The effect of lobbying activity in mixed oligopoly at free entry market

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Abstract

This paper shows that whether socially optimal level of privatization can be achieved or not under competitive lobbying depends on market structure. We prove that (i) with an exogenous number of private firms, optimal degree of privatization becomes lower by the competitive lobbying compared with the socially optimal level, however, (ii) in free entry case, optimal degree of privatization is the same as with the socially optimal level. This result is in sharp contrast to the finding in the previous literatures that, in a non-mixed oligopoly market, competitive lobbying has no effect on the policy such as optimal tariff, optimal tax rates, and optimal regulations. Our finding means that if a country imposes entry regulation of private firms, social optimal level of privatization cannot be achieved but once a country allows free entry of private firms, socially optimal level of privatization Matsumura and Kanda (2005) found are naturally achieved.

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1. Introduction

This paper investigates the optimal degree of privatization of the public firm in a mixed oligopoly under the competitive lobbying where all stake holders compete in lobbying. We show that whether socially optimal level of privatization can be achieved or not under competitive lobbying depends on market structure.

The issues whether lobbying activity affects the policies has been controversial in the literatures of public choice. One of the important topics in special interest politics is how lobbying activity influences the socially optimal policy. The seminal paper on the economics of lobbying is that of Grossman and Helpman (1994), which introduced a framework to understand how lobbying activities on tariff by special interest groups affect trade policies chosen by the incumbent government. As a result, they shows that the only industry organized special interest groups are protected by tariff, which lowers social welfare as we expected. This model is extended to the various policy problems to consider the effect of lobbying activities such as optimal indirect tax (Dixit, Grossman and Helpman (1997), optimal international capital tax (Lai, 2010, 2014), optimal international policies with international factor mobility (Facchini and Willman (2005), and optimal environmental policy (Aidt, 1998; Damania and Fredriksson, 2003).

The above results are that organized agents receive the benefits from the lobbying activities and unorganized agents do not. In contrast, as long as the campaign contribution is not wasteful, if all agents belong to special interest group and they can lobby, which we call *competitive lobbying*, the effects of

lobbying activities exactly are offset each other as in Grossman and Helpman (1994, p.843). That is, competitive lobbying generally does not affect the policy chosen in the situation where no lobbying exists. This result can be also admitted in a common-agency framework (Dixit, Grossman and Helpman, 1997). This means that competitive lobbying should be allowed so that the resource allocation with the competitive lobbying can duplicate the one without lobbying.

Contrary to this normative result, we argue that in a *mixed oligopoly model with an exogenous number of private firms*, the policy with lobbying *is not* the same as the policy without lobbying, that is, the socially optimal level of privatization cannot be achieved under competitive lobbying, even if all special interest groups can lobby. However, once we allow free entry of private firms in a mixed oligopoly market, the policy with lobbying becomes the same as the policy without lobbying, that is, the social optimal level of privatization can be achieved. The reason is as follows (i) in the case of an exogenous number of private firms, political pressure from each special interest group cannot be offset and thus leads to more nationalization in comparison with socially optimal level of privatization, and (ii) in the case of free entry, although the effect of political pressure from each special interest group is the same as the case of an exogenous number of private firm, regardless of lobbying activity, government always adopts the full nationalization policy.

It is important to know when social optimal level of privatization can be achieved. As the seminal paper by Matsumura (1998) proved, it is well known that neither full privatization nor full nationalization can

achieve optimality under moderate conditions, and the partial privatization policy is required. Our finding

implies that if a country imposes the entry regulation of private firms, social optimal level of privatization

cannot be achieved but once a country allows free entry of private firms, socially optimal level of

privatization Matsumura (1998) found are naturally achieved. Thus, while lobbing activity has to be ban

under regulation of the number of private firms, competitive lobbying always justifies in the situation of

free entry.

   The remainder of this paper is organized as follows. In section 2, a general lobbying model in the case

of an exogenous number of private firms is constructed. Section 3 discusses that model in the case of free

entry of private firms. Section 4 discusses policy implications and generalizations for future research.

2. Model

A mixed oligopoly model with the lobbying of private firms, a public firm, and organized consumers is

described here. This section investigates the effect of lobbying on the optimal level of privatization.

2.1 The basic setting

   We strictly follow the economic part of the model developed by Matsumura and Kanda (2005), in order

to focus on the effect of lobbying. Consider a market served by a partially privatized firm (firm 0) that is

jointly owned by a government and private sector, and n pure private firm (firm $1, \ldots, n$). All firms

produce homogenous goods, q_0 and q_i $(i = 1, \ldots, n)$, representing the quantity of output of the public

firm and private firms, respectively, and face the inverse demand function $p = p(z)$, where p denote the

price of goods. Aggregate output in this market is $Q \equiv q_0 + \sum_{i=1}^{n} q_i$. $c_0 = c_0(q_0)$ is cost function of a

public firm and $c_i = c_i(q_i)$ $(i = 1, \ldots, n)$ is cost function of each private firm Thus, each firm's profit

function becomes $\pi_j = p(Q)q_j - c_j(q_j)$. Social welfare is

$$
\begin{aligned}
W &= \int_0^Q p(z)dz - pQ + \pi_0 + \sum_{i=1}^{n} \pi_i \\
&= \int_0^Q p(z)dz - c_0(q_0) - \sum_{i=1}^{n} c_i(q_i).
\end{aligned}
\tag{1}
$$

The government owns a share $1 - \theta \in [0,1]$ of the partially privatized firm. Here, θ is the degree of

privatization, $\theta = 1$ is a perfectly privatized firm, and $\theta = 0$ is a perfectly public firm. Thus, partially

privatized firms' objective function becomes the sum of the social welfare and producer surplus of its firm:

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

We assume that the special interest group organized by the public firm, the private firms and organized

consumers can provide contributions, Z^0, $Z^i (i = 1, \ldots, n)$, and Z^{cs}, respectively, to the policymaker in

return for influencing the privatization ratio, θ, and can offer a differentiable contribution schedule for the

privatization ratio, $Z^j(\theta)$ $(j = 0, 1, \ldots, n$ and $cs)$, to the policymakers. As a result, the payoffs for the

special interest group organized by the public firm, the private firms, and organized consumers are

$$V = v - Z^0, \quad \Pi_i = \pi_i - Z^i, \text{ and}$$

$$CS = \int_0^Q p(z)dz - pQ - Z^{cs},$$

respectively.

The policymaker cares about the level of campaign contribution and social surplus because the number of votes depends not only on the size of the campaign contribution but also on the public endorsement. Thus, the objective function of the policymaker is the sum of social welfare and political contributions:

$$G = W + \gamma \left[Z^0 + \sum_{i=1}^n Z^i + Z^{cs} \right] \tag{2}$$

where $\gamma \, (> 1)$ denotes the weight of the policymaker for the political contributions of each special interest group. In order to focus on the effect of competitive lobbying, the weight of these political contributions are same as in Grossman and Helpman (1994). Moreover, as Cai and Li (2019, 2020), in order to ensure the existence of unique solutions, we assume that both G and W are strictly concave in θ.

Following Matsumura and Kanda (2005), we consider a complete information game. That is, θ is given exogenously and is observed by each firm. Each firm $i(i = 0, 1, \dots, n)$ independently maximizes their objective function with respect to q_i given other firms' outputs. The first-order condition of private firm and public firm are given by

$$p + p'q_1 - c_1'(q_1) = 0 \text{ and } \theta p'q_0 + [p - c_0'(q_0)] = 0 \tag{3}$$

Following Matsumura and Kanda (2005), we put on the following five assumptions:

Assumption 1: $p(z)$ is twice continuously differentiable and $p'(z) < 0$ and $p''(z) \leq 0$ as long as

$p(z) > 0$,

Assumption 2: $c_j''(q_j) > 0$ as long as $q_j \geq 0$ $(j = 0,1,\ldots,n)$ and $c_i (i = 0,1,\ldots,n)$ is strictly increasing

for $q_j \geq 0$,

Assumption 3: the relevant second-order conditions for (3) are satisfied,

Assumption 4: all private firms have identical cost function.

Assumption 5: the slope of the reaction function of each private firm is negative (strategic substitution).

Thus, our focus is symmetric equilibria where each private firm chooses the same output, $q_1 = q_2 =,\ldots,=$

q_n in equilibrium.

We consider two situations of the game depending on whether each private firm can entry the market

freely or not. Former is the case of an exogenous number of private firms and latter is the case of the free

entry of private firm.

The game runs as follows;

(i)   The case of exogenous number of private firms: in the first stage, each special interest group offers

         a campaign contribution schedule for policymakers. In the second stage, the policymaker

determines the privatization level. In the third stage, a private firm and a public firm compete in

the Cournot market.

(ii)   The case of free entry: in the first stage, each special interest group offers a campaign contribution

schedule for policymakers. In the second stage, the policymaker determines the privatization level.

In the third stage, each private firm decides whether they enter the market or not. In the fourth

stage, private firms and a public firm compete in the Cournot market.

The game is solved by working backward.

2.3 Optimal privatization policy under lobbying activity when the number of firms

is given.

In this section, we discuss the optimal level of privatization when the number of private firms is given

exogenously. Under Assumption 3, the effect of privatization on q_0, and q_1 are

$$\frac{dq_0}{d\theta} = \frac{-p'q_0}{\Delta}[p''nq_1 + p'(1+n) - c_1''] < 0 \ and \ \frac{dq_1}{d\theta} = \frac{p'q_0}{\Delta}[p''q_1 + p'] > 0,$$

respectively. In the second stage, the policymaker chooses the optimal level of privatization. In the first

stage, each special interest group determines the contribution schedule.

As a benchmark, as found by Matsumura and Kanda (2005), we show that perfect nationalization is not

optimal. Defining the equilibrium outputs and welfare as q_0^F, q_1^F, and $W^F(\theta) = \int_0^{q_0^F + nq_1^F} p(z)dz -$

$c_0(q_0^F) - nc_1(q_1^F)$, since the benevolent government maximizes W^F by θ, the optimal level of

privatization, θ, satisfies the condition: $\frac{dW^F}{d\theta} = -p' \left(\theta q_0^F \frac{dq_0^F}{d\theta} + n q_1^F \frac{dq_1^F}{d\theta} \right) = 0$. Thus, if $\theta = 0$, since

$\frac{dW^F}{d\theta}\Big|_{\theta=0} = -p' n q_1^F \frac{dq_1^F}{d\theta} > 0$, thus, government should privatize the public firm[1].

Next, we consider the amount of political contribution provided by each special interest group.

Following Grossman and Helpman (1994), we focus on the truthful contribution schedule, $Z^0(\theta) = max\{0, v(\theta) - b^0\}$, $Z^1(\theta) = max\{0, \pi_1(\theta) - b^1\}$ and $Z^{cs}(\theta) = max\{0, cs(\theta) - b^{cs}\}$. The maximization condition of the special interest group organized by the public firm, the private firm, and consumers must satisfy:

$$\frac{\partial v}{\partial \theta} = \frac{\partial Z^0}{\partial \theta}, \frac{\partial \pi_1}{\partial \theta} = \frac{\partial Z^1}{\partial \theta} \text{ and } \frac{\partial cs}{\partial \theta} = \frac{\partial Z^{cs}}{\partial \theta}, \tag{5}$$

when this condition is satisfied $Z^i > 0$.

Using a truthful equilibrium as the solution concept to the common-agency game as shown by Bernheim and Whinston (1986), we get the problem of non-benevolent government as $G(\theta) = W(\theta) + (\gamma - 1)[v(\theta) + \sum_{i=1}^{n} \pi_1(\theta) + cs(\theta)] = (\gamma - 1)(\theta - 1)\pi_0(\theta) + \{1 + (\gamma - 1)(2 - \theta)\}W(\theta)$. Thus, we can find the objective function of non-benevolent government is not corresponds to that of benevolent government under competitive lobbying. This is not same as Grossman and Helpman (1994).

What effect does this competitive lobbying cause the privatization level? The first order condition is

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[1] Moreover, if we consider the case private firms and a public firm have a same cost function. In this case, if $\theta = 1$, since $\frac{dW^F}{d\theta}\Big|_{\theta=1} = -p' q_0^F \left(q_0^F \frac{dq_0^F}{d\theta} + n \frac{dq_1^F}{d\theta} \right) = -p' q_0^F \frac{dQ^F}{d\theta} < 0$, benevolent government chooses partial privatization policy.

$$\frac{dG^F}{d\theta} = [1 + (\gamma - 1)(2 - \theta)]\frac{dW^F}{d\theta}$$

$$- (\gamma - 1)\left[\{W(\theta) - \pi_0(\theta)\} + (1 - \theta)\frac{d\pi_0(\theta)}{d\theta}\right]$$

$$= [1 + (\gamma - 1)(2 - \theta)]p'\left\{\theta q_0^F \frac{dq_0^F}{d\theta} + n q_1^F \frac{dq_1^F}{d\theta}\right\}$$

$$- (\gamma - 1)\left\{\{W(\theta) - \pi_0(\theta)\}\right. \tag{6}$$

$$- (\gamma - 1)(1 - \theta)\left[p' q_0^F \left(\frac{dq_0^F}{d\theta} + n\frac{dq_1^F}{d\theta}\right)\right.$$

$$\left.\left. + (p - c_0')\frac{dq_0^F}{d\theta}\right]\right\} = 0.$$

As in first raw of (6), we can see the second and third terms, $-(\gamma - 1)\{W(\theta) - \pi_0(\theta)\} + (1 - \theta)\frac{d\pi_0(\theta)}{d\theta}$,

are distortion effect by competitive lobbying. The second term, $-(\gamma - 1)\{W(\theta) - \pi_0(\theta)\} < 0$, represents

the effect of lobbying from the group organized by the public firm given q_0^F and q_1^F. So, we call this effect

"direct effect". The third term, $-(\gamma - 1)(1 - \theta)\frac{d\pi_0(\theta)}{d\theta}$, represents the effect on profit of a public firm

caused by changing total outputs. This is the "indirect effect".

We firstly show non benevolent government does not choose perfect nationalization policy; when $\theta = $

0, (6) becomes $\frac{dG^F}{d\theta}\Big|_{\theta=0} = \{1 + 2(\gamma - 1)\}p' n q_1^F \frac{dq_1^F}{d\theta} - (\gamma - 1)\left[\{W(\theta) - \pi_0(\theta)\} + p' q_0^F \left(\frac{dq_0^F}{d\theta} + n\frac{dq_1^F}{d\theta}\right)\right]$.

The sign of first term is $\frac{dW^F}{d\theta}\Big|_{\theta=0} = p' n q_1^F \frac{dq_1^F}{d\theta} > 0$, corresponded to the benevolent government case. The

sign of second term, and third term, are $-(\gamma - 1)\{W(\theta) - \pi_0(\theta)\} < 0$, and $-(\gamma - 1)\left[p' q_0^F \left(\frac{dq_0^F}{d\theta} + \right.\right.$

$\left.\left. n\frac{dq_1^F}{d\theta}\right)\right] < 0$, respectively. Thus, if $\frac{dG^F}{d\theta}\Big|_{\theta=0} \leq 0$ is satisfied or the direct effect and indirect effect of

competitive lobbying are larger than the privatization pressure as benevolent government, government

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adopts perfect nationalization policy, even though social optimal privatization policy is not perfect

nationalization policy.

Proposition 1

Even if all special interest groups use compensating contribution schedules, the competing bid for influence

does not result in a choice that is Pareto efficient among the set of feasible policies in a common-agent

model and is lower than the optimal privatization rate.

Proposition 1 contrasts with a previous result summarized by Grossman and Helpman (1994), which

states "when all voters belong to an interest group,…,the various interest groups neutralize one another."[2]

However, in our case, the optimal privatization level is more nationalization than social optimal

privatization level. The reason is that, in truthful equilibrium, the sum of the objective functions of each

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[2] The seminal paper by Grossman and Helpman (1994) consider markets organized by private firms and

consumers. In their model, since the maximization problem of social welfare is equal to the sum of the

benefits of each special interest group, the policymaker behaves as if (s)he was benevolent: competition

between special interest groups offset influence over each other, and lobbying from all special interest

groups does not affect resource allocation.

special interest group, $v(\theta) + \pi_1(\theta) + cs(\theta)$, is not equal to the social welfare function. In detail, the public firm cares about not only their revenue π_0, but also social welfare, $W(\theta)$, based on the share of θ which politicians determine. Since the public firm wants to be nationalized, that is, $\frac{dv^*}{d\theta} < 0$, the manager makes the campaign contribution to government to achieve a low level of privatization rate. Moreover, the special interest group organized consumers who want to be nationalized and the group organized a private firm that wants to be privatized. We find that the sum of these political pressures gives a downward pressure to the privatization level. Thus, the privatization level is not the same as in the case of a benevolent policymaker[3].

2.4 Optimal privatization policy under lobbying activity when the number of firms is endogenously determined.

In this section, we discuss the optimal level of privatization under the lobbying activity when the number of private firms is endogenously determined (this is the case of free entry). The model is same as last section except for free entry to the market of private firms, that is, before each private firm enters the market, they decide whether they enter the market or not with the entry cost, f_1, which is sunk cost.

First, we solve the fourth stage game, given θ. The subgame is the same as last section except for the number of private firms. Thus, the following conditions establish, $Q = q_0 + nq_1$ and $p + p'q_1 -$

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[3] Social optimal level of privatization cannot be implemented in the case of asymmetric lobbying.

$c_1'(q_1) = 0$ and $\theta p' q_0 + [p - c_0'(q_0)] = 0$. In the third stage, since each private firm enters the market if and only if it gains nonnegative profits, the free entry-market condition, $p - c_1(q_1) = 0$ must be satisfied, where c_1 includes entry cost f_1. Definning q_0^E, q_1^E, n^E and Q^E denote the equilibrium output of public firm, the equilibrium output of each private firm, the equilibrium number of private firms, and the equilibrium total output, respectively. As in Matsumura and Kanda (2005)'s lemma 2 to lemma 4, from assumption 1 to 5, we get the following properties, $\frac{dq_1^E}{d\theta} = 0, \frac{dQ^E}{d\theta} = 0,$ and $\frac{dq_0^E}{d\theta} = -q_1^E \frac{dn^E}{d\theta} < 0.$

Define the equilibrium welfare $W^E(\theta)$ by $W^E(\theta) = \int_0^{q_0^E + n^E q_1^E} p(z) dz - c_0(q_0^E) - n^E c_1(q_1^E)$, we find that perfect nationalization policy is social optimal policy because $\frac{dW^E(\theta)}{d\theta} = (p - c_0') \frac{dq_0^E}{d\theta} = -\theta p' q_0^E \frac{dq_0^E}{d\theta} \leq 0$, where $\frac{dW^E(\theta)}{d\theta} = 0$ is satisfied if and only if $\theta = 0$). That is, marginal cost pricing by public firm is optimal in mixed markets under free entry.

Now, we investigate the effect of competitive lobbying on the privatization level. after some manipulation by maximizing $G^E(\theta)$, we get

$$\frac{dG^E}{d\theta} = \frac{dW^E(\theta)}{d\theta} + \left[(\gamma - 1)(2 - \theta) \frac{dW^E(\theta)}{d\theta} - (\gamma - 1)(W^E - \pi_0^E) \right]$$

$$< 0$$

(7)

Proposition 2: When competitive lobbying occurs, government chooses perfect nationalization policy.

This means that the privatization policy with competitive lobbying becomes the same result of the socially optimal privatization policy. Especially, the lobbying strengthens the nationalization as in the second and third term, $\left[(\gamma - 1)(2 - \theta)\frac{dW^E(\theta)}{d\theta} - (\gamma - 1)(W^E - \pi_0^E)\right] < 0$. The reason is as follows. As shown by Matsumura and Kanda (2005), if government is benevolent, the number of firms at free entry equilibrium is excessive from the viewpoint of social welfare. In our case, in addition to this economic reason, competitive lobbying gives the downward pressure for privatization level, that is, $\frac{\partial v}{\partial \theta} + n\frac{\partial \pi_1}{\partial \theta} + \frac{\partial cs}{\partial \theta} < 0$. Thus, in competitive lobbying situation, entry restrictions improve social welfare. However, since each special interest group usually has a motivation to gives campaign contribution to politician, it needs to remove the restriction to improve social welfare.

Next question is the robustness of our results; depending on the coordination of special interest groups, whether our result can survive or not.

Corollary: Regardless of coordination of special interest groups, government always choose perfect nationalization policy.

Proof: it is enough to prove the optimal privatization policy is perfect nationalization policy when only special interest group organized by private firms lobby, because a public firm and consumers want to be nationalization. The maximization problem under the political pressure from special interest group

organized by private firms is $\max_{\theta} W(\theta) + (\gamma - 1)n\pi_1$ and $\pi_1 = 0$ in free entry equilibrium. Thus,

maximization condition becomes the same as in the optimal condition of benevolent government in free

entry equilibrium.

4. Conclusion

This paper investigated the optimal degree of privatization of the public firm in a mixed oligopoly under

the competitive lobbying where all stake holders compete in lobbying. We showed that whether socially

optimal level of privatization can be achieved or not under competitive lobbying depends on market

structure.

In general, we show that the original policy without lobbying cannot be replicated by lobbying in the

case of the exogenous number of private firms but that can be replicated by lobbying in the case of free

entry. This former result is in sharp contrast to Grossman and Helpman (1994). Thus, unlike the usual

lobbying model, our results have an important and powerful policy implication that lobbying cannot be

justified in a mixed oligopoly model in the case of an exogenous number of private firms. even if

governments are equally corrupt, governments should always ban lobbying. On the other hand, in free entry

case, both results obtained by Matsumura and Kanda (2005) and Grossman and Helpman (1994) survive

and any form of government always chooses full nationalization policy.

The study by Grossman and Helpman (2001, section 8.6) highlights one of the famous contributions of political lobbying, summarizes "if the SIGs all use compensating contribution schedules…then the competing bids for influence must result in a choice that is Pareto efficient among the set of feasible policies." However, our results indicate that in a mixed oligopoly market, if and only if a government allow free entry of private firms, this "result" survives.

Note that the analysis focuses on the normative aspects. To apply this result to economic policies, we must consider the effect of voting, legislature, trade policies, and the endogenous number of private firms. Moreover, we can consider other types of asymmetric lobbying between countries.

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