Strategic Policy Choices on Privatization in an International Mixed Duopoly

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Abstract

We consider the interaction of two countries regarding strategic choices on privatization policy in an international mixed market under an open economy. We demonstrate that the equilibrium degree of privatization depends not only on the relative efficiency of the state-owned enterprise, but also on trade policy. We show that the international competitive equilibrium involves less privatization and a higher tariff, even though they are jointly suboptimal.

Keywords: competitive privatization; international mixed market; tariff policy;

1. Introduction

In recent decades, we have witnessed a widespread wave of privatization, which has had a remarkable impact on society. For example, based on the various empirical results, \cite{Megginson2001, Megginson2006, Ethugala2011} have reported that privatization generates positive effects in the society as well as at the privatized firms. \cite{Barcena2005} and \cite{Han2008} considered a two-country model to incorporate the strategic interaction on privatization policy between two governments, and \cite{Chang2005, Chao2006, Yu2011} constructed a mixed oligopoly model to examine the effect of trade policy on privatization policy.

The purpose of this paper is to investigate the interaction of two governments regarding the strategic choice on privatization under trade policy. We show that the equilibrium degree of privatization depends not only on the relative efficiency between a state-owned enterprise and private firms, but also on the trade policy. In particular, we examine the relationship between optimal privatization and tariff policies in an international market and show that the competitive optimal degree of privatization in the local country is always lower than the global optimum, but the competitive optimal degree of tariff in the local country

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is always higher than the global optimum. Therefore, the international competitive equilibrium involves less privatization and a higher tariff, even though they are jointly suboptimal.

2. The Model and Analysis

2.1 Open economy model: two country case with free trade

Suppose that there are two countries: one is the home country (1) and the other is the foreign country (2). They produce homogeneous products and can trade those products. The home country and foreign country both have symmetric duopoly situations. We assume that the home state-owned enterprise (SOE) and private enterprise (PE) in each country can produce products, but PE only export them to the foreign country. Each country would impose a tax on the imports that are produced by the PE in the other country and investigate the interaction between privatization and tariff policies.

The import tariff is defined by $t_i (\geq 0)$ for country $i$. The inverse demand functions of both markets are the same and given by $P_i = \alpha - Q_i$, $i = 1, 2$, where the price of market $i$ is denoted by $P_i$ and the output of market $i$ is $Q_i = q_{si} + q_{hi} + q_{ei}$, where $i \neq j = 1, 2$. We assume that the cost function of the SOE is given as $C(q_{si}) = k_{c_i} q_{si}$ while that of the PE is $C(q_{hi} + q_{ei}) = c(q_{hi} + q_{ei})$, $i = 1, 2$, where $k > 1$ and $k$ is constant.

Suppose now $t_i = 0$; the model then is reduced to a two country case of an open economy with free trade. Then, the profits of the SOEs and the PEs in the home country will be expressed as $\pi_{si}$, $\pi_{pi}$, where

$$\pi_{si} = P_i q_{si} - k_{c_i} q_{si} = (\alpha - q_{si} - q_{hi} - q_{ei}) q_{si} - k_{c_i} q_{si}$$

$$\pi_{pi} = \pi_{hi} + \pi_{ei} \left( P_i q_{hi} + c q_i \right), \quad P_i q_{ei}$$

The home country’s social welfare is defined as the sum of the consumer surplus in the home market and the home industry profit $W_i = CS_i + \pi_{si} + \pi_{pi}$ where

$$CS_i = \frac{1}{2} Q_i^2 = \frac{1}{2} (q_{si} + q_{hi} + q_{ei})^2$$

The firm’s behavior is constrained by its ownership structure. We suppose that the PE maximizes its profits, while the SOE maximizes the objective of the government, which is defined as social welfare. Following the partial privatization model of [8] Matsumura (1998) and [9] Lee and Hwang (2003), we also assume that the manager of the partially state-owned enterprise—a semi-SOE—maximizes the share-weighted objectives between social welfare and profit. In the process of privatization, the government transforms the complete SOE into a semi-SOE, which is jointly owned by both the government and private investors. Then, decision-making behaviors of the SOE should take into account both the objectives of the government and the private sector.

Let $\theta$ refer to shares owned by private investors (or weights put on the profit). Then, $\theta$ can be used to measure the degree of privatization; that is, the government owns a share of $1 - \theta$ of the SOE. When $\theta = 0$, this firm is a complete SOE, which maximizes social welfare, and when $\theta = 1$, it is a PE, which maximizes its profit. Therefore, SOE maximizes the share-weighted objectives between social welfare and profits, which are defined as $T_i = (1 - \theta_i) W_i + \theta_i \pi_{si}$, where changes of $\theta$ indicate the tendency of the SOE to seek social welfare or profits in the process of privatization.

From the first-order conditions of the two SOEs and the two PEs in the two markets, we have the equilibrium outputs and market output and price: where $i = 1, 2$

$$q_{si} = \frac{2 \alpha - 3 k_c + c - (\alpha - c) \theta_j}{2 (1 + \theta_j)}$$

$$q_{hi} = \frac{(\alpha - c) \theta_j + (k - 1) c}{2 (1 + \theta_j)}$$

$$q_{ei} = \frac{(\alpha - c) \theta_j + (k - 1) c}{2 (1 + \theta_j)}$$

$$Q_i = \frac{2 \alpha - k_c - c - (\alpha - c) \theta_j}{2 (1 + \theta_j)}$$

$$P_i = \frac{(k - 1) c + (\alpha + c) \theta_j}{2 (1 + \theta_j)}$$
Then, we get the social welfare function of country $i$:

$$W_i = \frac{(\alpha - c)(c + 4k - 5c)\theta_i^2}{8(1 + \theta_i)^2} + \frac{2(4\alpha^2 - 5akc - 3ac + 6k^2c^2 - 7kc^2 + 5c^2)\theta_i}{8(1 + \theta_i)^2} + \frac{4(4\alpha^2 - 8akc + 9k^2c^2 - 10kc^2 + 5c^2)}{8(1 + \theta_i)^2} + \frac{[(k - 1)c + (\alpha - c)\theta_i]^2}{4(1 + \theta_i)^2}$$

**Proposition 1:** The global optimum, which maximizes global welfare, requires a higher degree of privatization than the local country optimum under open competition when the SOE is relatively inefficient.

**Proof:** The differentiation of $W_i$ with respect to $\theta_i$ yields and the differentiation of $\bar{W}$ with respect to $\theta_i$ yields:

$$\frac{\partial W_i}{\partial \theta_i} = \frac{3(\alpha - kc)[-(\alpha + c - 2k)\theta_i + (k - 1)c]}{4(1 + \theta_i)^3}$$

$$\frac{\partial \bar{W}}{\partial \theta_i} = \frac{(\alpha - kc)[\alpha + c - k6 \theta_i] + k5c}{4(1 + \theta_i)^3}$$

Assuming interior solutions, we have the following socially optimal degree of privatization in an open economy:

$$\theta^*_i = \frac{(k - 1)c}{2kc + c} \quad \text{when } k < \alpha + 2c \quad \frac{3c}{3c} \quad \text{However, if } k > \frac{\alpha + 2c}{3c}, \quad \theta^*_i = 1. \quad \text{Finally, from the second-order condition for the maximization problem, we have } \frac{\partial^2 W}{\partial \theta_i^2} \bigg|_{\theta = \theta^*_i} = -\frac{3(\alpha - kc)^2}{4(1 + \theta_i)^4} < 0. \quad \text{Notice that the competitive optimal degree of privatization in an open economy is also increasing in } k, \ i.e., \ \frac{\theta^*_i}{k} = \frac{(c)^c}{2kc + c} > 0. \quad \text{Assuming interior solutions, we have the following socially optimal degree of privatization in an open economy: } \ \theta^*_i = \frac{5(k - 1)c}{6kc + 5c} \quad \text{when } k < \frac{-10c}{11c}. \quad \text{However, if } k \geq \frac{-10c}{11c}, \quad \theta^*_i = 1. \quad \text{Finally, from the second-order condition for the maximization problem, we have } \frac{\partial^2 \bar{W}}{\partial \theta_i^2} \bigg|_{\theta = \theta^*_i} = \frac{-3(\alpha - kc)^2}{4(1 + \theta_i)^4} < 0. \quad \text{Therefore, } \theta_i^* > \theta_i^* \iff k < \frac{\alpha}{c} \quad \text{Q.e.d.} \quad \text{The intuition comes from the strategic interaction between the two independent countries. As shown in Proposition 1, there is a business stealing effect from the foreign firm under an open economy, and thus, concerning its own country’s welfare, each government will strategically reduce the degree of privatization to lessen the business-stealing effect. However, from the perspective of global welfare where both governments do not take the business-stealing effect into consideration at all, increasing the degree of privatization will increase the cost-saving effect from the PEs, and thus increase both the home country’s welfare and the other country’s welfare, i.e., global welfare. Notice that the global optimum in Proposition 3 is also increasing in } k, \text{ but its increasing rate is faster than the local country optimum in Proposition 2, i.e., } \frac{\partial \theta_i^*}{\partial k} > \frac{\partial \theta_i^*}{\partial k} > 0.$$
We now consider the general case with a tariff policy. Then, profits of the PE in country \(i\) will be expressed as 
\[
\pi_{\text{PE}, i} = p_{\text{ij}} q_{\text{ij}} - c q_{\text{ij}} - t q_{\text{ij}},
\]
where \(p_{\text{ij}}\) is the price in country \(i\) and \(q_{\text{ij}}\) is the quantity. The home country’s social welfare \(W_i\) is given by 
\[
W_i = CS_i + \sum_{j} (1 - \pi_j) q_{\text{ij}} q_{\text{ij}},
\]
where \(\pi_j\) is the social welfare objective of the SOE in country \(j\) and \(q_{\text{ij}}\) is the quantity in country \(i\). Again, the SOE maximizes its profits, and the SOE maximizes the share-weighted objectives between social welfare and profits, \(T_i = (1 - \pi_i) W_i + \pi_i q_{\text{ij}}^\ast\).

From the first-order conditions of the two SOEs and the two PEs in the two markets, we have equilibrium outputs and market output and price are
\[
q_{\text{ij}}^\ast = \frac{3kc + t_i (c + 2t_j) j}{2(1 + \pi_i)} \quad q_{\text{ij}}^T = \frac{(c + k) c + t_j}{2(1 + \pi_i)} \quad q_{\text{ij}}^T = \frac{(c + k) c + t_j}{2(1 + \pi_i)}.
\]

**Proposition 2:** Under an open economy with a tariff, the competitive equilibrium degree of privatization is partial privatization and is higher than without a tariff when the SOE is not very inefficient.

**Proof:** The differentiation of \(W_i\) with respect to \(\pi_i\) and \(t_i\) yields:
\[
W_i = (t_i - k) c + 2kc j \quad 3(k - 1)c \quad 4(1 + \pi_i) t_j \quad 4(1 + \pi_i) t_j.
\]
Assuming the interior (non-zero) solutions for equilibrium, we have the following equilibrium of privatization and tariff:
\[
\pi_i = \frac{3(k - 1)c}{2(4kc + 3c)} \quad \text{and} \quad t_i = \frac{2(k - 1)c}{k - 2 + 9c}.
\]
Thus, \(\pi_i^T < 1\) when \(k < 2\alpha + 9c / 14c\). Notice that both equilibriums of privatization and tariff are increasing in \(k\). Therefore, we have
\[
\pi_i^T = \frac{3(k - 1)c}{2(4kc + 3c)} > \pi_i = \frac{2(k - 1)c}{k - 2 + 9c}. \quad \text{Q.e.d.}
\]

The intuition is as follows. Compared to the free trade case, the government can use the tariff strategically to control the business-stealing effect from foreign countries. Furthermore, the home country has an additional income source from the tariff, which provides the home country with an incentive to increase the degree of privatization in order to increase revenue from the tariff. Then, from the perspective of strategic interaction, given the other country’s lower privatization level and higher tariff level, it is beneficial for the home country to have less privatization and a higher tariff to reduce the business-stealing effect in its home country and raise tariff revenue.

It is noteworthy that the globally optimal degree of privatization with a tariff is equal to that without a tariff when the SOE is not very inefficient.

**Proposition 3:** If each country sets the local country optimal tariff under an open economy, the equilibrium degree of privatization is lower than the degree of global optimal privatization without a tariff.

**Proof:** The differentiations yields
\[
\frac{\overline{W}}{t_i} = \frac{4(1 - k - 3c)(k - 1)c + t_j}{4(1 + \pi_i)^3}
\]
Then, from the global optimum condition for the tariff, \(t_i^T\),
= 0, we have the following global optimum for privatization: \( i^* T = \frac{5(k + c_k^* k c)}{6} \) when \( k < -\frac{10c}{c_k^*} \). Notice that the second-order condition satisfies the global optimum, i.e., \( \frac{2W}{k c_{k^*}} = i^* T = \frac{5(k + c_k^* k c)}{6} \). Therefore, we have \( \theta_i^* T > \theta_i^* T^* \) when \( k < -\frac{2\alpha + 9c}{10c} \); otherwise, \( \theta_i^* T = \theta_i^* T^* \). Notice that although the global optimum for privatization is increasing in \( k \), its increasing rate is faster than the local country optimum, i.e., \( \frac{\partial \theta_i^* T}{\partial k} > \frac{\partial \theta_i^* T}{\partial k} > 0 \). Q.e.d.

This implies that even though both countries can get higher welfare from higher privatization and zero tariff policies, they would use a tariff instrument and less privatization to increase their own welfare in a competitive equilibrium. This competitive result can be seen as the prisoner’s dilemma in an international game situation: international competitive equilibrium involves less privatization and a higher tariff, even though they are jointly suboptimal.

3. Concluding Remarks

This paper introduced the competitive privatization and tariff policies in an international mixed market in which the SOE competes with the PE in both the home and foreign markets and investigated the interaction of the two governments regarding the strategic choice of privatization. We demonstrate that the equilibrium degree of privatization depends not only on the relative efficiency of the state-owned enterprise, but also on trade policy. We show that the international competitive equilibrium involves less privatization and a higher tariff, even though they are jointly suboptimal.

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