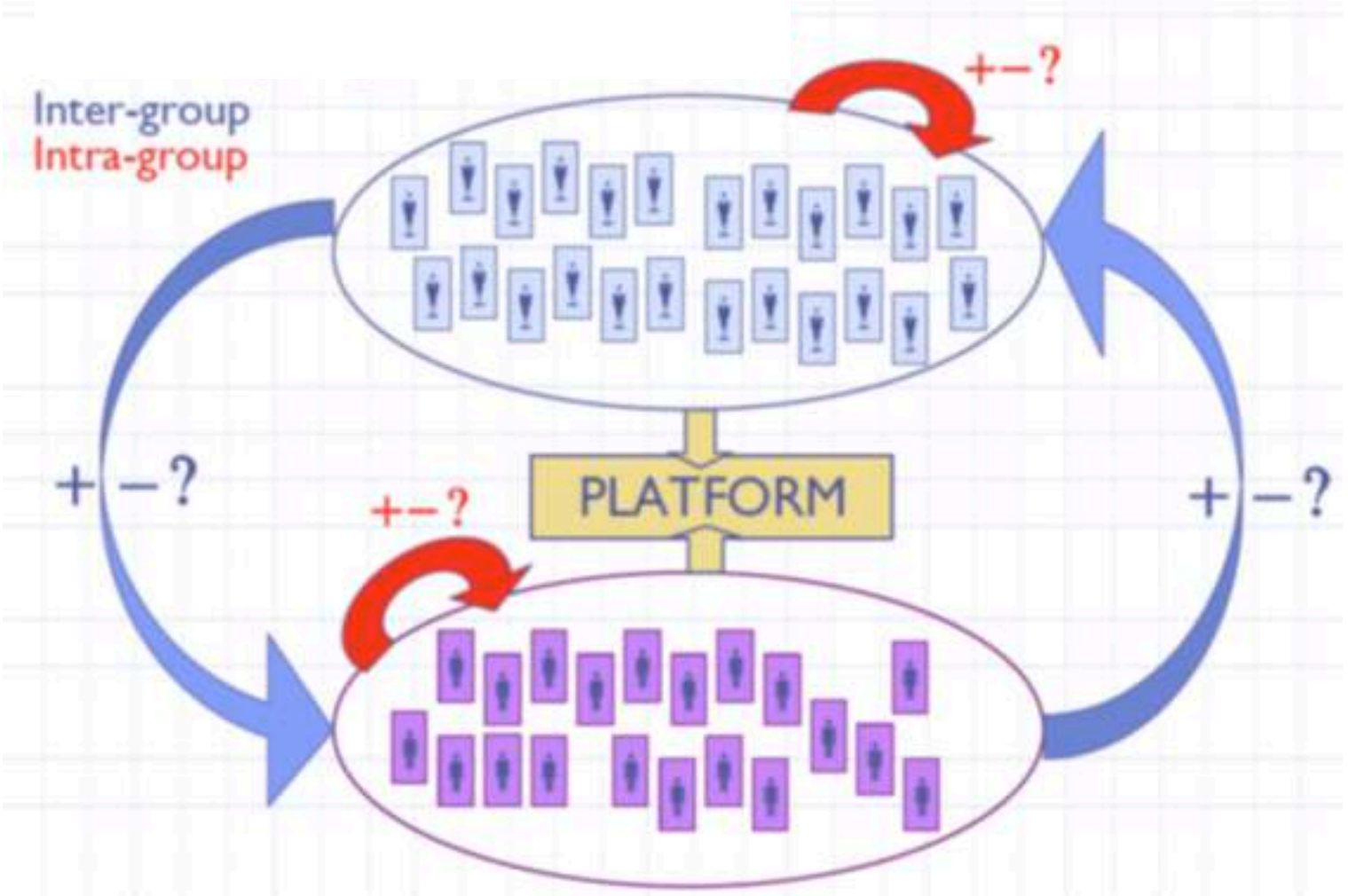
Multi-sided platform markets: Typology (2)

- Advertising-supported media
  - Examples
    - Magazines, newspapers, free television, and web portals
  - The platform either creates content (newspapers) or buys content from others (free television).
  - The content is used to attract viewers. The viewers are then used to attract advertisers.
- Transaction systems
  - Any method for payment works only if buyers and sellers are willing to use it.
  - Examples
    - Government backed systems: coins and notes
    - For-profit transaction systems: debit and credit cards, Paypal, …

Multi-sided platform markets: Typology (3)

- Software platforms
  - Allow applications developers and users to interact
    - Platform provide services for applications developers (e.g., obtain access to the hardware for the computing device in question).
    - Users can run these applications only if they have the same software platform as that relied on by the developers.
    - Developers can sell their applications only to users that have the same software platform they have relied on in writing their applications.
  - Examples
    - Personal computers
    - Smartphones
    - Video games
    - Digital music devices

Identifying externalities

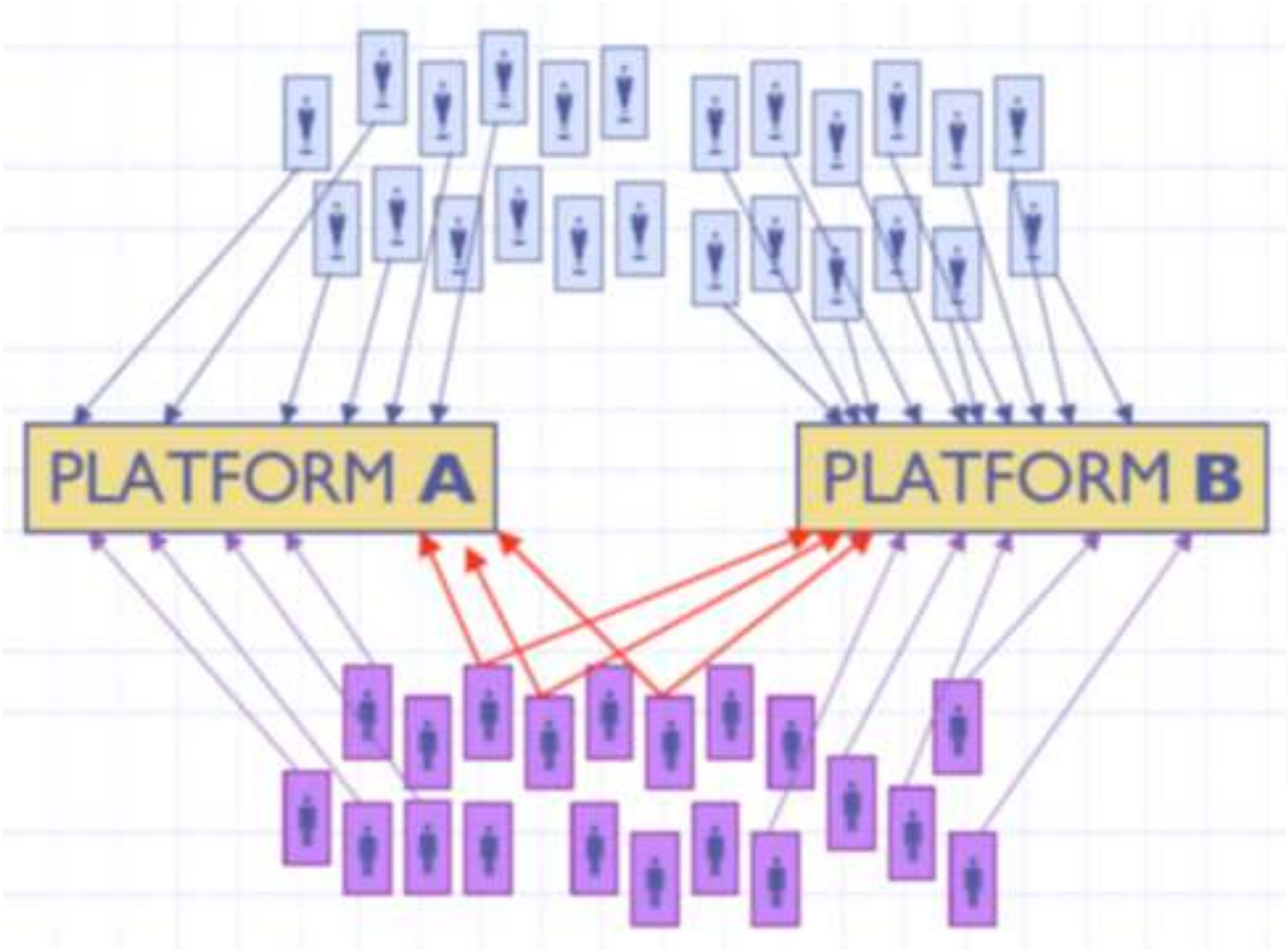


Identifying externalities (2)

- Some examples

	Sides	Inter-group	Intra-group
	A. Game developers B. Users	A to B: + B to A: +	In A: – In B: +
	A. Readers B. Advertisers	A to B: + B to A: – (+?)	In A: / In B: –
meetic	A. Women B. Men	A to B: + B to A: +	In A: / (–?) In B: / (–?)
	A. Merchants B. Consumers	A to B: + B to A: +	In A: – In B: /

Single- vs. multihoming



Intuition

✓Platforms have a monopoly for access to singlehomers.

✓Singlehomers are courted.

✓Multihomers are exploited.

“Getting both sides on board”

- Platforms face a “chicken-and-egg” problem
  - Side A is willing to participate only if side B participates and vice versa (also called “circular conundrum”- Spulber, 2009).
- Ways to solve the problem
  - Minimizing transaction costs
    - Matchmaking (exchanges)
    - Building audiences (advertising-supported media)
    - Minimizing duplication costs (software platforms, transaction systems)
    - Example doing all 3: MySpace
  - Designing correctly the price structure
    - Aim: internalize the various externalities across and within the sides of the platform

Pricing

- A market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount. (Rochet and Tirole, 2006)
  - The price **structure** matters (not just the total price).
  - There must be externalities between the two groups that the members cannot sort out for themselves.
  - ↔ "one-sided market": textbook wheat market → no externalities connecting buyers and sellers → price structure doesn't matter (a tax on wheat levied on buyers has the same effect on quantity as the same tax levied on sellers).
- 2 types of "prices"
  - Usage fees
  - Membership fees

Monopoly platform

- Example 1
  - 3 buyers and 3 sellers
  - Each buyer buys one unit from each seller
  - Buyers and sellers derive a positive gross surplus from each buyer-seller transaction
    - Buyers: each one derives 2 per transaction
    - Sellers: sellers 1, 2 and 3 derive, resp., 1, 2 and 3 per transaction
  - Intermediary sets usage (transaction) fees: P_b and P_s
  - Net surplus if n_b buyers and n_s sellers are on the platform:
    - Buyers: $U_b(n_s) = (2\text{-}P_b) \text{ x } n_s$
    - Sellers:
      - $U_s(n_b) = (1\text{-}P_s) \text{ x } n_b$ for seller 1
      - $U_s(n_b) = (2\text{-}P_s) \text{ x } n_b$ for seller 2
      - $U_s(n_b) = (3\text{-}P_s) \text{ x } n_b$ for seller 3
  - Intermediary's profits (Assumption: no cost): $\Pi = (P_b+P_s) \text{ x } n_b \text{ x } n_s$

Monopoly platform (2)

- Example 1 (cont'd)
  - Profit-maximizing price on the *buyer* side: $P_b = 2$
    - Buyers are homogeneous → intermediary can extract all surplus from buyers and still assure participation by all buyers
  - Profit-maximizing price on the *seller* side: $P_s = 2$
    - 2 sellers join → 6 buyer-seller transactions
    - Π = 6 x 2 + 6 x 2 = 24
  - Profit-maximizing prices overall: $P_b = 2$ and $\boldsymbol{P_s = 1}$
    - All sellers join → **9** buyer-seller transactions
    - Profits on the seller side ↓: 9 x 1 = **9** < 6 x 2 = 12
    - But, profits on the buyer side ↑: 9 x 2 = **18** > 6 x 2 = 12
    - Net effect is positive : Π = 9 x 2 + 9 x 1 = **27** > 24 → OPTIMUM

Lesson 1. Usage prices tend to be lower on the market side with a higher price elasticity and which exerts a stronger externality on the other side.

Monopoly platform (3)

- Example 2
  - 6 buyers and 6 sellers
  - Net surplus if n_b buyers and n_s sellers are on the platform:
    - Buyers: $U_b(n_s) = (6\text{-}P_b) \text{ x } n_s$
    - Sellers: $U_s(n_b) = (i\text{-}3\text{-}P_s) \text{ x } n_b$ for seller $i = 1, 2, ..., 6$
    - Note: even at price P_s=0, sellers 1 and 2 prefer not to participate
  - Profit-maximizing price on the *buyer* side: $P_b = 6$
  - Profit-maximizing price on the *seller* side (given that all buyers join): $P_s = 2$
    - 2 sellers join $\rightarrow$ 12 buyer-seller transactions
    - Π = 12 x 6 + 12 x 2 = 96
  - But this price does not maximize overall profits!
    - $P_s \downarrow \rightarrow n_s \uparrow \rightarrow$ more transactions $\rightarrow$ more revenues on the buyer side
    - If lowest authorized price is $P_s = 0 \rightarrow$ 24 transactions and Π = 24 x 6 = 144
    - If subsidies are allowed, then $\boldsymbol{P_s = -1} \rightarrow$ 30 transactions and Π = 30 x 6 + 30 x (-1) = 150 $\rightarrow$ OPTIMUM

Monopoly platform (4)

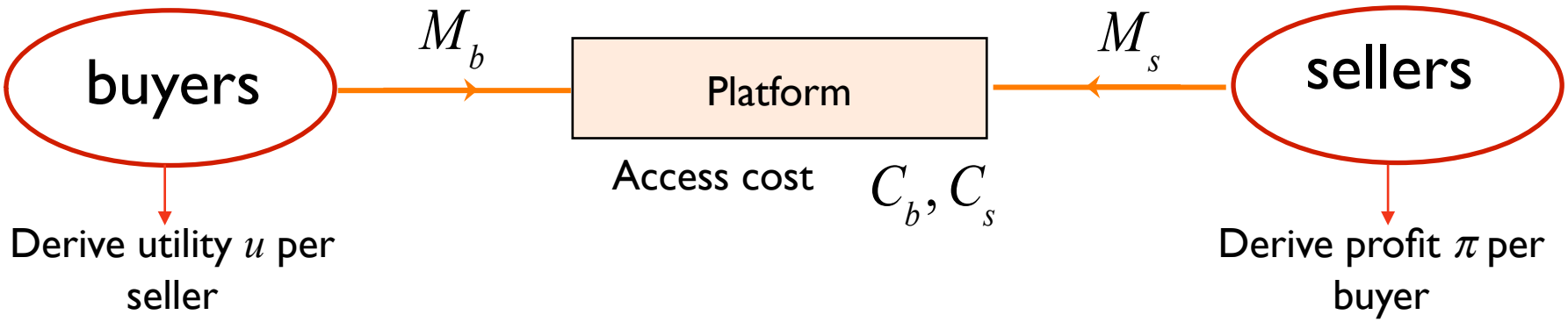
- Example 2 (cont'd)
  - Welfare-maximizing solution?
    - $W = n_b \text{ x } (6\text{-}P_b) \text{ x } n_s + \Sigma_i \, (i\text{-}3\text{-}P_s) \text{ x } n_b + (P_b\text{+}P_s) \text{ x } n_b \text{ x } n_s$
    - $P_b = 6$ and $P_s = -2$ implement full participation, which is the welfare-maximizing solution.

Lesson 2. A profit-maximizing intermediary may subsidize one side of the market because this generates a higher volume of trade and, thereby, higher profits on the other side of the market.

Lesson 3. Pricing below cost may be socially desirable, but the subsidy chosen by a profit-maximizing intermediary may be too low from a social point of view.

Monopoly platform (5)

- Model
  - Sellers sell independent products on a single platform.
  - All buyers accessing the platform have the same demand at each seller.
  - Each seller has a seller-buyer relationship with each buyer.
  - Platform charges a membership fee on each side.



Monopoly platform (6)

- Surplus when n_b buyers and n_s sellers join the platform

$$v_b = n_s u - M_b \text{ and } v_s = n_b \pi - M_s$$

- Buyers and sellers join if their surplus is larger than their (heterogeneous) opportunity cost
  $\rightarrow$ number of buyers and sellers on platform given by

$$n_b = N_b(v_b) \text{ and } n_s = N_s(v_s)$$

- Platform profits

$$\Pi = n_b(M_b - C_b) + n_s(M_s - C_s)$$

Monopoly platform (7)

- Platform profits (cont'd)
  - Use $M_b = N_s(v_s)u - v_b$ and $M_s = N_b(v_b)\pi - v_s$
  - To express profits as functions of surpluses:

$$\Pi = N_b(v_b)(N_s(v_s)u - v_b - C_b) + N_s(v_s)(N_b(v_b)\pi - v_s - C_s)$$

- FOCs for profit-maximization can be rewritten as

$$M_b = C_b - \pi n_s + \frac{N_b(v_b)}{N_b'(v_b)} \text{ and } M_s = C_s - u n_b + \frac{N_s(v_s)}{N_s'(v_s)}$$

  - Monopoly prices = cost of providing access
    - adjusted downward by the external benefit exerted on the other side of the market, and
    - adjusted upward by a factor related to the sensitivity of participation on the platform.

Monopoly platform (8)

- For a given number of participants on the other side, demand elasticities for access can be expressed as

$$\eta_b(M_b|n_s) = M_b \frac{N_b'(n_s u - M_b)}{N_b(n_s u - M_b)} \text{ and } \eta_s(M_s|n_b) = M_s \frac{N_s'(n_b \pi - M_s)}{N_s(n_b \pi - M_s)}$$

- Hence, markups are

$$\frac{M_b - (C_b - n_s\pi)}{M_b} = \frac{1}{\eta_b(M_b|n_s)} \text{ and } \frac{M_s - (C_s - n_b u)}{M_s} = \frac{1}{\eta_s(M_s|n_b)}$$

  - Markups are set as if there were lower costs (i.e., costs are adjusted downward by the external benefits that one group exerts on the other).
  - The monopoly intermediary internalizes indirect network externalities.

Monopoly platform (9)

- The standard formula for profit-maximization (inverse-elasticity rule) must be adapted.
- Why?
  - There is no way to allocate the increases in revenues from changes in prices to one side or the other; nor is there any way to allocate the costs.
  - *Opportunity* cost < *marginal* cost of serving a buyer (seller), as attracting an extra buyer (seller) generates revenues on the seller (buyer) side.
- The non adjusted margin is lower on the side where the elasticity is the highest and/or the externality created is larger.

Non-price strategies: Design decisions (Evans, 2011)

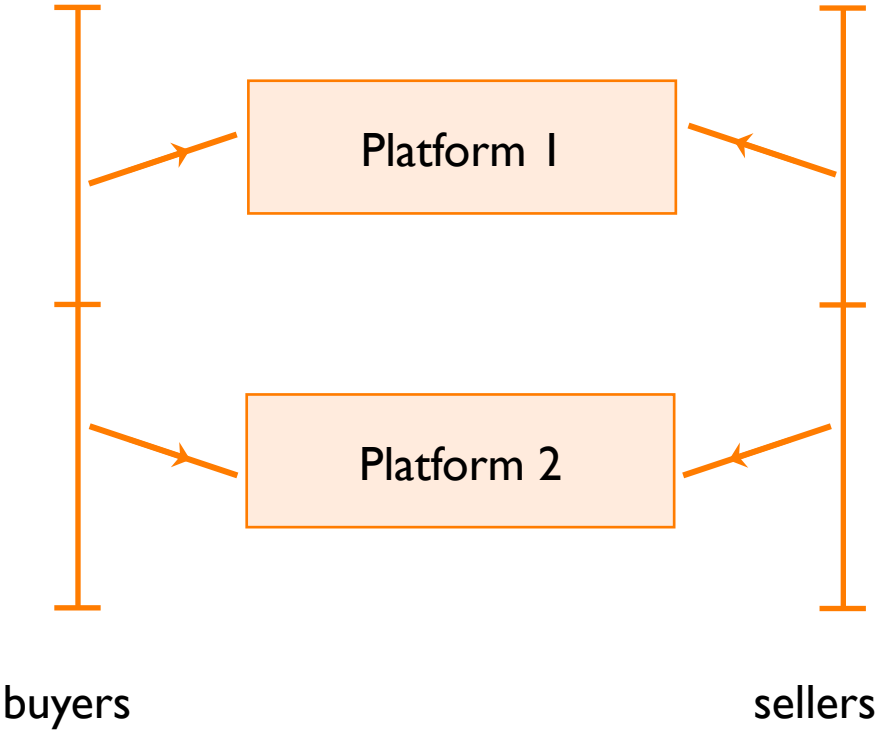
- Design decisions have an impact on…
  - the willingness of customers to join a platform;
  - the way they interact with each other once they have joined.
- Design decisions may have conflicting effects.
  - Shopping mall → Shoppers prefer to get to stores quickly, while merchants like to maximize foot traffic outside their stores.
  - Advertising-supported media → TV watchers might benefit from having ads clustered, but TV providers typically intersperse the ads.
  - Software platforms → Include features that do not benefit most users, but developers value knowing that any user will have features allowing them able to run their applications.
  - Payment card systems → Merchants must take a card for payment regardless of who presents it or which entity issued it. Merchants may benefit from being selective, but this would reduce the confidence that cardholders have that their cards will be taken at stores that display the acceptance mark.

Non-price strategies: Rules (Evans, 2011)

- Clear incentive to devise rules that promote positive externalities and limit negative externalities among customers.
- Examples
  - Exchanges → rules against "front-running"
    - Occurs when a broker receives a large purchase order from a customer, first buys on his own account, and then executes the customer order, which drives the price up slightly, and then sells on his own account and pockets the resulting profit.
    - Banning this practice directly harms brokers, but it makes buyers and sellers more confident that they are getting the best price possible, and thereby boosts volume on the exchange.
  - Cooperative two-sided platforms → further need for rules because their members' behavior can affect the platform value as a whole.
    - **Visa**: rules that govern the appearance of cards issued by members (common brand), rules that address disputed transactions (acquirers would favor merchants while issuers would favor cardholders)..

Platform competition

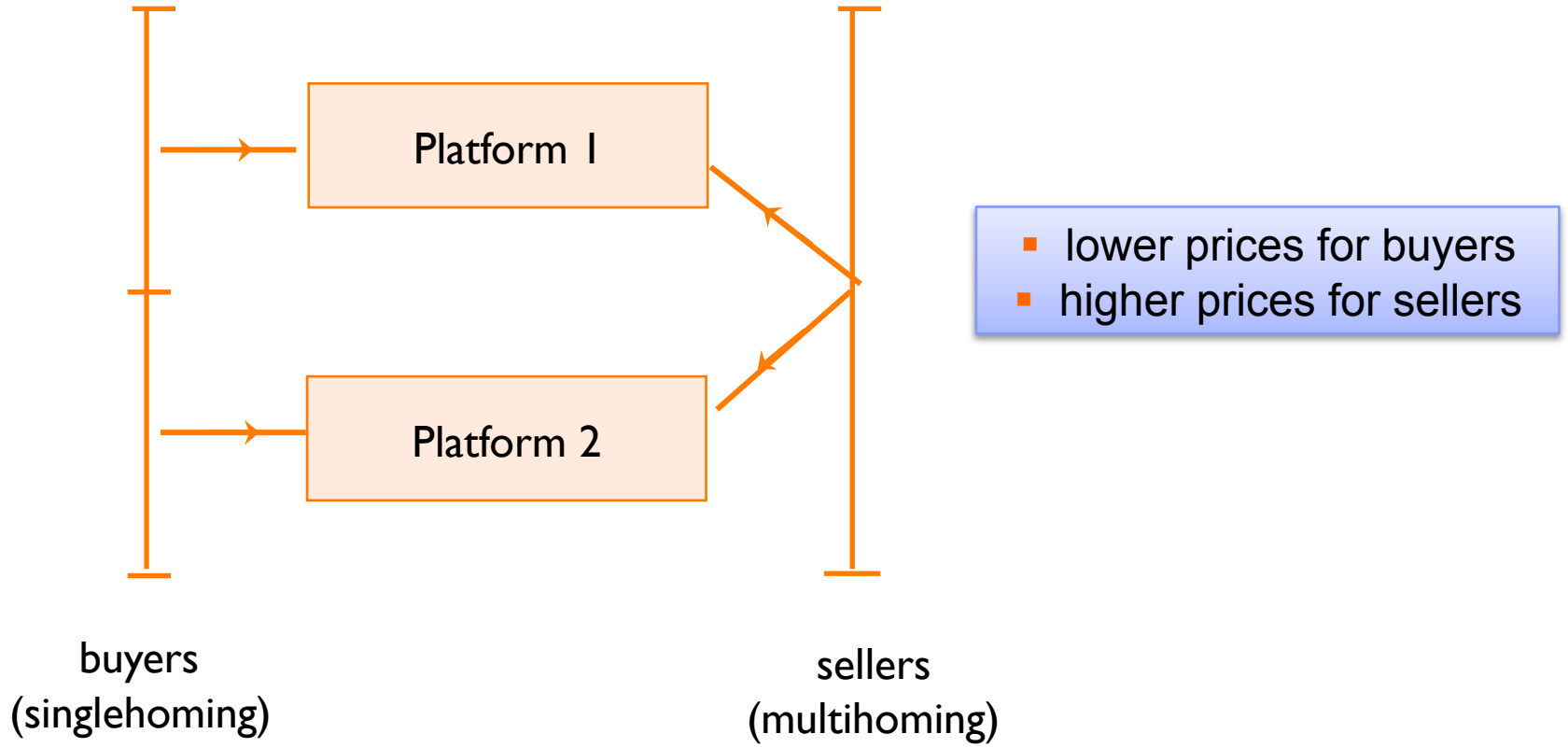
- Variant 1: Two-sided singlehoming



- Price smaller on both sides
- Expectations of users play an important role (potential multiplicity of equilibria)
- "Divide and Conquer"

Effects of multihoming

- Variant 2: Competitive bottlenecks



- lower prices for buyers
- higher prices for sellers

Effects of multihoming (2)

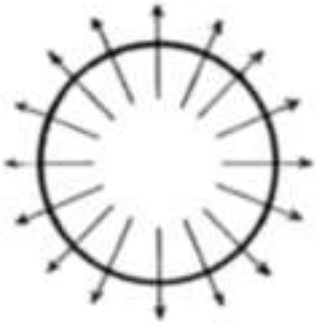
- Competitive bottlenecks (cont'd)
  - Charge « monopoly prices » in multihoming market
  - High profits on the multihoming side but dissipation of these profits through the competition on the singlehoming side.
  - Illustration
    - Advertisers multihome, eyeballs don't (and even if they do, repetition effect) → Subsidize eyeballs
  - Endogenous multihoming
    - Easy to divide but difficult to conquer
  - Multihoming reduces tipping by facilitating coexistence of platforms.

Platform competition: summary

- Determinants of the number and relative size of competing platforms

Forces leading to
concentration

Indirect network effects
Scale economies



Forces leading to
coexistence of platforms

Multihoming
Platform differentiation
(horizontal or vertical)
Congestion