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Privatization and Statutory Surplus Policy in Public Enterprise at Free Entry

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Abstract: The State-owned Enterprise (SOE) has long been one of the government's financing methods. Namely, it is obliged to submit its operating profit to the government. Thus, the abrupt full privatization of the SOE will jeopardize the government's finance. Due to this, this study explored that whether there is any alternative to the privatization of the SOE if the government would like to keep its finance and social welfare maximization. Distinguishing from other preceding literature, the statutory surplus policy was incorporated into this privatization model. This study hypothesized a mixed oligopoly model in an open economy, exploring which is the best policy choice for the SOE, statutory surplus policy or privatization policy. Besides, this study compared the social welfare equilibrium under the following two respective industrial conditions: Entry barrier in the short run and free entry in the long run. The comparison indicated that when the government adopts the statutory surplus policy, the SOE will submit just a portion of the surplus rather than the entire one to the government. This is to maximize both the objectives of the government and the manager. Moreover, when it is under an open economy with free entry in the long run, the SOE should be partially privatized in order to achieve social welfare maximization. This finding differs from those in other previous studies. However, no matter with entry barrier in the short run or free entry in the long run, the privatization policy has no difference to the statutory surplus policy when the government aims at maximizing the social welfare.

Key words: Privatization, statutory surplus policy, free entry

INTRODUCTION

The privatization of the State-owned Enterprise (SOE) has been a trend since 1980s and it is always the issue that people worldwide are highly attentive to. Numerous literatures utilize the mixed oligopoly model of one public company and other private companies to explore the issue of the SOE privatization.

For example, Cremer *et al.* (1989) explored that how the government exploits the public company as its policy tool to facilitate efficient resource allocation within an imperfect competition market. De Fraja and Delbono (1989) compared the corresponding social welfare levels within the following 4 market structures, a public monopoly, a mixed oligopoly, a pure oligopoly, or a public company as a market leader respectively. Their study argues that the privatization of SOE cannot manage to improve the social welfare unless the presence of enough private firms. George and La Manna (1996) assuming the existence of production cost asymmetry among public companies and private firms, indicated how production efficiency affects the privatization policy. Supposing that both domestic public companies and private ones compete with foreign private firms in the market, Fjell and Pal (1996) pointed out

the effect of the private firm number, including domestic and foreign private ones, on the public company's quantity and social welfare. Han and Ogawa (2007, 2008) and Matsumura and Shimizu (2010) also extended this issue to other relevant analysis. The studies mentioned above assume that the government adopts "no external intervention" to control its public companies, but still in further directs the market. In the contrast, some studies assume that the government generally imposes tax or subsidizes to intervene in the market. Mujumdar and Pal (1998) wrote that the taxation on private firms does not affect the social welfare of mixed economy. Moreover, the privatization of public companies can enhance the social welfare and the government tax revenue. Pal and White (1998) suggested that the social welfare after privatization increases if the government adopts subsidy policy.

The desirability of privatization was firstly examined by De Fraja and Delbono (1989). They concluded that privatization is desirable for welfare if the markets are competitive. Matsumura (1998) then clearly probed into the possibility of partial privatization and he show that the partial privatization is the optimal policy in a maximum social welfare goal. Huang *et al.* (2006) analyzed the government's optimal privatization strategy within the

framework of the mixed oligopoly. They found that when the cost efficiency of the public company is lower than a threshold value, the government should opt for a full mixed-oligopoly policy. Matsumura and Kanda (2005) proposed that although partial privatization is the optimal policy in the short-run, the optimal choice with free entry in the long run is full nationalization. All of these studies suggest that the number of private firms matters for analyzing optimal privatization policy. Hsu *et al.* (2010) described how the stock flotation of privatization impacts the statutory surplus submitted to the government. However, this study only focused on the effect in the short run, rather than that in the long run with free industrial competition.

In practice, a public company, no matter it is fully or partially privatized, should submit all of its net profit to the government. This is the most crucial mission of the SOE to supplement the finance of the government. However, the preceding literature did not incorporate the statutory surplus policy into the privatization model. This study, therefore, aimed to explore how the statutory surplus policy affects a public company's privatization strategy. Besides, the effect on all the firms' quantity decision as well as that on the social welfare with free entry was discussed.

In other words, this study extended the discussion in Matsumura and Kanda (2005) and Matsumura and Tomaru (2012) and established a mixed oligopoly model with open economy. The model utilized multi-period game theory to analyze whether the adoption of the optimal statutory surplus affects the government's privatization policy.

MODEL HYPOTHESIS

Following Matsumura and Tomaru (2012), this study assumed that this is a mixed oligopoly with one public company and *n* private firms in the domestic market. Besides, the foreign investor possesses the stock equity of all the *n* private firms up to the proportion of θ . All the firms, both the public and the private firms, produce homogeneous products with Cournot competition in the market. The market demand is $p = \alpha - Q$, where, α denotes the market scale, *p* stands for the market price:

$$Q = q_0 + \sum_{i=1}^n q_i$$

is the aggregate market demand, where, q_0, q_i are the respective production quantities of the public company and other private firms. The cost structures of the public and other private firms are, respectively $C(q_0) = (g q_0^2/2) + f^2_0$ (Wang and Chen, 2010)¹ and $C(q_i) = (q_i^2/2) + f^2_i$, which are all increasing marginal cost functions (De Fraja and Delbono, 1989)², where $g \geq 1$ and $f^2_k = f^2, k = 0, i$ implies the fixed cost.

In the following are the profit functions of the public company and the private firms, respectively:

$$\pi_0 = (a - Q)q_0 - \frac{gq_0^2}{2} - f^2 \tag{1}$$

$$\pi_i = (a - Q)q_i - \frac{q_i^2}{2} - f^2, i = 1, \dots, n \tag{2}$$

In the short run equilibrium, the government sets an entry barrier and the public company is completely state-owned without any privatization. In this section, a two-stage game model is established to probe into how the government sets up the optimal statutory surplus proportion for this public company. On Stage one, with the objective of social welfare maximization, the government decided the optimal proportion of statutory surplus submission from the public company. On Stage 2, it is the market competition. Given the statutory surplus proportion, the public company has quantity competition with private firms.

It was assumed that in the short run equilibrium, the SOE manager aims at the weighted average of statutory surplus submission and the social welfare. Thus, the objective function *G* is expressed as:

$$G = (1 - \alpha)(1 - \beta)\pi_0 + \alpha w \tag{3}$$

In the above equation, α denotes how the SOE manager cares about the social welfare. In other words, he can accumulate his political power to climb up the career ladder or acquires higher position through the social welfare this SOE creates; $(1 - \alpha)$ stands for how the SOE manager cares about the disposable surplus kept in this public company. β is the proportion of surplus submission, while w means the disposable surplus that the public company can hold; that is, the economic reward that a SOE manager can get by running this SOE. Here,

¹The parameter *g* highlights the production efficiency discrepancy between the public company and the private ones. Please refer to the discussion in Wang and Chen (2010)

²De Fraja and Delbono (1989) also assumed that all the companies, public or private ones, have increasing marginal cost functions Under this assumption, that the completely state-owned enterprise supplies all the market demand is not the optimal policy

this study assume that $1 \geq \alpha \geq 0$ and $1 \geq \beta \geq 0$. When $\alpha = 1$, this implies that the manager only cares about his political future. When $\alpha = 0$, he cares nothing but the economic profit of this SOE³.

It is assumed that the consumer surplus is $CS = Q^2/2$. Then, the domestic social welfare function is the summation of all the firms' profit functions plus the consumer surplus. Thus, its objective function is expressed as:

$$W = CS + \pi_0 + (1 - \theta) \sum_{i=1}^n \pi_i \quad (4)$$

In the following section, discussion proceeds to the interaction among firms and the government's optimal policy within short run or long run equilibrium.

RESULTS

Statutory surplus policy: To achieve the market equilibrium, the respective optimal production quantities for the public company and other private firms are as follows:

$$q_0 = \frac{a(2 - 2(1 - \alpha)\beta + n\alpha\theta)}{2(1 + (1 - \alpha)(1 - 2\beta)) + n(1 - \alpha)(1 - \beta) + g(2 + n)(1 - (1 - \alpha)\beta) + n\alpha\theta} \quad (5)$$

$$q_i = \frac{a(1 + g(1 - (1 - \alpha)\beta) - a)}{2(1 + (1 - \alpha)(1 - 2\beta)) + n(1 - \alpha)(1 - \beta) + g(2 + n)(1 - (1 - \alpha)\beta) + n\alpha\theta} \quad (6)$$

Equation 5 and 6 illustrate that when $1 \leq g \leq \max\{1, (1 + 2\alpha - 2\beta + \alpha\beta + n\alpha\theta)/(1 - (1 - \alpha)\beta)\}$ is established, then $q_0 \geq q_i$. This implies that when there is not much production efficiency gap between the public company and other private firms, the public company outperforms other private firms in quantity. However, when $g > \max\{1, (1 + 2\alpha - 2\beta + \alpha\beta + n\alpha\theta)/(1 - (1 - \alpha)\beta)\}$ is established, then $q_0 < q_i$. This indicates that the production efficiency of the public company cannot compete with that of any private firm. Namely, the public company produces less than other private firms.

By maximizing the government's social welfare objective, the optimal proportion of statutory surplus submission is obtained as:

$$B^* = \frac{4(1 - \alpha) + n(g((s\theta - 1) - (2 + n)\alpha\theta) + (1 - \alpha)(s\theta + 1))}{(1 - \alpha)(4 + n(2 + (1 + g)(s\theta - 1)))} \quad (7)$$

The above equation concludes the following proposition:

- **Proposition 1:** When the government aims at maximizing the social welfare and the manager bears dual policy objectives in mind, the public company should submit a portion of its business surplus to the government

When the SOE manager increases his concern for the disposable surplus kept in the SOE, $(1 - \alpha)$, the optimal surplus submission of the SOE raises up. When $\alpha = 0$, the manager targets at maximizing his economic reward for running this SOE. Then, $\beta^*(\alpha = 0) > \beta^*(0 < \alpha < 1)$. This implies that when the SOE manager only cares about maximizing the SOE profit, its optimal surplus submission should be higher than that when the government aims at maximizing both the surplus submission and the social welfare. Namely, the optimum is complete surplus submission. Because the objective of the manager completely does not correspond with that of the government, the government should reduce the disposable surplus that this SOE can hold in order to lower the manager's rent seeking incentive. Under the Sub-game Perfect Nash Equilibrium (SPNE), the optimal social welfare is:

$$W = \frac{4 + n(1 + s\theta + g(s + n - s\theta))}{2(4 + n + g(2 + n)^2 + sn\theta)} a^2 - f^2(1 + n(1 - \theta)) \quad (8)$$

Partial privatization policy: As in Matsumura (1998), when the public company is partially privatized and its privatization proportion is $(1 - \lambda)$, the objective function is:

$$V = (1 - \lambda)\pi_0 + \lambda W \quad (9)$$

To achieve the market equilibrium, the respective optimal production quantities of the public company and other private ones are obtained as follows:

$$q_0 = \frac{a(2 + n\lambda\theta)}{4 + n - 2\lambda + g(2 + n) - n\lambda(1 - \theta)} \quad (10)$$

$$q_i = \frac{a(1 + g - \lambda)}{4 + n - 2\lambda + g(2 + n) - n\lambda(1 - \theta)} \quad (11)$$

Equation 10 and 11 show that when $1 \leq g \leq (1 + \lambda + n\lambda\theta)$ is established, then $q_0 \geq q_i$. This means that when there is not much production efficiency gap between the public company and other private firms, the public company outperforms other private firms in quantity. When $g > (1 + \lambda + n\lambda\theta)$ is established, then $q_0 < q_i$. This implies that

³When $\alpha = 0$ and $\beta = 1$, it implies that the manager only cares about the return of running the SOE but the profit all returns to the government. This makes the manager lack of the incentive to running well the business. Therefore, this study assumes that $G > 0$ in order to emphasize the role of the manager

the production efficiency of the public company cannot compete with that of any private firm. Namely, the public company produces less than other private firms.

With the objective of the social welfare maximization, the best SOE equity holding by the government is:

$$\lambda^* = \frac{4 + n + sn\theta a(1 + g) - gn}{4 + n + n\theta (s + g(2 + n))} < 1 \quad (12)$$

From the analysis above, the conclusion is the same as that presented by Matsumura and Kanda (2005). In the short run, the government should adopt privatization policy. Finally, under the Sub-game Perfect Nash Equilibrium (SPNE), the best social welfare is achieved as follows:

$$W = \frac{4 + n(1 + s\theta + g(s + n - s\theta))}{2(4 + n + g(2 + n)^2 + sn\theta)} a^2 - f^2(1 + n(1 - \theta)) \quad (13)$$

The social welfare levels under these two policies, represented in Eq. 8 and 13 concludes the following proposition:

- **Proposition 2:** Assuming that there is entry barrier to private firms in the short run, the SOE statutory surplus policy is indifferent to the SOE privatization policy under social welfare maximization

EQUILIBRIUM IN THE LONG RUN

Statutory surplus policy: The optimum output level in the market equilibrium is as Eq. 5 and 6. For private firms are allowed free entry in the market, the equilibrium private firm number can be derived by setting zero profit for private firms:

$$\pi^E = \frac{\sqrt{6\alpha}((1-\alpha)(1-\beta) + g(1-(1-\alpha)\beta)) - 4f(2(1-\alpha)(1-\beta) + g(1-(1-\alpha)\beta) + \alpha)}{2f((1-\alpha)(1-\beta) + g(1-(1-\alpha)\beta) + \alpha\theta)} \quad (14)$$

The above equation demonstrates that the optimum private firm number shrinks when the SOE manager increases his concern for the social welfare (α), the statutory surplus submission proportion (β) or the proportion of private firms with foreign joint venture (θ). Because the SOE manager increases his concern for the social welfare, he decides to have production expansion which leads to price and profit cut in the market. The optimum firm number dwindles then. If the statutory surplus submission proportion is raised, the SOE manager will tend to neglect other private firms' profit. This policy effect is the same as reducing privatization. When the

proportion of domestic-foreign joint ventures climbs up, the domestic firm profit in the social welfare function will dwindle. To reduce the profit shifting abroad, the optimum firm number in the market gets smaller. When the public company is faced with the enlarged production disadvantage (g), its output level will decrease but other private firms' will grow. Therefore, the optimum firm number in the market increases.

With free entry in the market, the optimal surplus submission proportion is:

$$\beta^* = \frac{2\sqrt{6}\alpha\theta((1+g)(1-2\alpha) + \alpha + (1+4g+2g^2)\alpha\theta) - sa^2g(1+g)\alpha\theta^2 - sf^2((2+g)\theta - 1)(1-\alpha) + (1+g)\alpha\theta}{2f(1-\alpha)(\sqrt{6}\alpha(1+g)\theta - 4f((2+g)\theta - 1))} \quad (15)$$

From Eq. 15, the impact of the SOE production technology disadvantage on the optimal surplus submission proportion is derived in the following:

$$\frac{\partial\beta^*}{\partial g} = -\frac{(\sqrt{6}\alpha - 4f)\alpha\theta}{4f(1-\alpha)} < 0 \quad (16)$$

From Eq. 16, when the disadvantage gap is enlarged, the government should lower the optimal submission proportion. However, the impact of the proportion of domestic-foreign joint ventures is ambiguous. To simplify the analysis, $g \rightarrow 1$ and $\theta \rightarrow 1$ are put into the comparative static analysis equilibrium. It is as follows:

$$\left. \frac{\partial\beta^*}{\partial g} \right|_{g \rightarrow 1} = -\frac{(\sqrt{6}\alpha - 4f)\alpha}{4f(1-\alpha)} < 0 \quad (17)$$

Equation 16 and 17 derive that when the SOE production disadvantage enlarges or the proportion of domestic-foreign joint ventures boosts in the long run, the government should lower the optimal surplus submission proportion. This result differs from that in the short run. In the short run, when the proportion of domestic-foreign joint ventures boosts, the government should raise up the optimal surplus submission to prevent profit shifting abroad, which causes the shrinkage of social welfare. Therefore, the government should raise up the surplus submission in order to boost the manager's concern for social welfare. In the long run, all the private firms have zero profit which implies no more profit shifting effect. Therefore, when the proportion of domestic-foreign joint ventures increases, the government should lower the optimal submission proportion. This will encourage the SOE manager to strive for the SOE profit maximization, which in further reflects in the increase of social welfare.

From Eq. 15, the best social welfare is acquired under the Sub-game Perfect Nash Equilibrium (SPNE). It is expressed as:

$$W = \frac{sa^2 - 4\sqrt{6}af + 2f^2}{6} + \frac{4f^2}{sg} \quad (18)$$

Partial privatization policy: The optimum output level in the market equilibrium is expressed as Eq. 10 and 11. Thus, the private firm number is:

$$n^E = \frac{\sqrt{6a(1-\lambda+g)} - 4f(2-\lambda+g)}{2f(1-\lambda+g+\lambda\theta)} \quad (19)$$

With free entry, the optimal SOE equity holding by the government is:

$$\lambda^* = \frac{2f(\sqrt{6a(1+g)\theta} - 4f((2+g)\theta - 1))}{sf^2g(1+g)\theta^2 + sf^2((2+g)\theta - 1)((1+g)\theta - 1) - 2\sqrt{6af\theta}(2(1+g)^2\theta - (1+2g+\theta))} \quad (20)$$

From Eq. 20, the best social welfare is achieved under the Sub-game Perfect Nash Equilibrium (SPNE). It is expressed as:

$$W = \frac{sa^2 - 4\sqrt{6}af + 2f^2}{6} + \frac{4f^2}{sg} \quad (21)$$

In further, Eq. 20 shows that when $g \rightarrow 1$ and $\theta \rightarrow 1$, the optimal privatization proportion $(1-\lambda)$ is:

$$(1-\lambda) \Big|_{\substack{g \rightarrow 1 \\ \theta \rightarrow 1}} = \frac{\sqrt{6\alpha} - sf}{\sqrt{6\alpha} - 4f} < 1 \quad (22)$$

Equation 22 indicates that although this study assumes that the public company and other private firms have the same production technology in an open economy, the optimal privatization proportion in the long run is still less than 1. This finding differs from that in Matsumura and Kanda (2005), but is consistent to what Wang and Chen (2010) stated. The following is the explanation: With free entry in the long run, the proportion of domestic-foreign joint ventures boosts. So, does the optimal privatization proportion. When $g = 1$ and $\theta = 1$, the optimal privatization proportion is zero, which implies that the government should have the public company completely state-owned in the long run. This is also the conclusion in Matsumura and Kanda (2005). Proposition 3 is then acquired:

- **Proposition 3:** Assuming that there is free entry for private firms in the long run, the SOE should be partially privatized instead of being completely state-owned in order to achieve the government's social welfare maximization

Through comparing the social welfare levels under the above two policies, shown in Eq. 18 and 21, the following proposition is derived:

- **Proposition 4:** Assuming that there is free entry for private firms in the long run, the SOE statutory surplus policy is indifferent to the SOE privatization policy under social welfare maximization

CONCLUSION AND SUGGESTION

This study hypothesized a mixed oligopoly model in an open economy where the government has two policy choices, statutory surplus policy or privatization policy. Besides, this study also considered and compared the social welfare equilibrium under the following two respective industrial conditions: entry barrier in the short run and free entry in the long run.

The comparison indicated that when the government aims at social welfare maximization and the manager also bears dual policy objectives in mind, the SOE will only submit a portion of the surplus to the government.

Moreover, when it is under open economy with free entry in the long run, the SOE should be partially privatized rather than completely state-owned in order to achieve the government's social welfare maximization. This finding differs from those in other previous studies. Finally, no matter with entry barrier in the short run or free entry in the long run, the privatization policy has no difference to the statutory surplus policy when the government aims at maximizing the social welfare.

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