Stock Exchange Alliances Access Fees, and Competition

Oz Shy
University of Haifa
& Bank of Finland

Juha Tarkka
Bank of Finland

Objectives

(a) Investigate market consequences of stock exchange alliances

(b) Changes in fee structures of stock exchanges and security houses

(c) Analyze a variety of access-fee mechanisms

(d) Explore the efficiency implications of alliances and access fees

Major Observations

2 major changes in European and US stock exchanges take place at the same time:

1. Become public (London, Deutsche Börse)

2. Seek to form alliances with other stock exchanges ("hunting for liquidity")

Discuss: Merger $\neq$ Alliance $\neq$ Cross-listing

Some existing alliances

- Euronext: Paris, Amsterdam, and Brussels bourses
- Newex: Deutsche Börse and Vienna
- Norex: Copenhagen, Stockholm, Oslo, and Iceland
- Eurex: European-wide derivatives trading network

(show presfig.pdf now!)

Some existing alliances among banks

- SWIFT: (Society for Worldwide Interbank Financial Telecommunication) est. 1973, links over 7000 financial institutions in 193 countries. The average daily value of payment messages is over $5 trillion

- Private "alliances"
  - CHIPS (US): (Clearing House Interbank Payment System)
  - EBA (EU): European Banking Assoc.

- Public "alliances"
  - Fedwire (US): Executes transfer of funds
  - TARGET (EU): run by the ECB

- ATMs: (Automated Teller Machine), for example: Cirrus, VISA

Other Observations

- Large increase in cross-border equity flows (est. over $1 trillion in Europe)

- Europe: Single currency facilitated accounting practices

- Technology change: Fully-automated trade facilitates some aspects of alliance operations

The Key Question (that we don't ask)

Is it optimal to have a number of stock markets, rather than having a single world market?

In particular, has the change from a floor-based trading system to e-trade removed all decreasing returns to scale and opened the way to a single trading platform?

The Key Question: 5 Answers

1. Alliances (joint access to a common trading network) remove the need to trade in large stock exchanges

2. Investors prefer to place orders for equity in markets located in the proximity of the firms simply because of

   - better information
   - language and cultural barriers

3. investors have different needs of preferences for speed of execution and anonymity

4. Terrorists' attacks and natural disasters (diversification of risk: no single center!)

5. We do not observe a single world-wide telephone company, a single mail carrier or a single commercial bank!

Questions that We do Ask

1. How alliances affect:

   (a) the fees stock exchanges levy on security houses, and their profits?

   (b) the fees security houses levy on investors as well as their profits?

2. What would be the effect on investors' participation rate, investors' welfare, and social welfare?

3. What are the efficient and inefficient access fee mechanisms?

4. Are there differences between alliances in the Telecom industry and stock exchanges?

Related Theoretical Literature

- Gehrig (Book, 2000): A comprehensive survey

- Economides and Siow (AER, 1988): Trade-off between network externalities & economies of scale versus localization advantages

- Pagano (QJE, 1989) Asymmetric market access costs may lead to multiple equilibria, where large-quantity investors select markets with high access fees

- Gehrig (EER, 1998) Suggests a novel approach for modeling competition between market places [consumers select market and then which firm within the market]

- Santos & Scheinkman (QJE, forth.): Investors have different default rates. Monopoly would demand fewer guarantees (collateral)

Access Pricing: A Disussion

- Key instrument for transforming a "natural monopoly" into a competitive industry

- The essential mechanism for deregulating and privatization of "natural monopolies" (public utilities) in the past 20 years

- There is no need to grant a monopoly power to a single firm merely because the service it provides requires a large investment in infrastructure

- Instead, access fee mechanisms can support competition requiring that all firms (incumbents) to allow competing firms to use the infrastructure

Access Pricing: Continued

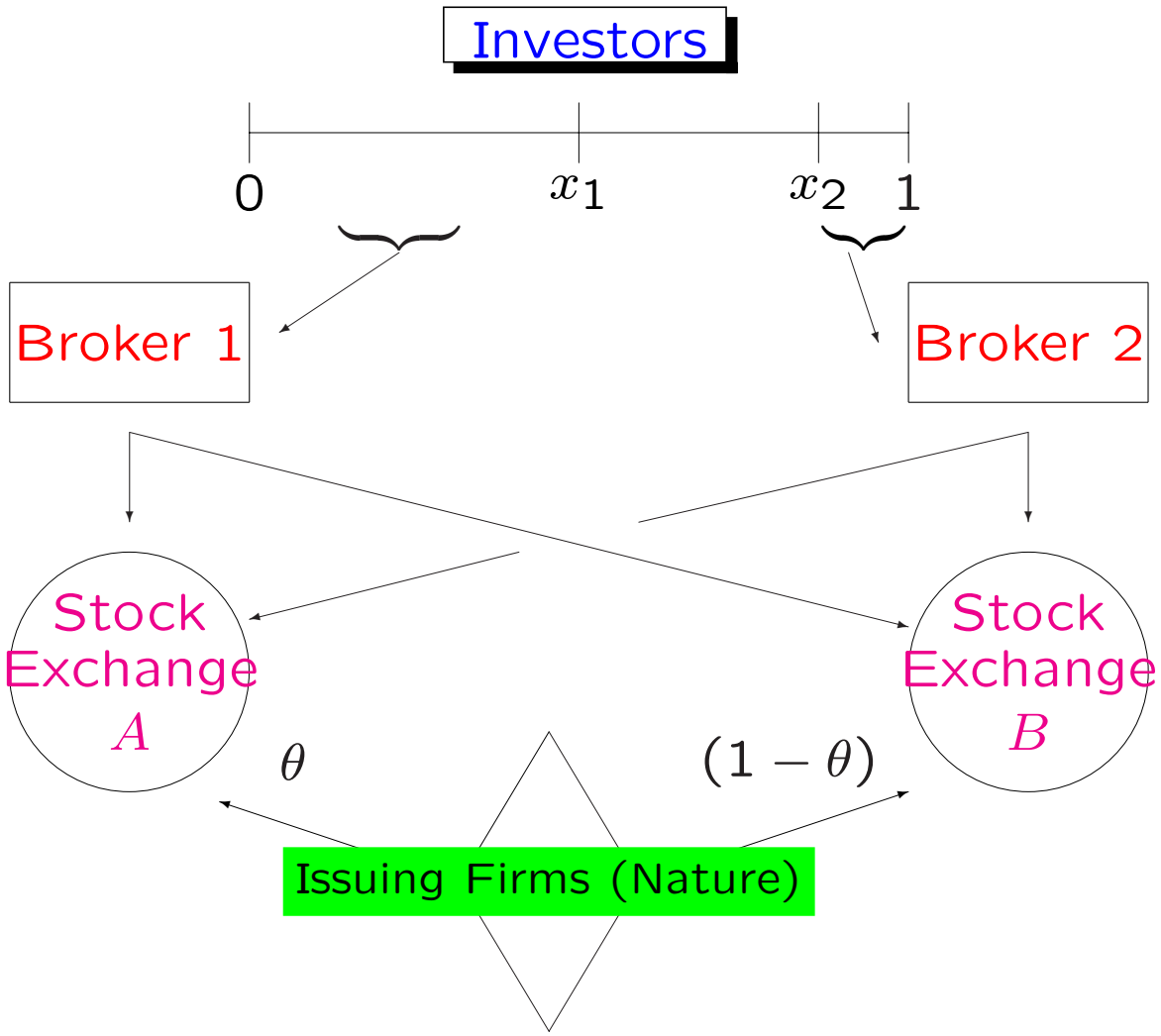
- Access pricing is observed in: Telecom (wired and wireless), Banking (ATMs), Airlines (code-sharing), Credit/debit cards (settlements); Railroad track sharing.

- Big Problem: How access fees are determined? Collusion (Code-sharing)? Regulated (Telecom)?

- Generates severe antitrust problems
  Access-fee negotiations may lead to:
  (i) price fixing (ii) market division

The Model

3 types of agents + nature:



Potential Investors

- Investors: buyers & sellers
  (we don't distinguish)

- Continuum of investors, indexed by x on $[0, 1]$

- V basic value from a trade

- f_1, f_2: "expected" fee to broker 1 and 2

- τ differentiation parameter

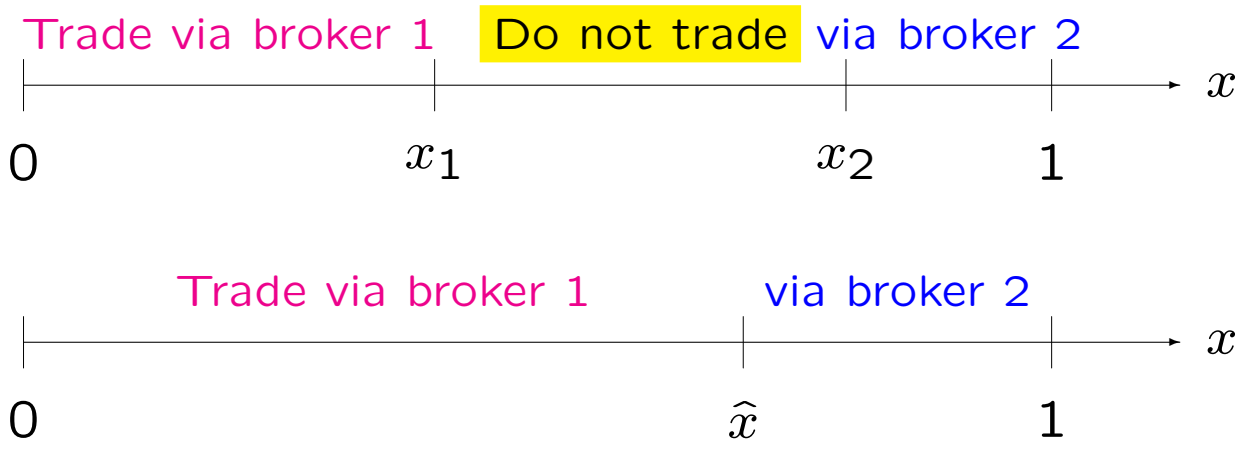
$$U_x \stackrel{\text{def}}{=} \begin{cases} V - f_1 - \tau x & \text{if trades via broker1} \\ V - f_2 - \tau(1-x) & \text{if trades via broker2} \\ 0 & \text{if does not trade,} \end{cases}$$

Investors' Paticipation (Rate)

2 cases:

- Market is partially-served
  (the interesting case!)

- Market is fully-served
  (ruled-out by parameter restrictions!)
  (in fact, there does *not* exist an equilibrium where firms treat $x_1 = x_2 = \widehat{x}$)



Issuing Firms (Nature)

Let, $\frac{1}{3} < \theta < \frac{2}{3}$. Interpretation: Proportion of the # shares: Variation of location of floatations (new shares) is bounded

- θ: proportion of shares traded in stock exchange A
- $1-\theta$: proportion of shares traded in stock exchange B
- Interpretation for, say, $\theta > \frac{1}{2}$:
  1. SE A is "larger" than B [more listings, in the vicinity of more firms]
  2. SE A has been established before B [Area of A grows faster (more IPOs and new issuances)]

Security Houses (Brokers)

- Broker 1 serves x_1 investors
- Broker 2 serves $1 - x_2$ investors
- $\mu \geq 0$ cost for locating a foreign match
- (Non-fee) cost to broker 1 is: $(1-\theta) \cdot x_1 \cdot \mu$
- (Non-fee) cost to broker 2 is: $\theta(1 - x_2)\mu$
- Fees levied by broker 1: f_1^A and f_1^B
- Fees levied by broker 2: f_2^A and f_2^B

Brokers: continued

Profit of broker 1:

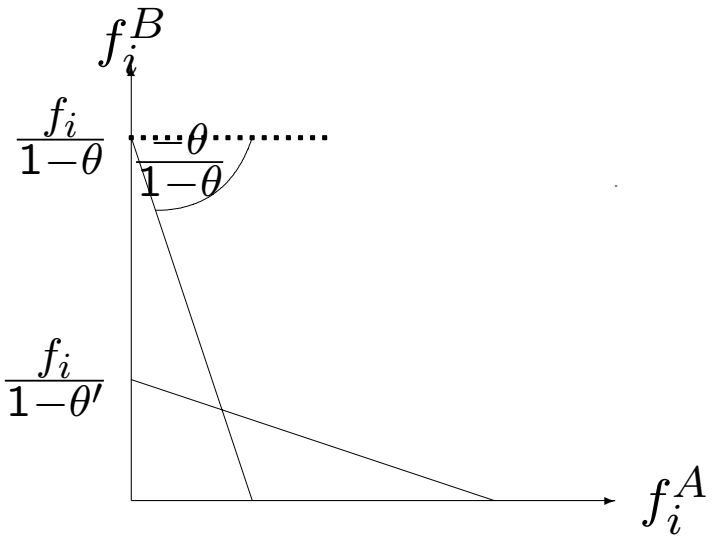
$$\pi_1 \stackrel{\text{def}}{=} x_1 \left[\theta(f_1^A - f_A) + (1-\theta)(f_1^B - f_B - \mu)\right],$$

Profit of broker 2:

$$\pi_2 \stackrel{\text{def}}{=} (1-x_2) \left[\theta(f_2^A - f_A - \mu) + (1-\theta)(f_2^B - f_B)\right].$$

We can define the "expected" fee levied by each broker:

$$f_1 \stackrel{\text{def}}{=} \theta f_1^A + (1-\theta) f_1^B \quad \text{and} \quad f_2 \stackrel{\text{def}}{=} \theta f_2^A + (1-\theta) f_2^B.$$



(Note: $0 < \theta' < 1/2 < \theta < 1$)

Stock Exchanges A and B

- $\theta =$ proportion of shares traded in market A

- $1-\theta =$ proportion of shares traded in market B

Profit of stock exchange A:

$$\pi_A \stackrel{\text{def}}{=} \theta(x_1 + 1 - x_2) f_A$$

Profit of stock exchange B:

$$\pi_B \stackrel{\text{def}}{=} (1-\theta)(x_1 + 1 - x_2) f_B.$$

where,

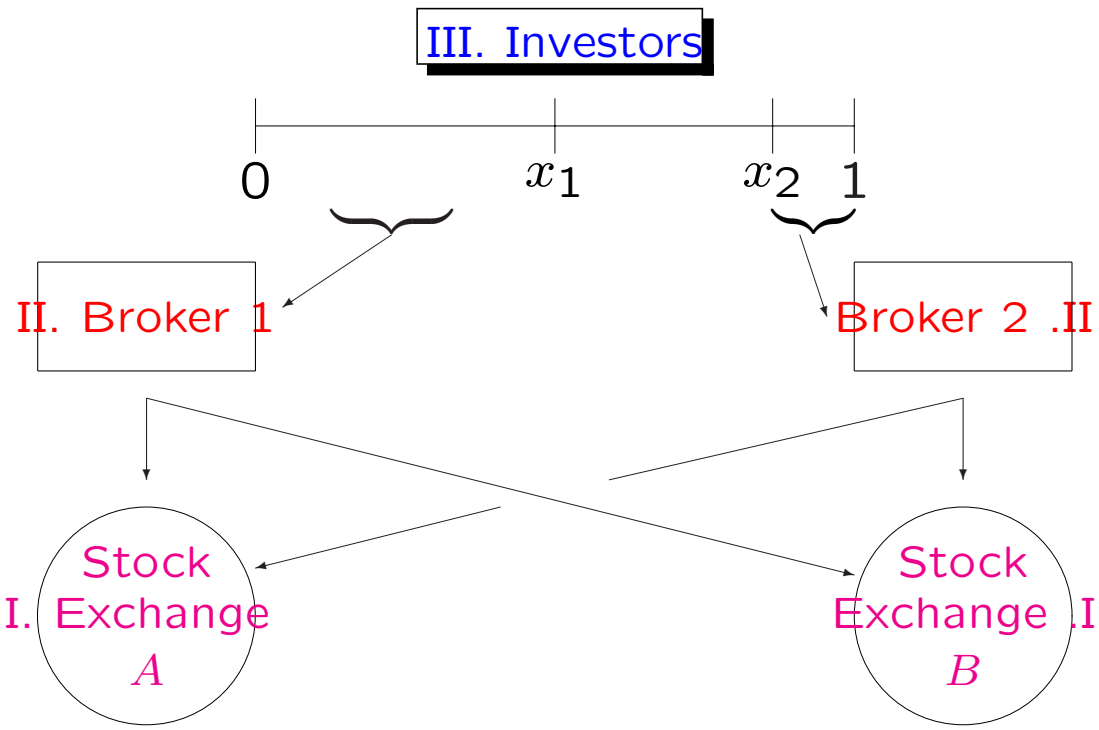
$$x_1 = \frac{V - f_1}{\tau} \quad \text{and} \quad x_2 = -\frac{V - f_2 - \tau}{\tau}.$$

Timing

Stage I: Stock exchanges set fees on brokers: f_A and f_B

Stage II: Brokers set investors' fees: f_1^A, f_1^B (f_1), and f_2^A, f_2^B (f_2)

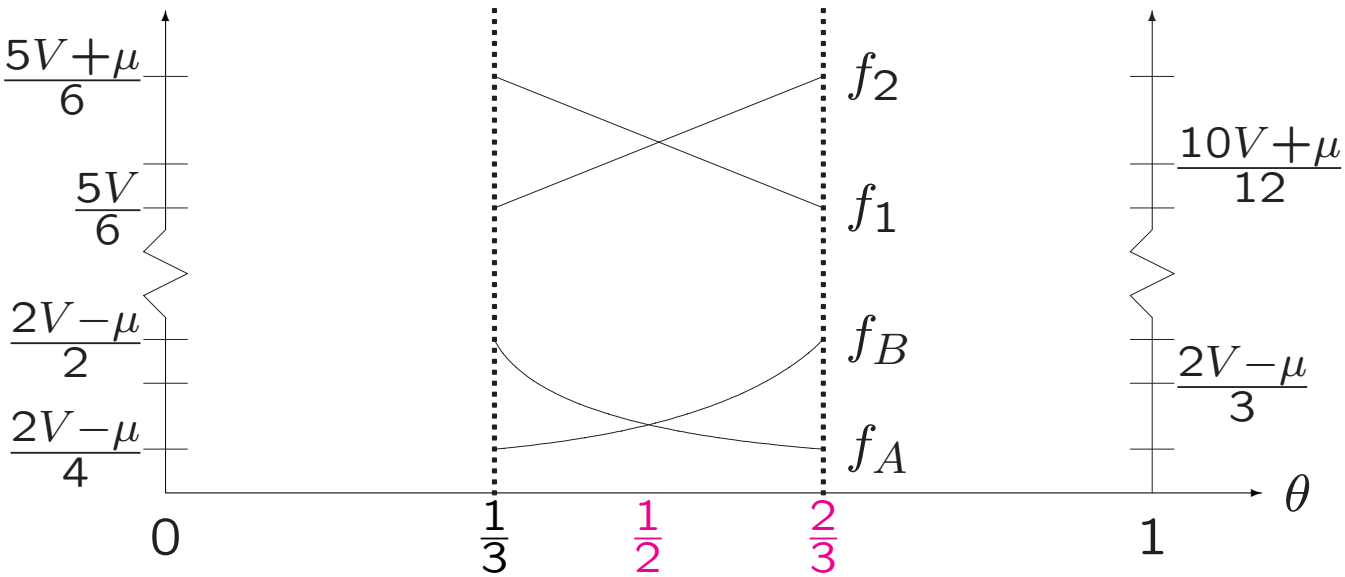
Stage III: Potential investors determine to trade via broker 1, via 2, or not at all.



Equilibrium in Absence of Alliances

Proposition 1 *The fees stock exchanges levy on brokers (f_A, f_B) are strategic substitutes.*

Proposition 2 *Let A be the "larger" SE ($\theta > 1/2$) and $\mu > 0$. Then, (a) $f_A < f_B$, (b) $f_1 < f_2$, (c) $x_1 > 1 - x_2$, and (d) $\pi_1 > \pi_2$.*



Intuition: "Large" SE more sensitive to investors' participation (more elastic demand)

Equilibrium in Under the Alliance

- a_A access fee SE A charges competing SE per-match (proportion θ)

- a_B access fee SE B charges competing SE per-match (proportion $1-\theta$)

Under the alliance, we have a 4-stage game:

Stage I: Stock exchanges set access fees: a_A and a_B noncooperatively!)

Stage II: Stock exchanges set: f_A and f_B

Stage III: Brokers set: f_1 and f_2

Stage IV: Potential investors determine to trade via broker 1, via broker 2, or not at all.

Alliance: Continued

Brokers solve:

$$\max_{f_1} \pi_1 = x_1(f_1 - f_A) \qquad \max_{f_2} \pi_2 = (1-x_2)(f_2 - f_B),$$

Stock exchanges maximize
(w.r.t fees, then access fees–backwards)

$$\pi_A = \theta\,[x_1 f_A + (1 - x_2)a_A] + (1-\theta)x_1(f_A - a_B),$$

$$\pi_B = (1-\theta)\,[(1 - x_2)f_B + x_1 a_B] + \theta(1-x_2)(f_B - a_A).$$

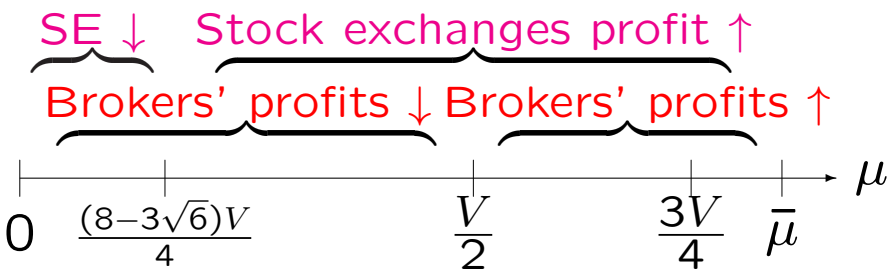
Proposition 3 *(a) "Larger" SE charges lower access fee:* $a_A < a_B \iff \theta > 1/2$
(b) However, $\forall\theta$*, both exchanges charge brokers equal fees and earn the same profit.*

Why?
(a) elasticity (participation) (b) insurance

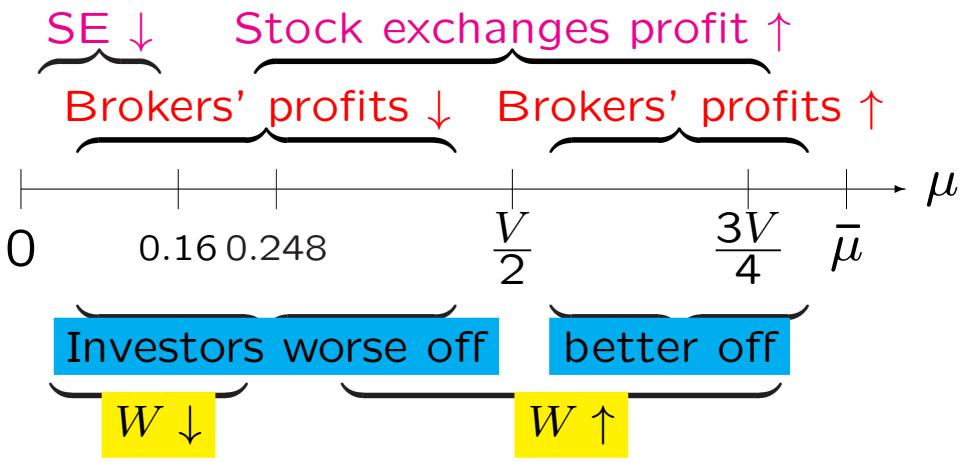
Consequences of the Alliance

Comparing symmetric cases: $\theta = \frac{1}{2}$

Profit comparison:



Fees, investors, and social-welfare comparisons:



Alliances: Access Fee Mechanisms

We analyze the following mechanisms:

1. Collusion on access fees

2. ECPR
   (Efficient Component Pricing Rule)

3. Fully-distributed Cost Mechanism
   (Here, we model fixed-costs)

Collusion on access fees

Stage I: Jointly choose a_A and a_B

to solve: $\max_{a_A, a_B} (\pi_A + \pi_B)$

Proposition 9 *Stock exchanges maximizing joint profit would eliminate access fees.*

Note: Opposite result to the telecommunication literature. Why? Phone companies sell directly to consumers (not brokers!)

Proposition 10 *Collusion on access fees among stock exchanges is Pareto improving.*

Proposition 11 *The socially-optimal access fees are negative. That is, they involve cross subsidization between the stock exchanges.*

Efficient Component Pricing Rule

- Also called the Baumol-Willig rule
- Compensated according to "lost sales"
- $B \to A$: $(1 - x_2) f_A$ [proportion θ]
- $A \to B$: $x_1 f_B$ [proportion $(1 - \theta)$]

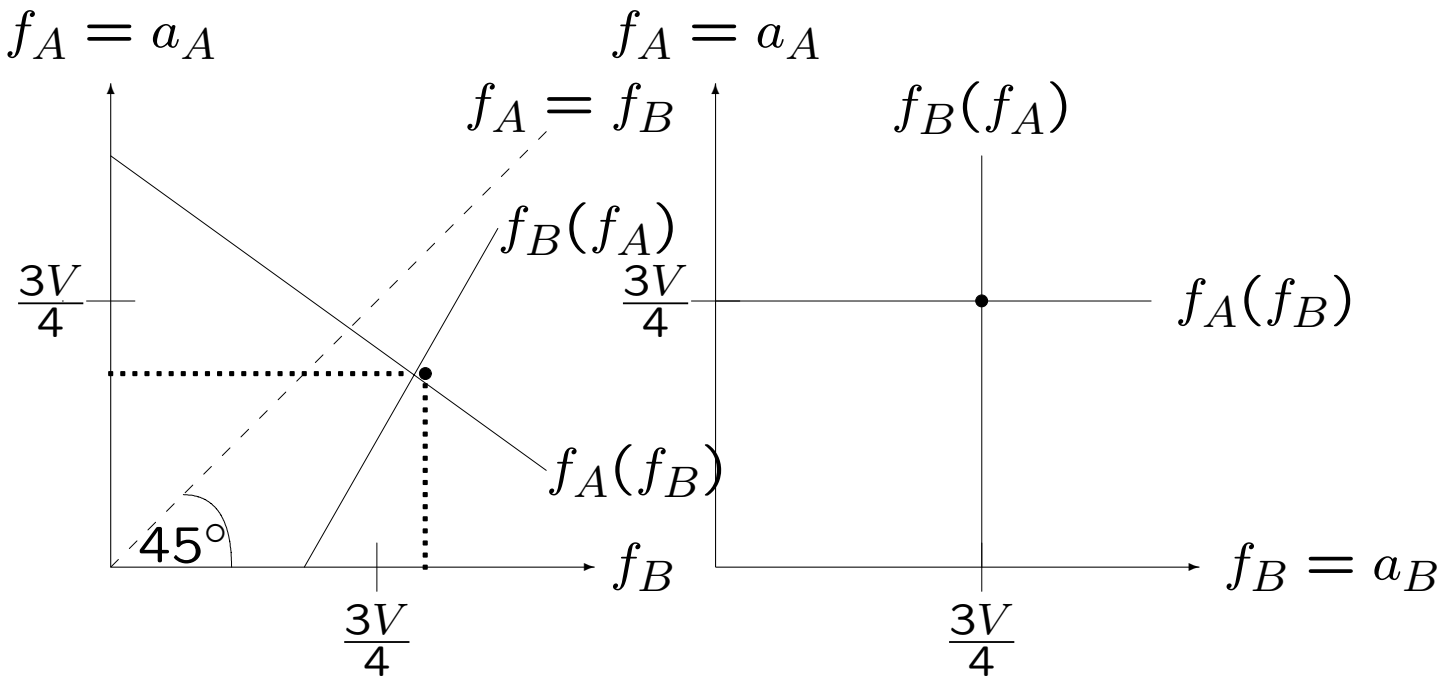
Hence, the regulator set access fees to:

$$a_A = f_A, \quad \text{and} \quad a_B = f_B$$

...and stock exchanges compete in f_A and f_B

ECPR (continued)

The best-response functions are given by



i.e., $\theta > \frac{1}{2}$ implies $R_A \downarrow$ & $R_B \uparrow$

Proposition 12 *For the symmetric case where $\theta = 1/2$, the ECPR mechanism yields the same equilibrium allocation as the equilibrium where access fees are determined noncooperatively. Hence it is inefficient.*

Fully-distributed Cost Mechanism

- Introduce fixed costs of stock exchanges $\phi_A = \phi_B = \phi$

- Also called: "usage-proportional markup"

- Firm utilizing the infrastructure pays its share of the fixed cost (acc. relative use)

$$a_A = \left(\frac{1 - x_2}{x_1 + 1 - x_2}\right)\phi_A \quad a_B = \left(\frac{x_1}{x_1 + 1 - x_2}\right)\phi_B$$

Proposition 13 *The fully-distributed cost mechanism supports an allocation which is Pareto superior to the ECPR mechanism and the independently-determined access fee equilibrium.*

Concluding Remarks (yes, almost the end!)

Our Investigation

1. We analyzed the implications of alliances among stock exchanges

2. We demonstrated the parallels and differences between stock exchanges and the telecom industries

3. Differences: b/c SE do NOT sell directly to end-users (may change in the future)

4. Example (difference): Collusion on access fees may be Pareto improving

Concluding Remarks (yes, this is the end!)

Main Results

1. Larger SE charge brokers a lower fee (non-alliance)

2. Larger SE charge other SE lower access fee (alliance)

3. Low (high) foreign membership costs imply brokers lose (gain) from alliances

4. High foreign membership costs imply alliance is Pareto improving

5. Collusion on access fees may lead to Pareto improvement (zero or negative access fees)

6. The fully-distributed cost mechanism is Pareto superior to ECPR and non-cooperation