Partial privatization under asymmetric multi-market competition

Akio Kawasaki
Faculty of Economics, Oita Univ.

Tohru Naito
Faculty of Commerce, Doshisha Univ.

Introduction

- Since 1989, the problem of public firm's privatization has been discussed.
  → Matsumura (1998) proposes a very important result.
  → Both full privatization and full nationalization are inefficient!
  → Partial privatization is efficient.
- Previous studies assume that there exists one market only.
  → In an actual economy, some examples of multi-market exist.

Introduction

- Example
  Kagoshima city → Bus services
  Fukuoka city → Bus and subway services
  Tokyo city → Subway services etc.

Introduction

- Our interest
  "When the public firm provides goods or services in two regions (or markets) and the private firm provides them in one region (or one market) only, does privatization of the public firm increase social welfare?"
- In the above situation, one region is a competitive market and the other region is a monopolistic market.
  → Due to existence of the monopolistic market, privatization may decrease social welfare.

Introduction

- When considering the multi-market type competition, do the similar results obtained in previous studies hold?
- When we consider the (partial) privatization problem, the difference of costs is important.
  → Because of the high marginal cost of the public firm, the public firm should be privatized.
  → Does this result hold in the situation of the multi-market competition?

Introduction

- This study introduces two factors; one is a difference of market size, and the other is a difference of the size of the marginal cost between the private firm and the public firm.
- Introducing the difference of the size of the marginal cost brings interesting results!

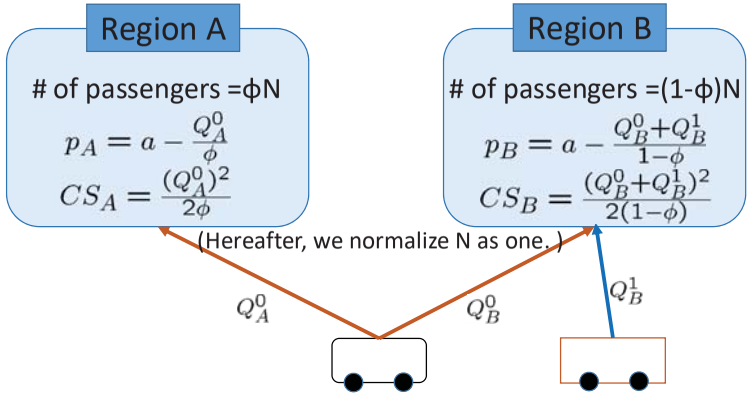
Related works

- Studies about privatization
  - De Fraja and Delbono (1989)
  - Matsumura (1998)
  - Lee and Hwang (2003)
  - Fujiwara (2007)
  - Jain and Pal (2012)
- Studies about multi-market competition
  - Bulow et al. (1985)
  - Kawasaki et al. (2014)

Main result

- In the situation of multi-market competition, partial privatization is not always socially preferable.
- When comparing the single product market, the degree of partial privatization becomes small.
- When the difference of the size of the marginal cost is large, the optimal degree of privatization does not always increase.

The model



The model

- Profit function of each firm

$$\pi_0 = p_A Q_A^0 + p_B Q_B^0 - \frac{\gamma}{2}(Q_A^0 + Q_B^0)^2$$

$$\pi_1 = p_B Q_B^1 - \frac{1}{2}(Q_B^1)^2$$

- Social welfare

$$SW = CS_A + CS_B + \pi_0 + \pi_1$$

- Objective function of firm 0

$$V_0 = \theta\pi_0 + (1-\theta)SW$$ (θ: the degree of privatization)

- Firm 0 maximizes V_0, and firm 1 maximizes π_1

Analysis

- Best responses

$$Q_A^0 = \frac{a\phi}{1+\gamma+\theta} + \frac{\gamma\phi}{(1+\theta)(1+\gamma+\theta)}Q_B^1$$

$$Q_B^0 = \frac{a(1-\phi)}{1+\gamma+\theta} - \frac{1+\theta+\gamma\phi}{(1+\theta)(1+\gamma+\theta)}Q_B^1$$

$$Q_B^1 = \frac{a(1-\phi)}{(3-\phi)} - \frac{1}{3-\phi}Q_B^0$$

- Outcomes

$$Q_A^{0*} = \frac{a\phi(-2+\theta(-3+\phi)+\gamma(-1+\phi)+\phi)}{(1+\theta)(-2+\theta(-3+\phi)+\phi)+\gamma(-3+\theta(-3+\phi)+2\phi)}$$

$$Q_B^{0*} = \frac{a(1-\phi)(-2+\theta(-2+\phi)+\phi(1+\gamma)}{(1+\theta)(-2+\theta(-3+\phi)+\phi)+\gamma(-3+\theta(-3+\phi)+2\phi)}$$

$$Q_B^{1*} = \frac{a(1+\theta)(\gamma+\theta)(-1+\phi)}{(1+\theta)(-2+\theta(-3+\phi)+\phi)+\gamma(-3+\theta(-3+\phi)+2\phi)}$$

Comparative static analysis (Lem. 1)

(1) $\frac{\partial Q_A^{0*}}{\partial\theta} \leq 0$

➡ As the degree of privatization increases, the amount of goods or services supplied in Region A decreases.

➡ It is obvious!

Comparative static analysis (Lem. 1)

(2) $\frac{\partial Q_B^{0*}}{\partial \theta} \geq (<) 0 \Longleftrightarrow \phi \geq (\leq) \frac{2(1+\theta)^2}{\gamma(1+\gamma)+2\gamma\theta+(1+\theta)^2}$

➡ Two opposite incentives exist.

- Decrease in production to set a high price
- Increase in production through decrease in the MC

$(MC = \gamma(Q_A^0 + Q_B^0))$

MC decreases with θ ⬅ decreases with θ

Comparative static analysis (Lem. 1)

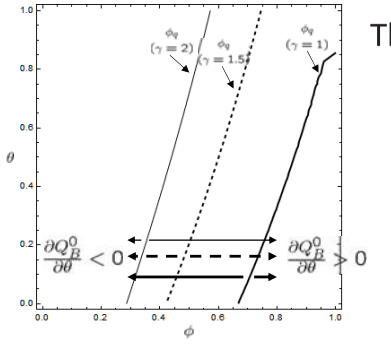
(3) $\frac{\partial Q_B^{1*}}{\partial \theta} \leq (>) 0 \Longleftrightarrow \phi \geq (<) \frac{2(1+\theta)^2}{\gamma(1+\gamma)+2\gamma\theta+(1+\theta)^2}$

➡ Due to a strategic substitution.

➡ This result is straightforward.

Comparative static analysis (Lem. 1)

(4) Here, we discuss the influence of γ on a result of a comparative static analysis.

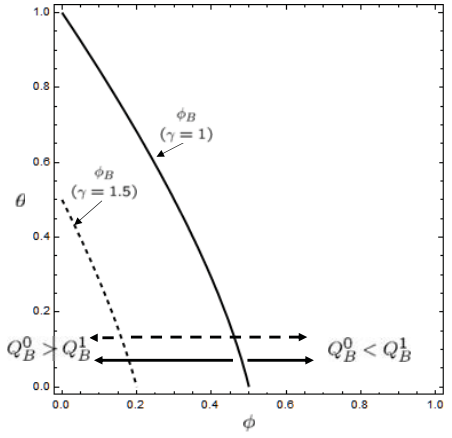


The range of $\frac{\partial Q_B^0}{\partial \theta} > 0$ increases with γ

γ UP ➡ Q_A^0 DOWN ➡ MC DOWN

An incentive to increase Q_B^0 UP

Comparison of quantity (Lem. 3)



- $\varphi = 0$ → Results are obvious!

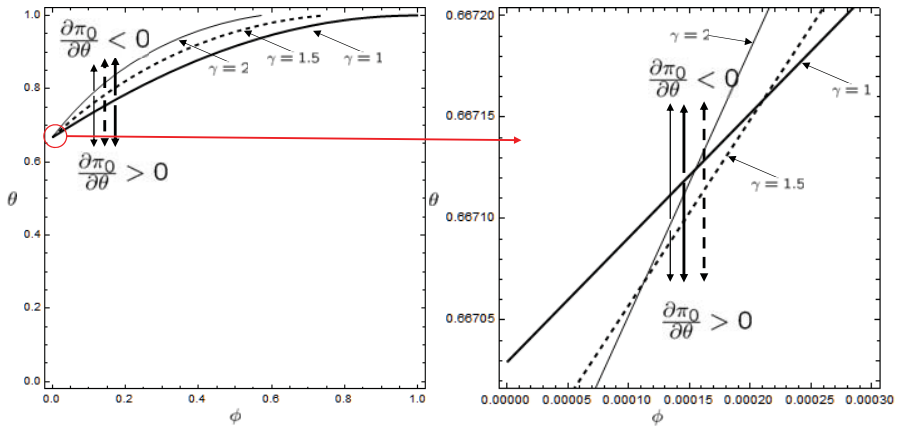
  ⬇

  "CS" vs. "higher size of MC"

- $\varphi > 0$ → MC increases

  ➡ The influence of CS becomes weak.

Comparative static analysis (Prop.1)

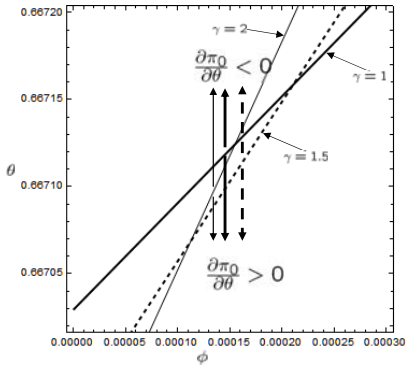


Mechanism

- $\varphi = 0$ → As θ increases …
  - Price UP ← larger if θ is small
  - quantity DOWN ← larger if θ is large
- $\varphi > 0$ → the profit from the monopolistic market UP
  - ➡ Privatization brings more profits to firm 0
  - ➡ A critical line (which means a line to be $\frac{\partial \pi_0}{\partial \theta} = 0$) is upward!

The influence of γ

- $\varphi = 0$: the range to hold $\frac{\partial \pi_0}{\partial \theta} > 0$ → $\gamma = 1 > \gamma = 1.5 > \gamma = 2$
- $\varphi = 0.0025$: the range to hold $\frac{\partial \pi_0}{\partial \theta} > 0$ → $\gamma = 1 < \gamma = 1.5 < \gamma = 2$



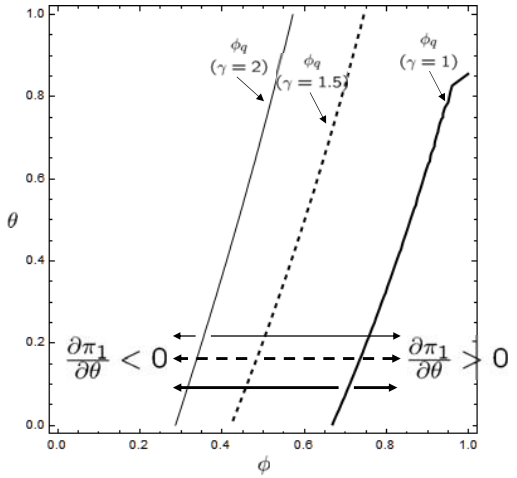
Mechanism

- γ UP → production in the monopolistic market DOWN
  → production in the competitive market UP
  → This effect increases with φ!
- When $\varphi = 0$, the range to hold $\frac{\partial \pi_0}{\partial \theta} > 0$ decreases with γ.
  → because of largely decrease in quantity

↓

- As φ increases, because decrease in quantity becomes small, the range to hold $\frac{\partial \pi_0}{\partial \theta} > 0$ does not always decrease with φ. (Or, its range increases with φ)

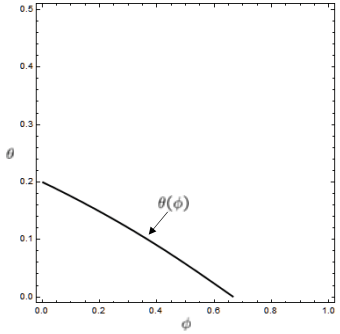
Comparative static analysis (Prop.2)



Optimal privatization level

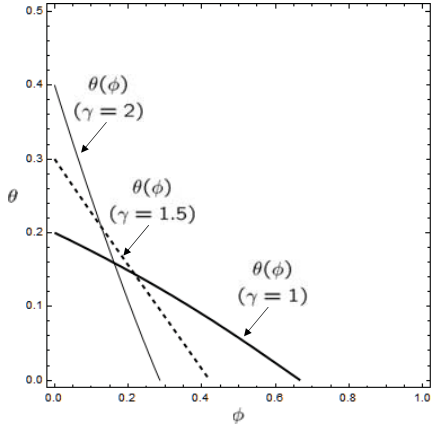
- When solving social welfare maximization problem by θ, the optimal privatization level is derived.
  → However, due to complex calculations, we cannot derive it analytically.
  → Alternatively, we use a simulation analysis.
- $\max_\theta SW(\theta)$
  → $\theta^* = \theta(\phi)$
  (A second-order condition is satisfied.)

Optimal degree of privatization (Prop.3)



- When the market share of the monopolistic market becomes large, privatization is not socially preferable because privatization of firm 0 gives firm 0 a larger market power.

Optimal degree of privatization



The optimal privatization level

- Intuitively, the degree of privatization increases with γ. ← When ϕ is small, this is correct. However, when ϕ is not small, this is NOT correct!

↓

- This is an interesting result!
- The important point to interpret this reason
  → Increasing marginal costs!

Mechanism

- An advantage of privatization
  → decrease in the production costs by the inefficient firm.
- A disadvantage of privatization
  → decrease in production (which decreases CS).

↓

- When ϕ is not small, the advantage of privatization decreases with γ!

Mechanism

- The quantity in the monopolistic market
  → always decreases with θ.
  → The advantage of privatization increases.
- The quantity in the competitive market
  → NOT always decrease with θ!
  → The advantage of privatization may decrease!
  → This advantage decreases with ϕ!

Important implication

- In general, we argue that because the public firm has an inferior production technology to the private firms, the public firm should be privatized.
- However, when the multi-market competition is assumed, the above argument is not always correct!

Attention

- If we assume a linear cost function, the result that the optimal degree of privatization can decrease with γ does not appear.
  →The assumption of the increasing marginal cost is also important to obtain this result.

Concluding remarks

- Main conclusion
  - In the situation of multi-market competition, partial privatization is not always socially preferable.
  - When comparing with the single product market, the degree of partial privatization becomes small.
  - When the difference of the size of the marginal cost is large, the optimal degree of privatization does not always increase.

Concluding remarks

- Future research
  - Entry by the private firms
  - Oligopolistic situation
  - Converse situation
    (The private firms provide the goods or services in both regions and the public firm provides the goods or services in one region only).