

2020年度寡占理論 (3)

Hidden Protectionism by State Enterprises

今日の講義の構成

- (a) 混合寡占
- (b) 最適民営化政策
- (c) 市場競争と最適民営化政策
- (d) Optimal Privatization Policy with Asymmetry among Private Firms
- (e) Firms' Costs, Profits, Entries, and Innovation under Optimal Privatization Policy
- (f) Hidden Protectionism by State Enterprises

報告論文情報

Title

- (1) Asymmetry Among Private Firms and Optimal Privatization Policy.
- (2) Implicit Protectionism via State Enterprises and Technology Transfer from Foreign Enterprises.

Co-author

Junichi Haraguchi (神奈川大学助教, 2013年度-2016年度寡占理論受講)

Journal

- (1) Bulletin of Economic Research, forthcoming
- (2) Review of International Economics, forthcoming

Mixed Oligopolies, Mixed Markets

State-owned public firms compete against private firms

Examples of mixed oligopolies in Japan

Banking: Postal Bank, DBJ, Iwate Bank

Private Funds: DBJ, Industrial Revitalization Corporation of Japan

Life Insurance: Postal Life Insurance (Kampo)

Overnight Delivery: Japan Post

Energy: Public Gas Corps (Narashino, Fukui,...), TEPCO

Telecom: NTT

Broadcasting: NHK

Examples of mixed oligopols in other countries

Banking: Postal Banks (New Zealand, U.K., Germany,...)

Automobiles: Renault, VW

Medicine: Public Institute in Brazil

Defense, Aviation: EADS, Airbus

Airline: airlines (Swiss, Belgian, France,...)

Overnight Delivery: USSP

Energy: Electricite de France, Gas de France

Broadcasting: BBC

Differences between public and private firms

(1) Public firms are less efficient than private firms.

→ Many empirical works do not support this view (and many other papers do support this view).

(2) Difference of objective function

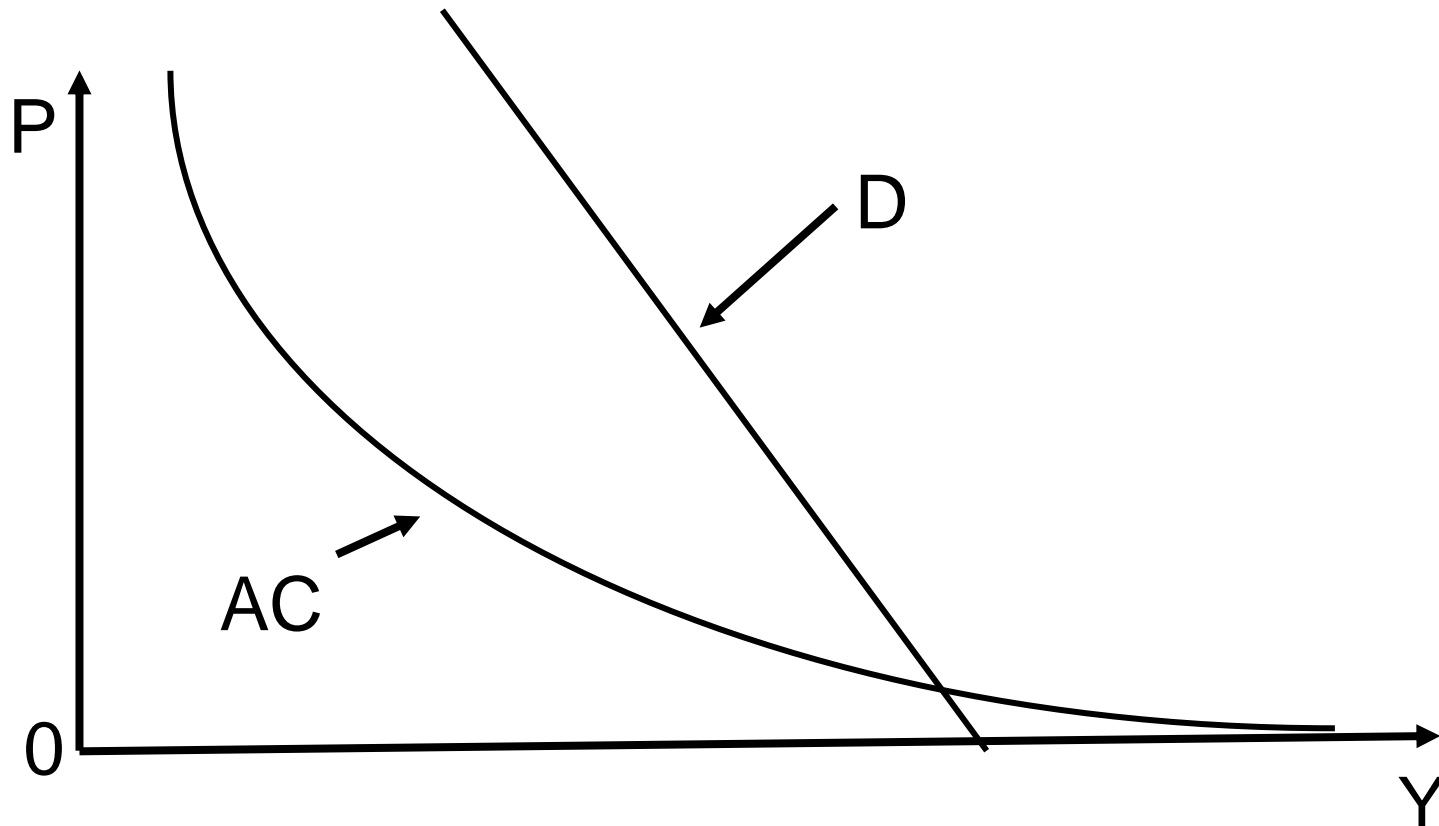
→ Private firms maximize their own profits, whereas public firms might care about social welfare.

Classical discussions of public firms

Why do public firms exist?

- (1) Natural monopoly
 - (a) Public firm monopoly
 - (b) Regulated private firm monopoly

Natural Monopoly



Classical discussions of public firms(2)

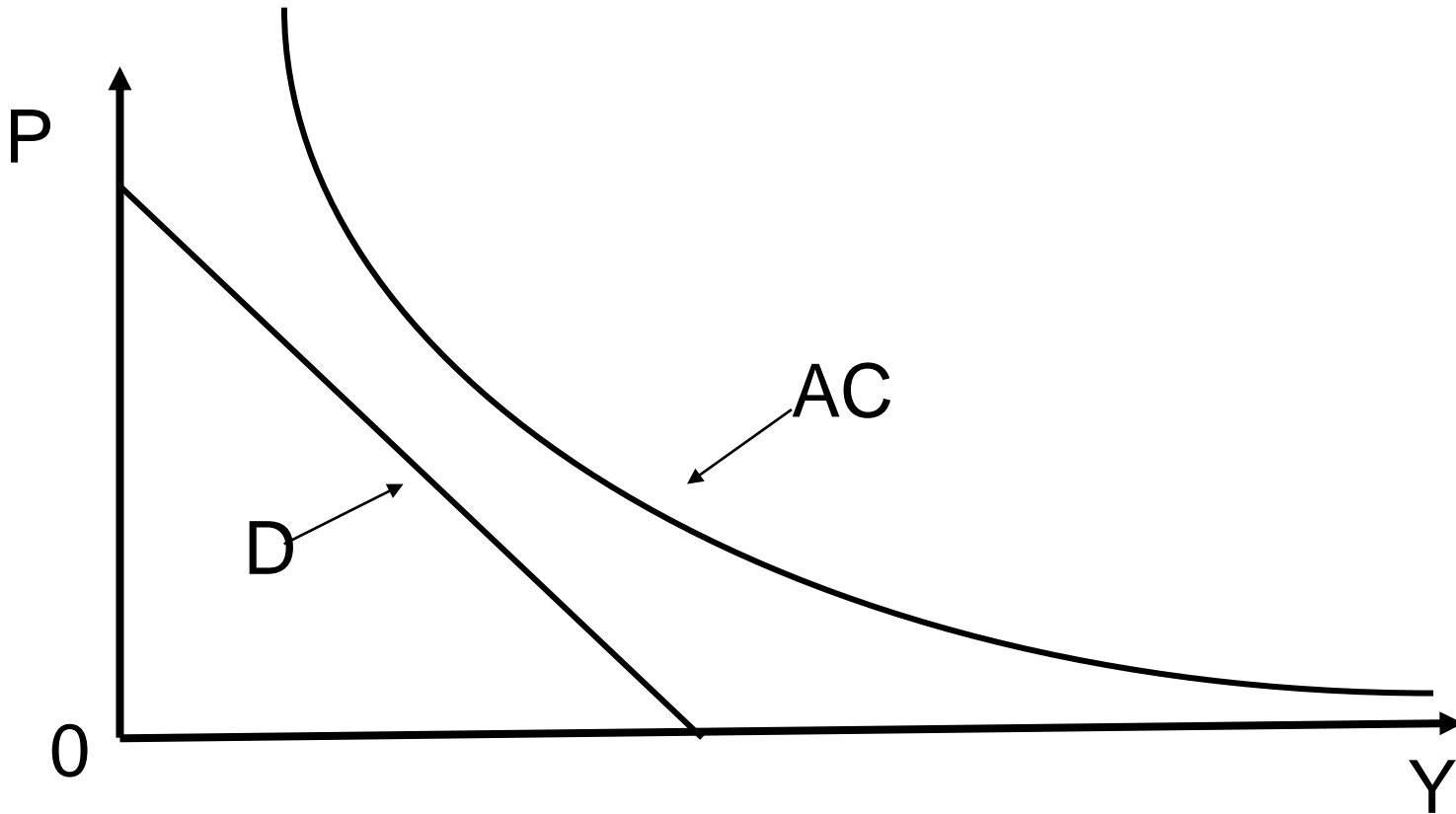
Why do public firms exist?

(2) Unprofitable market

(a) Public firm monopoly

(b) Private firm monopoly with subsidy
(compensation of deficit from public funds)

Non-Profitable Market



Classical discussions on state-owned public firms

→Public firm is the monopolist in both stories.

In real economies, public firms are not always monopolists.

Public firms do not always face significant economy of scale that guarantees monopoly by the public firm.

Problem(1)

(1) How to provide incentives for welfare maximization?

→ This is the central issue for the public firm's monopoly

If we assume that the public firm is a welfare-maximizer under the monopoly, it is absolutely obvious that the first best is achieved by definition.

→ No unsolved research problem exists. Thus, researchers never assume that the public firm is a welfare maximizer when they consider monopoly situations.

Problem(2)

(2) Is the welfare-maximizing behavior by the public firm efficient for social welfare?

→ This problem never appears in the public firm's monopoly.

This question makes sense in mixed oligopoly because welfare-maximizing behavior by the public firm might worsen welfare through strategic interaction between public and private firms.

→ This is the central issue of mixed oligopoly

De Fraja and Delbono (1989)

- (1) Cournot-type (quantity-setting competition, simultaneous-move, no product differentiation)
- (2) No cost difference between public and private firms.
- (3) Linear demand and quadratic cost function.
- (4) The private firm maximizes its own profits given outputs of other firms.
- (5) The public firm maximizes social welfare given outputs of other firms.
→ The public firm chooses its output level so that the price equals to its marginal cost.

Results

Compare the pure economy (after the privatization) to the mixed economy (before the privatization)

→ Privatization of the public firm might improve welfare

$W^P > W^M$ or $W^P < W^M$.

$W^P > W^M$ more likely takes place when the number of private firms is large.

Intuition

(1) Privatization of the public firm reduces public firm's output q_0

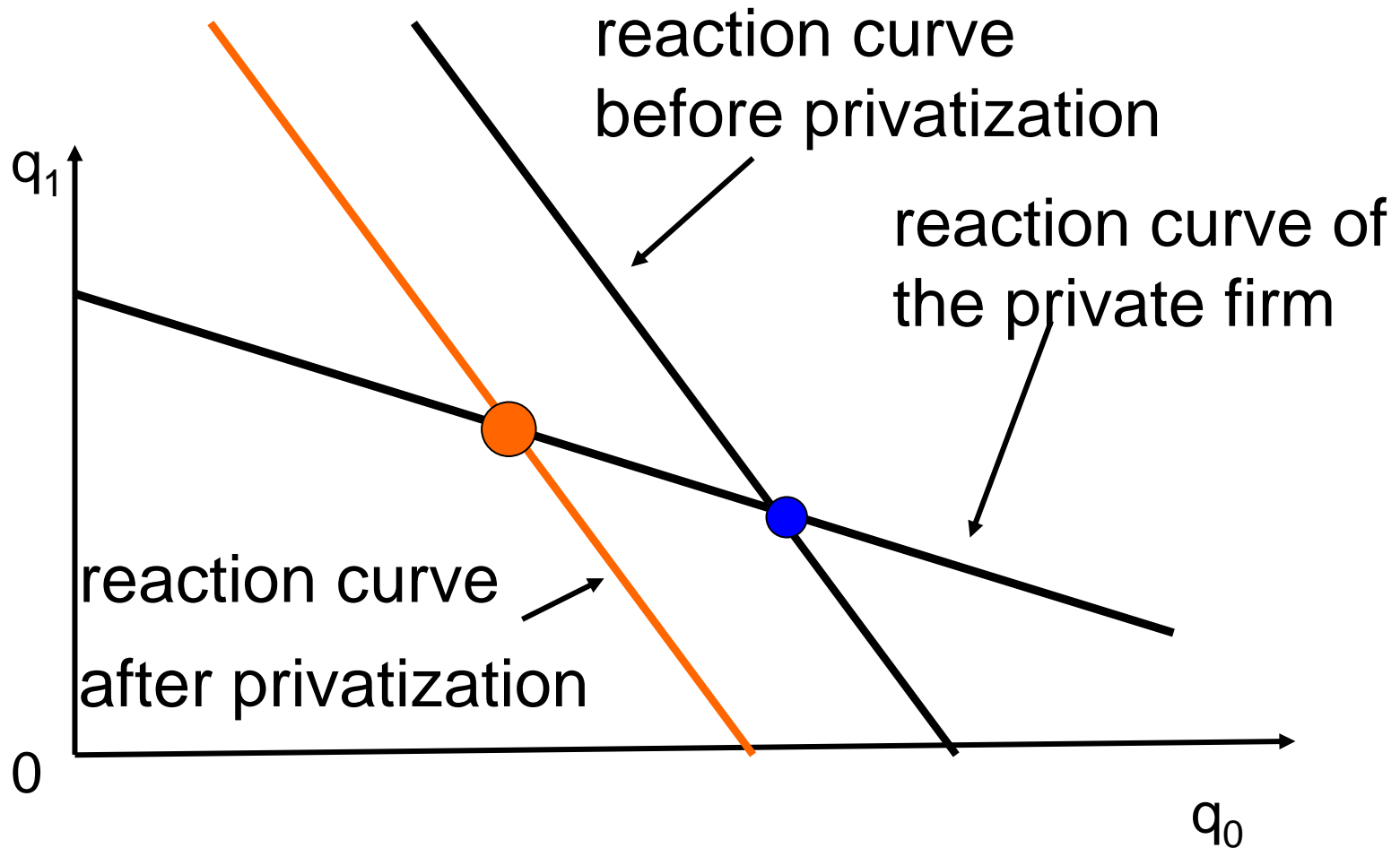
(2) Privatization increases each private firm's output q_1
→ production substitution from the public firm to the private firms.

(3) Privatization decreases total output $q_0 + nq_1$

Effects (1) and (3) reduce welfare and effect (2) improves welfare. Effect (2) may be the strongest, leading to an improvement of welfare.

(2) is stronger and (3) is weaker when m is larger
→ Privatization more likely improves welfare when n is larger.

Production substitution



More detailed explanation of intuition

Privatization of the public firm reduces q_0 and increases q_1 (production substitution).

Before Privatization $p = c_0' > c_1'$

→ Public firm's marginal cost is higher than private firm's

→ Production substitution from public to private economizes production costs → **Welfare-improving**

→ Privatization reduces total production level and so consumer surplus → **Welfare-reducing**

It is possible that the former effect dominates the latter effect.

Contribution of De Fraja and Delbono(1989)

(1) No cost difference between public and private firms
→ privatization does not improve production efficiency

(2) Public firm's objection is welfare → No agency problem in the public firm

(3) No additional policies by regulation, tax, or subsidy after privatization.

⇒ Ideal circumstances for the existence of public firm.

Against assumptions for the advocators of privatizations. → Nevertheless, privatization might improve welfare

Why quadratic costs ?

Constant marginal cost yields problems

If marginal costs are constant and no cost differences exists, the public firm's monopoly yields the first best.

→ It is nonsense to discuss mixed oligopoly in such a circumstance.

How to avoid this problem?

- (1) Using constant marginal costs and assuming cost differences between public and private firms.
Mujumdar and Pal (1998), Pal (1998), Matsumura (2003a), Matsumura and Ogawa (2010)

How to avoid this problem?

(2) Using increasing marginal costs. De Fraja and Delbono (1989), Fjell and Pal (1996), White (1996), Matsumura and Kanda (2005), Heywood and Ye (2009a), Wang et al. (2009).

If there is no cost difference between public and private firms, at the first best all firms choose the same output level. It is not always achieved in mixed oligopoly since public and private firms have different objectives.

How to avoid this problem?

(3) Dropping the assumption of homogenous goods.

Monopolistic competition: Anderson et al. (1997),
Matsumura et al. (2009)

Linear demand (quadratic utility function) with product differentiation: Fujiwara (2007), Matsumura and Ogawa (2012)

Mill pricing location model: Cremer et al. (1992),
Matsumura and Matsushima (2003,2004), Inoue et al. (2008),

Delivered pricing location model: Matsushima and Matsumura (2003,2006), Heywood and Ye (2009b)

Partial Privatization

De Fraja and Delbono: The public sector holds whole shares in the firm (nationalization) or the private sector holds whole shares in the firm (privatization)

In the real world, we observe many firms with mixture ownership (partial privatization)

JP, Postal Bank, Kampo, NTT, JT, Iwate Bank, TEPCO, VW, Renault

Matsumura (1998)

- (1) Cournot-type (quantity-setting competition, simultaneous-move, no product differentiation)
- (2) No restrictions on the cost differences between public and private firms.
- (3) The objective function of the public firm is the weight sum of social welfare and its own profits.

(Partial Privatization)

$$U_0 = (1-\alpha) W + \alpha \pi_0$$

- (4) General demand and general costs.

The government chooses α . After observing α , firms compete in the product market.

Results

$\alpha = 0$ is optimal only if it yields public monopoly.
→ If we allow partial privatization, no privatization (full nationalization) never becomes optimal.

Partial Privatization

Free Entry: Matsumura and Kanda (2005), Wang et al. (2010), Cato and Matsumura (2012)

Product Differentiation: Fujiwara (2007)

Spatial Model: Lu and Poddar (2007)

Environmental Policy: Kato (2006), Ohori (2006)

Anti-Trust: Barcena-Ruiz and Garzon (2003)

Labour Market: Beladi and Chao (2006)

Subsidization: Tomaru (2006)

Endogenous Timing: Matsumura and Ogawa (2010), Barcena-Ruiz and Garzon (2010)

Foreign Penetration: Han and Ogawa (2008), Lin and Matsumura (2012)

Optimal Degree of Privatization

If we adopt partial privatization approach, we can investigate the optimal degree of privatization (optimal θ). Optimal degree of privatization depends on

(i) the number of private firms

(ii) the degree of foreign penetration in the product market and financial market (potential buyers of privatized firms) Lin and Matsumura (forthcoming)

(iii) cost difference between public and private firms

(iv) existence of other policy instruments such as tax-subsidy policy and shadow cost of public funding

(vi) Competition structure (free entry, role of public firm and so on)

The Relationship between Competition and Optimal Privatization Policy

De Fraja and Delbono (1988)

Privatization more likely improves welfare when the number of private firms is larger.

Matsumura and Shimizu (2010)

~Multiple public firm version.

Privatization is more likely to improve welfare when competition is severer.

The Relationship between Competition and Optimal Degree of Privatization

Lin and Matsumura (2012)

The optimal degree of privatization is increasing in the number of the firms regardless of the nationality of privatization.

The severer competition is, the higher the optimal degree of privatization.

Market Concentration Index and Optimal Degree of Privatization

An increase in the number of firms reduces the market concentration index such as HHI.

The existing works mentioned above suggests the higher HHI is, the more the government should privatize the public firm.

However, the market competition index depends on the asymmetry among firms, too.

We should investigate the relationship between the degree of asymmetry among firms and the optimal privatization policy to know how market competition index affects optimal privatization policy.

(1) Optimal Privatization Policy with Asymmetry among Private Firms

Joint work with Junichi Haraguchi

Model

Triopoly model ~ one public (firm 0) and two private firms (firms 1 and 2).

→ **The simplest model** allowing cost difference among private firms.

The same demand and cost functions as in De Fraja and Delbono (1988).

Partial privatization approach (Matsumura, 1998)

~The public firm maximizes

$\alpha(\text{its own profits}) + (1 - \alpha)\text{welfare}$,

each private firm maximizes its own profits.

Cost Function

Each factory has the following cost structure:

F : set-up cost,

$kq^2/2$: the variable cost, where q is the output produced at this factory and k is a positive constant.

If a firm i holds m_i factories, it allocates production evenly among the factories to minimize variable costs.

Thus, its total cost becomes

$$c_i(q_i) = (k/(2m_i))q_i^2 + m_i F.$$

An increase in m_i increases the firm's set-up cost and reduces its variable (and marginal) cost.

Cost Asymmetry

$$m_i = 1, m_1 + m_2 = m, m_1 \geq m_2 \quad (m \geq m_1 \geq m/2)$$

Firm 1's marginal cost is larger than or equal to firm 2'.

The degree of cost asymmetry is increasing in m_1

Time Line

In the first stage, the government chooses α to maximize welfare.

In the second stage, given α , three firms face Cournot competition.

How Cost Asymmetry Affects the Outputs in the Second Stage Game

Proposition 1.

(i) q_0^* is increasing in m_1 .

(ii) q_1^* is increasing in m_1 .

(iii) q_2^* is decreasing in m_2

(iv) $q_1^* + q_2^*$ is decreasing in m_1

(v) Q^* (total output) is decreasing in m_1 .

(iv) and (v) suggest that market concentration index appropriately reflect the degree of market competition.

How Cost Asymmetry Affects the Price-Cost Margin in the Second Stage Game

Lemma 1.

- (i) $p^* - c_0'(q_0^*)$ is nondecreasing in m_1 and increasing in m_1 for $\alpha > 0$.
- (ii) $p^* - c_1'(q_1^*)$ is increasing in m_1 .
- (iii) $p^* - c_2'(q_2^*)$ is decreasing in m_1 .

Main Result: How Cost Asymmetry Affects the Optimal Degree of Privatization

Proposition 2.

(i) If $m < ((17)^{0.5}+1)k/4$, then α^* is increasing in m_1 .

→ The more the market is competitive, the lower the optimal degree of privatization is.

(ii) $m > ((17)^{0.5}+1)k/4$, then the relationship between m_1 and α^* is nonmonotone. When m_1 is close to $m/2$ (m), α^* is decreasing (increasing) in m_1 .

→ U-shaped

Production Substitution Effect and Total Output Effect

An increase in α reduces q_0 and increases q_1 and q_2
→ Welfare-improving production substitution from public firm to private firms.

An increase in α reduces total output
→ Welfare reducing total output effect.

Total Output Effect

An increase in m_1 strengthens total output effect because total output is decreasing in m_1 .

If only total output effect matters, α^* is increasing in m_1 .

Production Substitution Effect

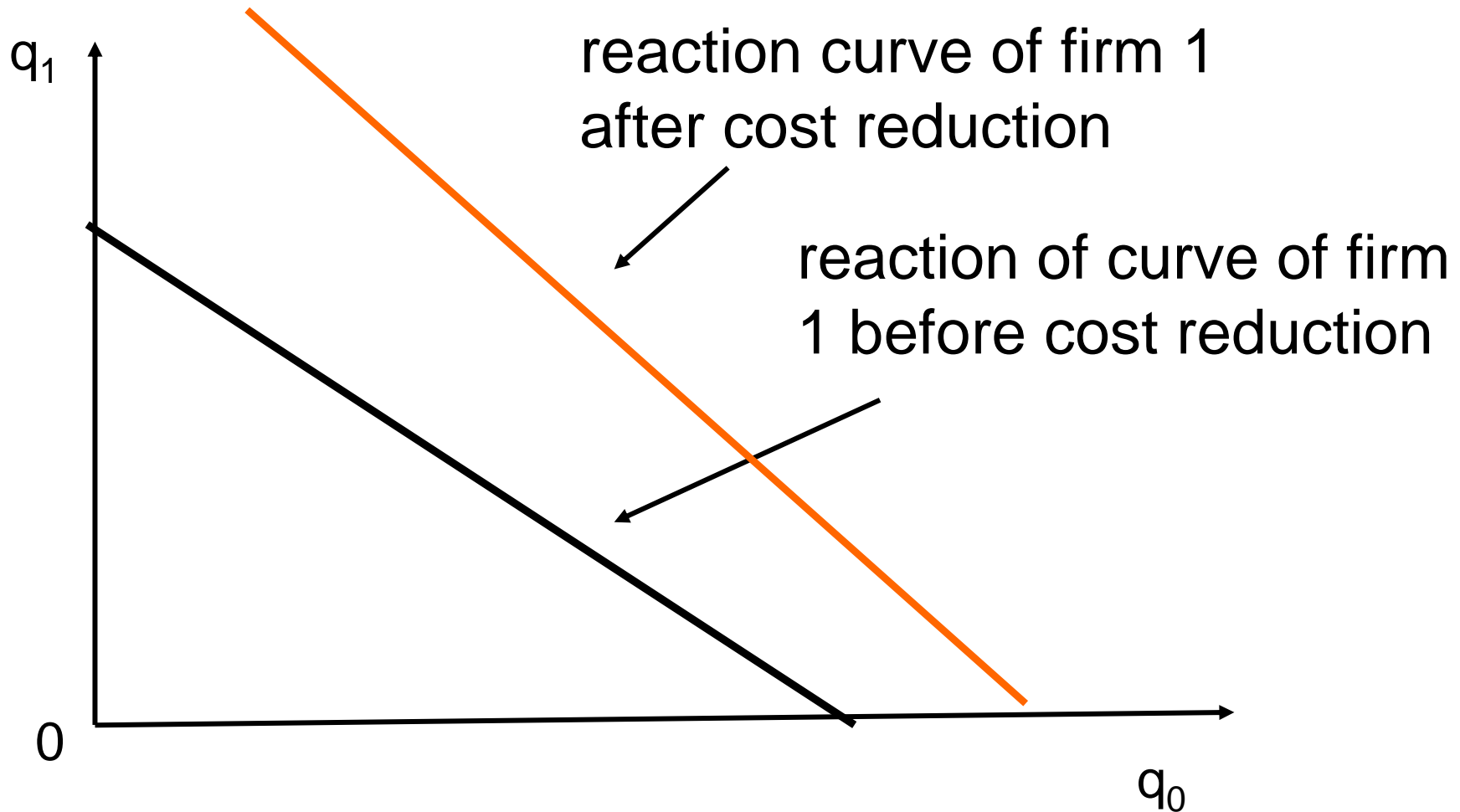
Lemma 1 states that an increase in m_1 increases the price-cost margin in firm 1 and reduces it in firm.

Therefore, production substitution from firm 0 to firm 1 (firm 2) is more (less) important as m_1 increases.

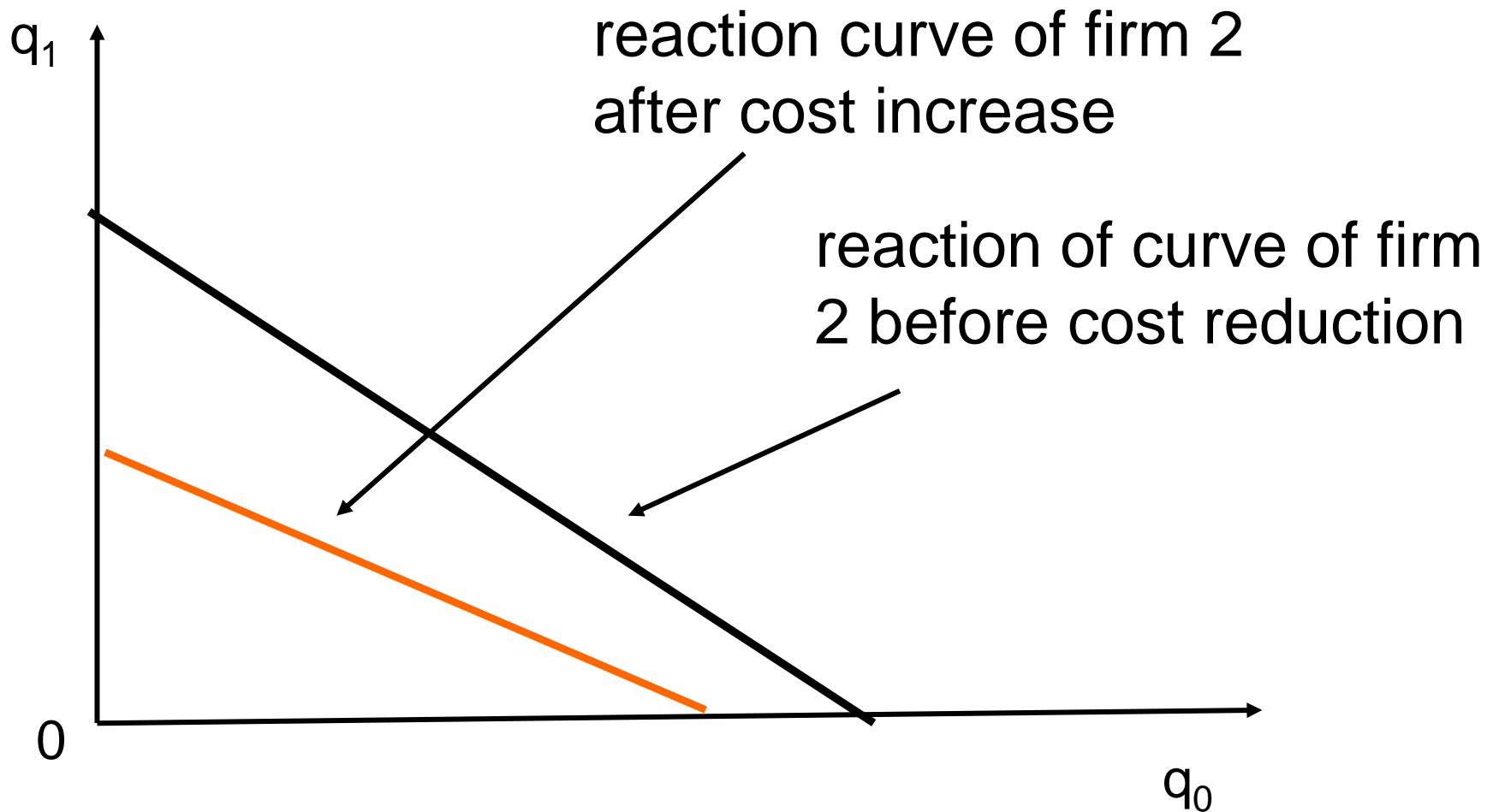
An increase in m_1 strengthens one production substitution effect ($q_0 \rightarrow q_1$) and weakens the other production substitution effect ($q_0 \rightarrow q_2$) because the slope of the reaction curve is more (less) steep as m_1 increases, and an increase in α more (less) significantly affects firm 1's (firm 2's) output.

If only production substitution effect matters, α^* is decreasing in m_1 .

Shift of Reaction Curve under Increasing Marginal Costs



Shift of Reaction Curve under Increasing Marginal Costs



Two Effects

m is small \rightarrow the marginal cost of the industry is high
 \rightarrow optimal output level is low. \Rightarrow total output effect is weak (welfare loss caused by insufficient production is small). \Rightarrow Production substitution effect more likely dominates total output effect. (Proposition 2(i))

m_1 close to m \sim firm 2 is not active. An increase in m_1 makes the firm 1's reaction curve less stepper, and thus, total output effect becomes weak because the increase of firm 1's production compensates the decreases of firm 0' production (Proposition 2(ii)).

How the Number of Factories Affects the Optimal Degree of Privatization

Proposition 3.

(i) Suppose that $m_1 = m_2 = m/2$.

Then α^* is increasing in m .

The more efficient private firms are, the higher the optimal degree of privatization is

Summary

Optimal degree of privatization can be increasing in the degree of asymmetry among private firms.

Therefore, the relationship between the degree of market competition index and the optimal privatization is much more complicated than what the existing works suggests.

(2) Firms' Costs, Profits, Entries, and Innovation under Optimal Privatization Policy

Joint work with Junichi Haraguchi

Difference between the First and the Second Studies

The first study uses the approach (2) in slide 24 (increasing marginal cost). The second study uses the approach (1) in slide 23 (constant marginal cost with cost difference between public and private firms).

Robustness Check of the First Study

We guess (wish ?) that the results of our first study are robust in the model with constant marginal costs.

(Of course, if this guess were true, we would not write the second paper.)

~ **Unfortunately(?)**, our guess is not correct.

The Optimal Degree of Privatization and Cost Asymmetry among Private Firms

Optimal degree of privatization depends on the marginal cost of the public firm (c_0), the number of private firms (n) and total marginal cost of the private firms ($c_1 + c_2 + \dots + c_n$) → The cost level matters but the cost asymmetries among the private firms does not matter for the optimal degree of privatization.

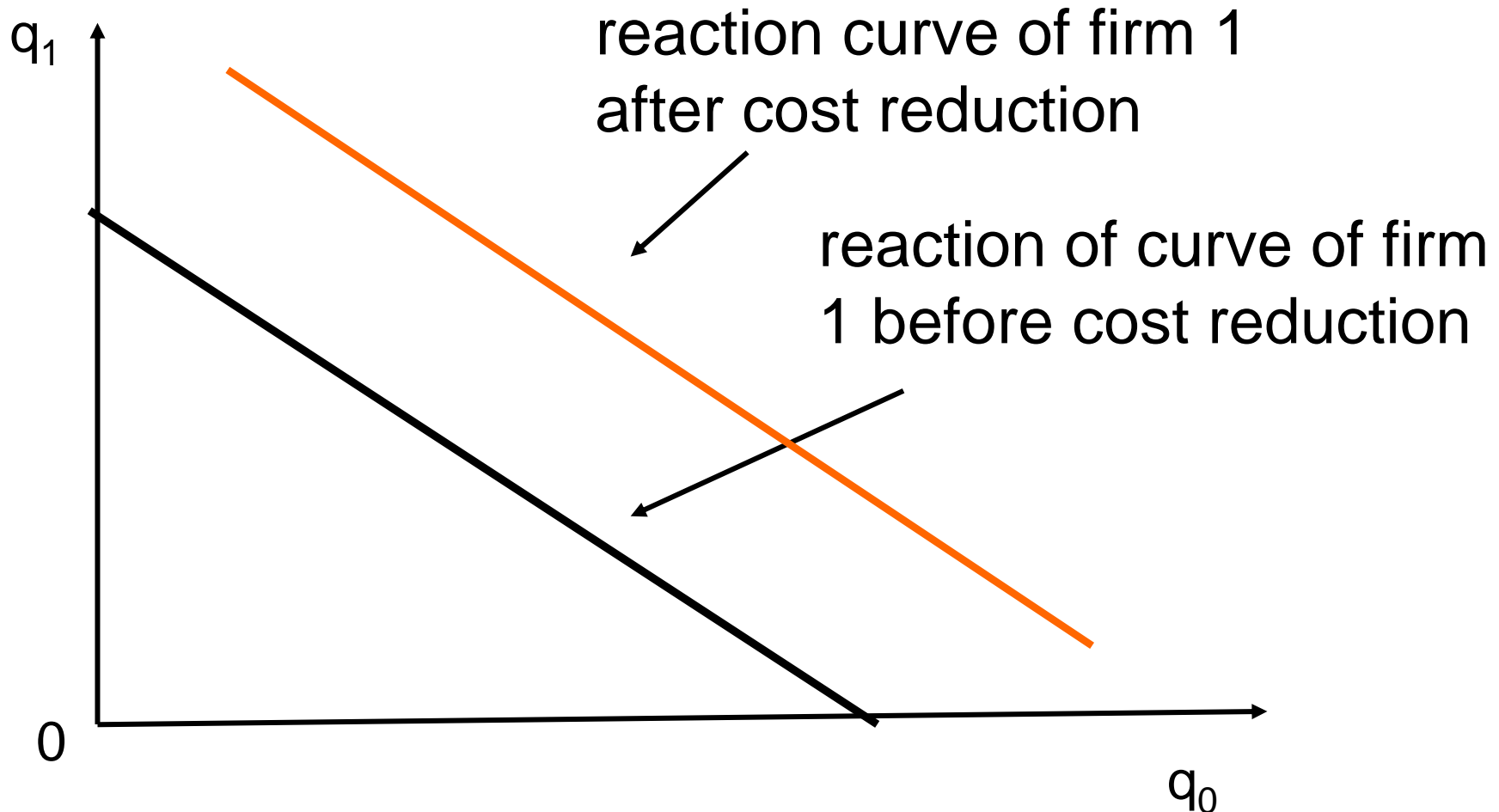
Contrasting implication to the literature but different implication from the first study.

The Difference between Approaches 1 and 2.

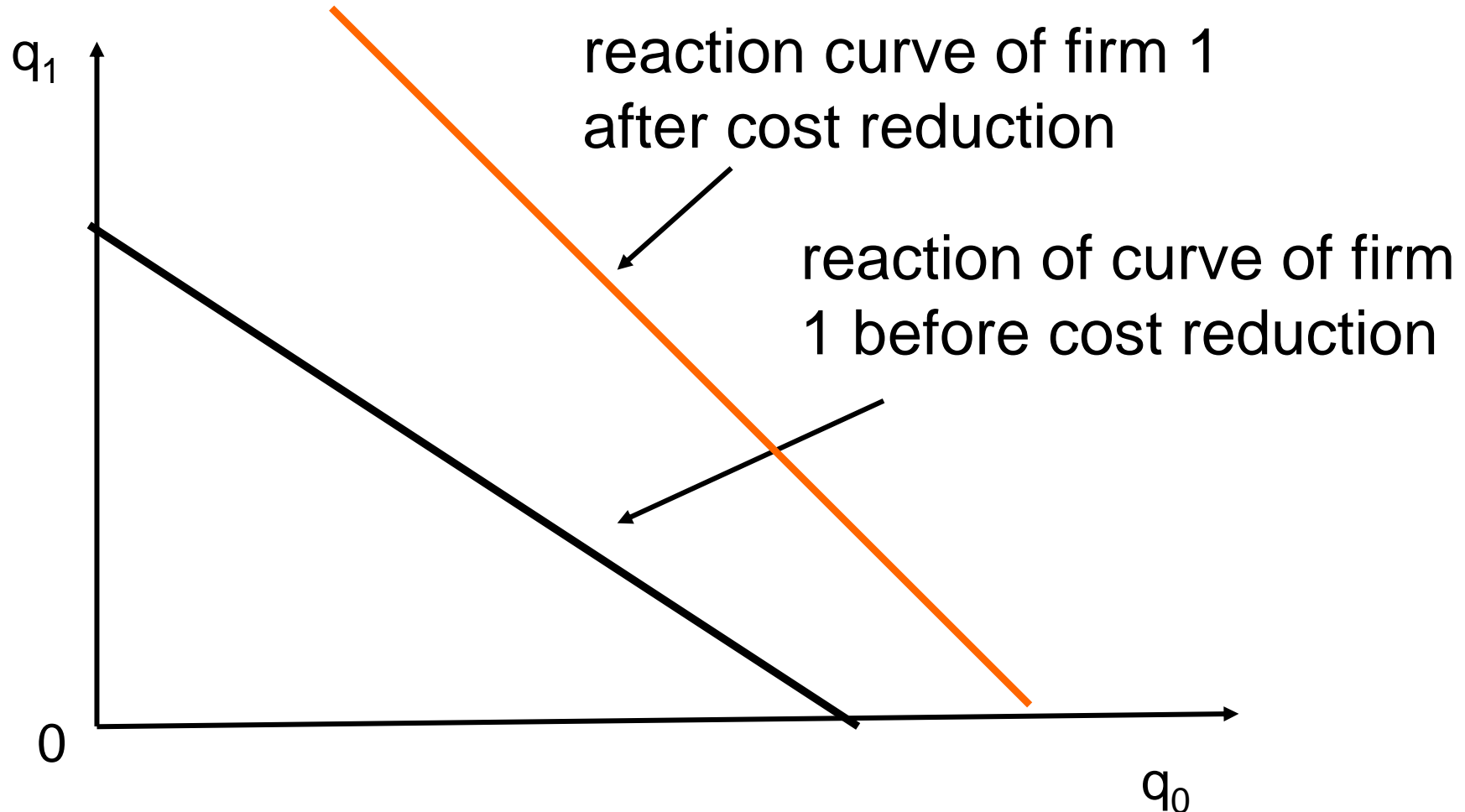
In the increasing marginal cost case, the cost allocation affects the slopes of the reaction curves of private firms. → The cost allocation affects the strength of production substitution effect.

In the constant marginal cost case, this effect disappears.

Shift of Reaction Curve under Constant Marginal Costs



Shift of Reaction Curve under Increasing Marginal Costs



Motivation

Optimal degree of privatization is decreasing in $(c_1 + c_2 + \dots + c_n)$, which increases each private firm's profit.

→ This result must be interesting in many contexts

If we assume $c_1 = c_2 = \dots = c_n = c$ and execute comparative statistics with respect to c , we cannot distinguish the effect by the change of its own cost and by the change of its rival's cost. If we allow the cost difference among private firms, we can distinguish these two effects and can derive many interesting implications.

The Basic Model

Oligopoly model ~ one public (firm 0) and n private firms (firms 1,2,...,n).

The same demand function as in De Fraja and Delbono (1988).

Partial Privatization Approach (Matsumura, 1998)

~The public firm maximizes $\alpha(\text{its own profits}) + (1 - \alpha)\text{welfare}$, each private firm maximizes its own profits.

Constant marginal cost with cost disadvantage of the public firm ($c_0 < c_i$ for $i=1,2,\dots,n$.)

Time Line

We compare the following two cases.

Endogenous α

In the first stage, the government chooses α to maximize welfare.

In the second stage, given α , all firms face Cournot competition.

Exogenous α

α is given exogenously and firms face Cournot competition.

How Costs Affect the Firms' Profits

Proposition 1 (endogenous α case).

If $\alpha^* < 1$, private firm i 's profit is decreasing in c_j for $i, j=1,2,\dots,n$ and increasing in c_0

Private firm i 's profit is decreasing in its own cost
→obvious (common result in private and mixed oligopolies).

Private firm i 's profit is increasing in the public firm's cost →obvious.

Private firm i 's profit is decreasing in its rivals' costs
→New Result (Our main result)

How Costs Affect the Firms' Profits (Exogenous α)

Proposition 2 (exogenous α case).

Suppose that the degree of privatization α is given exogenously.

- (i) Private firm i 's profit is decreasing in c_i and increasing in c_0 .
- (ii) Private firm i 's profit is nondecreasing in c_j for $i=1,2,\dots,n$, $j=1,\dots,n$ and $j \neq i$.
- (iii) If $\alpha > 0$, private firm i 's profit is increasing in c_j for $i=1,2,\dots,n$, $j=1,\dots,n$ and $j \neq i$.

**Private firm i 's profit is increasing in its rivals' costs \rightarrow
(An obvious and common result in private oligopolies)**

Intuition behind Proposition 1

A decrease in a private firm's cost increase α .
→ It is beneficial for all private firms.

How A New Entry Affects the Optimal Degree of Privatization and Profits of Private Firms

Proposition 3 (endogenous α case).

Suppose that $\alpha^* < 1$. The new entry of a private firm increases α^* .

Proposition 4 (endogenous α case).

Suppose that $\alpha^* < 1$ even after the entry of firm $n+1$.

Then, the entry of firm $n+1$ increases the profits of all incumbent private firms (firm 1,2,...,n).

How A New Entry Affects Profits of Private Firms (Exogenous α)

Lemma 2 (exogenous α case).

Suppose that α is given exogenously.

The new entry of a private firm reduces the profits of all incumbent private firms.

Free Entry Model without Cost Asymmetry among Private Firms

In the first stage, each private firm chooses whether to enter the market. ($c_1 = c_2 = \dots = c_n = c$). n is determined by zero profit condition. The entry cost is F .

In the second stage, the government chooses α to maximize welfare.

In the third stage, given α , all firms face Cournot competition.

~ Entry-then-privatization model. (Lee, Matsumura, and Sato, 2018)

Optimal Degree of Privatization in Free Entry Markets

Proposition 5.

If $n > 0$, at the locally stable equilibrium $\alpha^* = 1$.

If $\alpha^* < 1$, each private firm's profit is increasing in n .
→ This is never stable.

Corollary: In equilibrium $n = 0$ or $\alpha^* = 1$.

But this is true only in the entry-then privatization model with constant marginal costs.

R&D with Spillover

Endogenous cost structure

$$c_i(x_i; x_j) = C - (x_i + \beta \sum_{j \neq i} x_j) \quad (i, j = 1, 2, \dots, n, i \neq j)$$

C: positive constant

x_i : Firm i 's cost reducing R&D investment

Time Line

(Endogenous α)

In the first stage, each private firm i chooses x_i independently. All firms are symmetric ex ante.

In the second stage, the government chooses α to maximize welfare. In the third stage, given α , all firms face Cournot competition.

(Exogenous α)

α is given exogenously. In the first stage, each private firm i chooses x_i independently. All firms are symmetric ex ante. In the second stage, all firms face Cournot competition.

Equilibrium R&D

$x^*(\alpha)$: The equilibrium R&D level when α is given exogenously.

x^* : The equilibrium R&D level when α is endogenous.

Results

Proposition 6.

Suppose that $\alpha^* < 1$.

(i) $x^*(\alpha) < x^*$

(ii) x^* is increasing in β , whereas $x^*(\alpha)$ is decreasing in β .

(iii) x^* is increasing in n , $x^*(\alpha)$ is decreasing in n .

Intuition

When α is endogenous, each private firm has an incentive to reduce private rivals' costs to increase the degree of privatization, which is beneficial for all private firms.

→ Private firms more intensively engage in R&D when α is endogenous.

Caution: We assume that the public firm's cost is given exogenously. If the spillover effect reduces the public firm's cost, Proposition 6 does not hold. A decrease in c_0 reduces the profits of all private firms, and thus, each private firm has a weaker incentive for innovation when the spillover effect is stronger.

Summary

- (1) Strategic behavior of the private firm to stimulate privatization yields several counterintuitive results that does not appear in private oligopolies.
- (2) Constant marginal cost model may yield quite different results from that with increasing marginal costs in mixed oligopolies.

Criticism

Two reports say ``This paper is consist of three unrelated (slightly related) notes. These should be not discussed in the single paper.” →rejected.

Surprisingly, both referees and an editor recommended us to produces several salami papers.
→We decide to make two notes.

(a) Multiple Long-Run Equilibria in a Free-Entry Mixed Oligopoly ⇒ Revised version is forthcoming in Economic Modelling.

(b) Hidden Protectionism by State Enterprises ~ これから話す論文

~ We now recognize that the recommendation of referees are appropriate.

(3) Hidden Protectionism by State Enterprises

Joint work with Junichi Haraguchi

Model

Triopoly model ~ one domestic public firm (firm 0) and two private firms (firms 1 and 2).

The same demand function as in De Fraja and Delbono (1988). → linear demand

Constant marginal costs with cost disadvantage of firm 0.

Partial Privatization Approach (Matsumura, 1998)

~The public firm maximizes α (its own profits) + $(1 - \alpha)$ welfare, each private firm maximizes its own profits.

The foreign ownership share in private firm i ($i=1,2$) is θ_i

Model 1 (exogenous foreign ownership share in private firms)

In the first stage, firm i chooses whether it transfers its knowhow to firm j ($i=1,2, j \neq i$) that reduces firm j 's marginal cost.

In the second stage, the government chooses α to maximize domestic welfare.

In the third stage, firms face Cournot competition.

Lemma 1: second stage game

The equilibrium degree of privatization policy is partial privatization if and only if $c_0 < \mathbf{c}_0(c_1, c_2, \theta_1, \theta_2)$.

The equilibrium degree of privatization is decreasing in c_i if and only if $\theta_i < \theta_i(c_1, c_2, \theta_j)$, .

Proposition 2

Suppose that $c_0 < \mathbf{c}_0(c_1, c_2, \theta_1, \theta_2)$. The equilibrium profit of firm i is decreasing in c_j ($i=1,2, j \neq i$) if and only if $\theta_j < 1/2$.

The domestic firm absorbs foreign firm's technology but the foreign firm does not.

~Hidden industrial policy that enhances the competitive advantage of domestic firm.

Model 2 (endogenous foreign ownership share in a private firm)

θ_1 is given exogenously.

In the first stage, firm 2 chooses θ_2 .

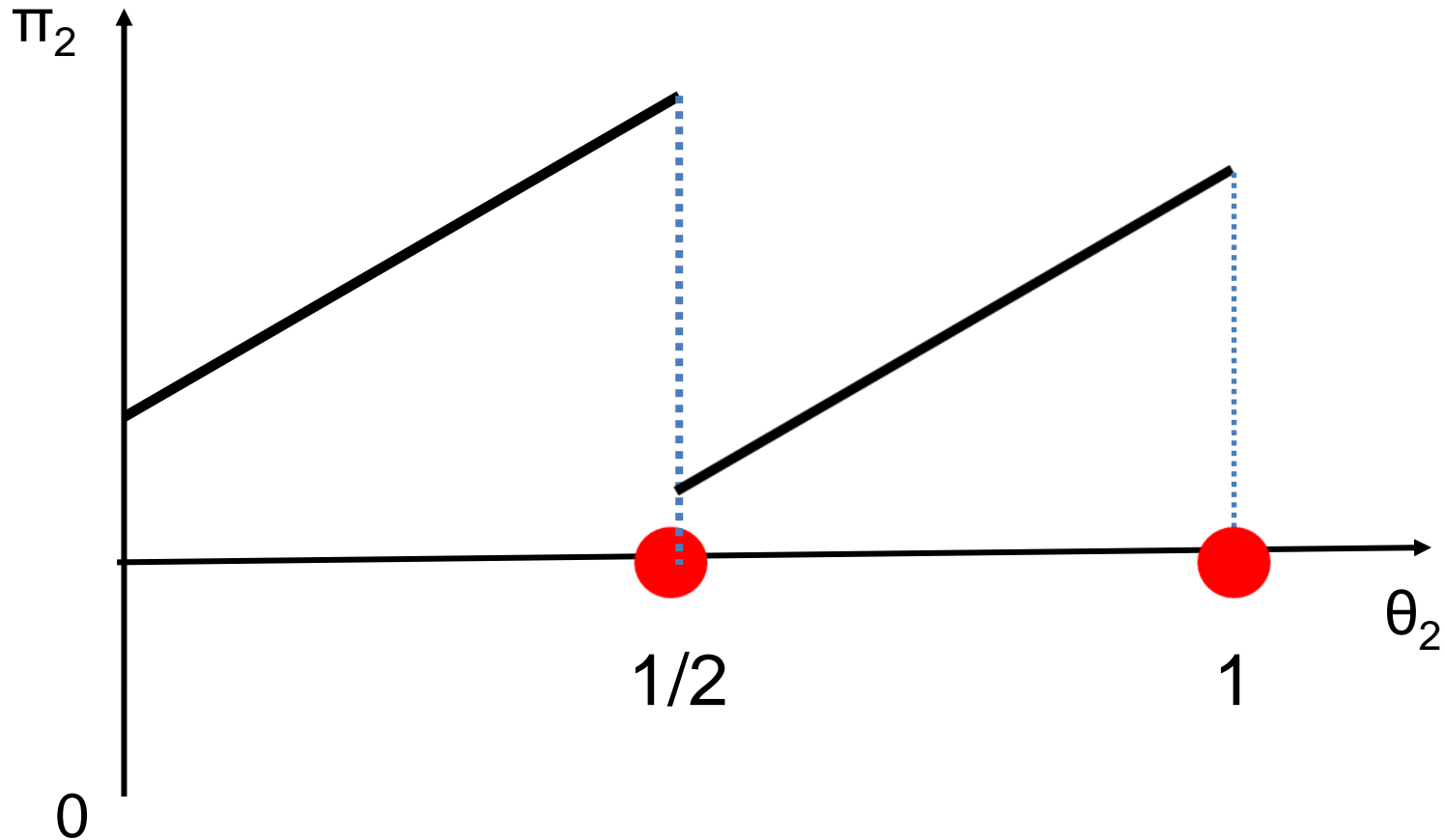
In the second stage, firm 1 chooses whether it transfers its knowhow to firm 2 that reduces firm 2's marginal cost.

In the third stage, the government chooses α to maximize domestic welfare.

In the fourth stage, firms face Cournot competition.

Firm 2's cost is decreasing in θ_2 . $\partial c_2 / \partial \theta_2 = -k$

Optimal Foreign Ownership Share



Proposition 4

Firm 2 chooses $\theta_2=1$ or $\theta_2=1/2$ and it chooses $\theta_2=1$ only if k is sufficiently large .

Firms 2 may reduce foreign ownership share in order to promote mutually beneficial cooperation, not unilateral technology transfer.

Model 3 (Licensing)

$\theta_1 = 0$. θ_2 is given exogenously.

In the first stage, firm 2 names the royalty r .

In the second stage, firm 1 chooses whether or not to accept the offer. In the third stage, the government chooses α to maximize domestic welfare.

In the fourth stage, firms face Cournot competition.

Proposition 5

Firm 2 chooses $r=0$ if θ_2 is sufficiently large.

A lower cost of firm 1 leads to higher degree of privatization, which in turn increases firm 2's profit.

**Thank you very much for your kind
attention!!**

非常感謝!!