Oligopoly Theory (3) Optimal Privatization Policies in Mixed Oligopolies under Quantity Competition

Aim of this lecture

- (1) To understand the reason why welfaremaximizing behavior may harm welfare
- (2) To understand the ideas of partial privatization approach and optimal degree of privatization.

Outline of the Third Lecture

- 3-1 Overview of Mixed Oligopolies
- 3-2 Welfare-Improving Privatizations
- **3-3 Partial Privatization Approach**
- 3-4 Optimal Degree of Privatization
- 3-5 Foreign Penetration and The optimal Degree of Privatization

Mixed Oligopolies, Mixed Markets

State-owned public firms compete against private firms

Examples of mixed oligopoly in Japan

Banking: Postal Bank, DBJ, Iwate Bank Housing Loan: the Public House Loan Corporation Private Funds: DBJ, Industrial Revitalization Corporation of Japan Life Insurance: Postal Life Insurance (Kampo) **Overnight Delivery: Japan** Post Energy: Public Gas Corps (Narashino, Fukui,...) **Broadcasting: NHK**

Examples of mixed oligopoly 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)



Classical discussions on stateowned public firms

 \rightarrow 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.
- \rightarrow This is the central issue of mixed oligopoly

Issues of mixed oligopoly

- Is welfare-maximizing behavior by the public firm desirable in mixed oligopoly ?
- What distortion does welfare-maximizing behavior by the public firm yield ?

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.
- \rightarrow 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)

 \rightarrow 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 are large.

Intuition

- (1) Privatization of the public firm reduces public firm's output q_0
- (2) Privatization increases each private firm's output $q_1 \rightarrow$ 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 \rightarrow Privatization morel 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=c₀' >c₁'
- →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
- \rightarrow privatization does not improve production efficiency (2) Public firm's objection: welfare \rightarrow No agency problem in the public firm
- (3) No additional policies by regulation, tax, or subsidy after privatization.
- \Rightarrow Ideal circumstances for the existence of public firm. Against assumptions for the advocators of privatizations. \rightarrow Nevertheless, privatization might improve welfare

Assumptions of De Fraja and Delbono(1989)

Many researchers in this field believe that the assumptions above are plausible, but many other researchers (as well as I) make these assumptions for strategic purposes.

(1) Even without cost differences, privatization improves welfare.

 \rightarrow If public firm is less efficient, much more.

(2) Even without any agency problem in the public firm, privatization improves welfare.

 \rightarrow If public firm has agency problem, much more.

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.
- \rightarrow It is nonsense to discuss mixed oligopolies in such a circumstance.

- (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)
- First best is achieved by the marginal cost pricing of the private firm.
- The private leadership yields the second best where only private firms produce and the price is equal to the marginal cost of the public firm.
- It is the equilibrium in the observable delay game.

(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.

(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), Haraguchi and Matsumura (2014,2016)

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) Oligopoly Theory

- More general Costs : Matsumura (1998, 2003b), Kiyono and Tomaru (2013)
- Discuss both (1) and (2): Matsumura and Okamura (2015).
- Discuss both (2) and (3): Matsumura and Shimizu (2010)

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)

NTT, JT, JP, Iwate Bank, Hokuriku Electric Power Company, 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)

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

(4) General demand and general costs.

The government chooses s and s affects θ . After observing θ firms compete in the product market.

Results

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

Intuition

(1) Suppose that $\theta = 0$. A slight increase of θ from 0 reduces public firm's output q_{0} . Since $p=c_0$, when $\theta = 0$, this effect is negligible (second order) — envelope theorem (2) An increasing in θ increases private firm's output q_1 . Since $p>c_1$, this effect is nonnegligible (first order) \Rightarrow (2) dominates (1).

Partial Privatization

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

Optimal degree of privatization

- If we adopt partial privatization approach, we can investigate the optimal degree of privatization (optimal degree of θ .
- Optimal degree of privatization depends on
- (i) the number of private firms
- (ii) the degree of foreign penetration
- (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)

Optimal degree of privatization

Suppose that firms face Cournot competition. Optimal degree of privatization is increasing in the number of private firms. (Han and Ogawa, 2007, Lin and Matsumura, 2012, Matsumura and Okamura, 2015). It is decreasing in the foreign penetration in product markets in the short run (Han and Ogawa, 2007, Lin and Matsumura, 2012), and the result is inversed in the long run (free entry markets). The latter result is robust because it does not depend on the strategic substitutability in product markets (Cato and Matsumura, 2013).

Foreign Competitors

Public firm maximizes domestic welfare

- →The public firm's behavior is dependent on whether its rivals are domestic or foreign. If the rivals are foreign, the public firm becomes more aggressive. Fjell and Pal (1996)←De Fraja and Delbono (1989) Pal and White (1998) ← Strategic Trade Policy Mukherjee and Suetrong (2009) ← FDI Chang (2005), Chao and Yu (2006) ← partial
- privatization version
- Cato and Matsumura (2015) \leftarrow Strategic Trade Policy at Free Entry Markets.
- Foreign penetration in privatized firms.←Lin and Matsumura (2013)

Optimal degree of privatization and foreign ownership share in private firms

The foreign ownership share in private firms is larger, a lower price benefits for domestic welfare more. An increase in θ reduces the total output (welfare loss) and induces welfare-improving production substitution. Welfare loss effect becomes more significant \rightarrow The optimal degree of privatization is decreasing in the foreign ownership share in private firms.

Optimal degree of privatization and foreign ownership share in privatized firms ~ Lin and Matsumura (2012)

The foreign ownership share in the privatized firm is larger, the privatized firm becomes more aggressive after privatization. Expecting this aggressive behavior, the stock price of the former public firm falls, resulting in a welfare loss. Thus, the government chooses a larger degree of privatization sells more when foreign ownership in the privatized firm is larger.

 \rightarrow The optimal degree of privatization is decreasing in the expected foreign ownership share in privatized firm.

Assumptions of single public firm

Most existing works consider models with single public firm.

If this single public firm is privatized, the market becomes pure market economy.

Assumptions of single public firm

Considering desirable reform of the economic system in former communist transitional countries, this is not a plausible assumption. In reality numerous public firms exist in such countries and it is politically impossible to privatize all of the public firms at the same time. Considering large scale privatization program in traditional mixed economies, one privatization does not yield pure market economy (because substantial public firms remain after the privatization of several firms). \rightarrow Existing works cannot analyze these markets effectively.

Examples of economies with multiple public firms

- (1) Former communist transitional countries
- (examples) Russia, Many of Eastern and Central European countries, China, Vietnam, Mongolia...
- (2) Developing, recently developed, and emerging countries
- (examples) Brazil, India, Iran, Indonesia, Thailand, Korea, Taiwan...

Examples of economies with multiple public firms

- (3) Successful privatization programs in developed countries
- (examples) UK, Japan, Germany, Australia, NZ
- (4) Traditional mixed economies in developed countries
- (examples) Japan, France, Germany, Korea

Why did existing works consider models with single public firm?

- If no cost difference between public and private firms exists, obviously N = m yields the first best outcome.
- →Full nationalization of the economy (complete communist economy) yields the first best.
- \rightarrow It is nonsense to discuss mixed oligopoly under such assumptions.
- But the result (complete communist economy yields the first best) is so unrealistic and implausible.

The assumption of no cost difference between public and private firms

- (1) Strategic assumption. (Even if no cost difference, privatization can improve welfare.)
- \rightarrow Much more if cost difference exits.
- (2) Realistic assumption. (In mixed market, the public firm faces tough competition with private firms. If the public firm is extremely less efficient than private firms, it would not be able to survive.)

The assumption of no cost difference between public and private firms

- If m = N (pure planned economy), no competitive pressure exists and the assumption of no cost difference is not plausible.
- →Restricting attentions to single public firm and avoiding the nonsense result that the first best is achieved by pure nationalized economy.

Approach of Matsumura and Shimizu (2010)

- Suppose that the economy has 100 firms and 25 of them are public firms.
- Then the number of public firms becomes 24,23,22,... by privatization.
- What happens in the process of this privatization?
- We believe that it is worth discussing this problem.
- We dare to deviate from the traditional single public firm model.

Matsumura and Shimizu (2010)

- m state-owned public firms compete against N-m private firms. N firms face Cournot competition.
- Each public firm maximizes welfare, while each private firm maximizes its own profits.
- Quadratic costs:
- $C = 0.5\theta(q_i)^2 + K$ (public firm),
- $C = 0.5\beta(q_i)^2 + K$ (private firm), $\theta \ge \beta$

Main concerns: Relationship between m and welfare.

Result 1

- (1) W(m) is decreasing if the public firms are significantly less efficient than the private firms.(W is total social surplus, consumer surplus + profits of firms. m is the number of public firms)
- If public firms are sufficiently less efficient than the private firms, privatization improves welfare regardless of m and N



Result 2

(2) W(m) is increasing if the cost difference between public firms and private firms is sufficiently small and the total number of firms N is small.

The government should improve the competitiveness of the market before privatizing the public firms.



Result 3

(3) W(m) is U-shaped if the cost difference between public firms and private firms are sufficiently small and N (the total number of firms) is large.

This is the most interesting case





Larger scale privatization programs eventually more likely end up with great success



Welfare-gains of privatizations is accelerating



Intuition

- Suppose that m public firms and N m private firms exist. Suppose that one public firm is privatized.
- →Production substitutions from the privatized firm to m - 1 public firm and to N - m private firms take place.
- →The former production substitution reduces welfare and the latter improves welfare.
- \rightarrow The latter becomes stronger when m is smaller and N is larger.

Implications

- Failures at early stages do not imply the failure of the whole privatization program (except for highly concentrated markets).
- →We should evaluate privatization program from the long term viewpoint.
- (2) Smaller size privatization programs more likely fail.
- (3) Welfare-gains of privatizations are larger at the latter stage of privatization program.
- →Once we reach the critical stage, the privatization automatically proceeds with larger support.