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AIMS AND SCOPE

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The *HELLENIC OPEN BUSINESS ADMINISTRATION Journal* (The HOBA Journal) is published two times a year, in January and July. These two issues constitute one volume. One or more issues may focus on a specific topic of wider interest and significance, which is announced through relevant call for papers.

The editorial process at The HOBA Journal is a cooperative enterprise. Articles received are distributed to the Editor for a decision with respect to publication. All articles are first reviewed to be judged suitable for this journal. The Editor arranges for refereeing and accepts and rejects papers or, alternatively, forwards the papers to a member of the Board of Editors. The member of the Board of Editors, then, arranges for refereeing and accepts or rejects papers in an entirely decentralized process. In any case, each submission is sent to two referees for blind peer review and the final decision is based on the recommendations of the referees. The referees are academic specialists in the article's field of coverage; members of the Board of Editors and/or members of the Editorial Advisory Board may act as referees in this process. Only when a paper is accepted for publication it is sent again to the Editor. Subsequently, the Editor sends the finally accepted paper to The HOBA Journal office for final editing and typesetting.

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The above outlined co-editing process has major advantages. First, it is helpful in the assignment of referees and in the decision whether to publish a submission. Second, it avoids the apparent conflict of interest that results when an Editor handles a colleague's article. As a general rule the Editor and the members of the Board of Editors never assign papers written by authors at the same institution.

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While the Journal seeks to publish papers, which are academically robust, hence the rigorous review process (double blind peer review), it also seeks to publish papers that communicate effectively. It is interesting, well written and, therefore, readable papers that really contribute to the area of interest. Articles submitted should, therefore, keep technical jargon and statistical formulae within papers to a minimum and always aim to present material, however complex, simply and clearly.

As a forum, the Journal invites responses to articles that are published and is also willing to publish controversial articles to stimulate debate. To facilitate this, in addition to standard articles, the Journal also publishes "viewpoints" and "notes". These are short papers (up to 2,000 words), that explore, or comment on, an issue in a way which is useful, interesting, worthwhile, relevant and, ideally, provocative.

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PARTIAL PRIVATIZATION IN INTERNATIONAL MIXED DUOPOLY WITH PRICE COMPETITION

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Abstract

This paper examines privatization policy in a price-setting mixed duopoly where a domestic public firm competes against a foreign private firm. The domestic government chooses the degree of privatization to maximize domestic welfare. The paper considers two games: Bertrand-Nash competition and Stackelberg competition with the domestic firm being the leader. The paper shows that neither full nor partial privatization is optimal in the two international mixed duopoly games with price competition.

Keywords: International mixed duopoly, Price competition, Partial privatization, Welfare effects, Public firm, Foreign private firm

JEL Classification: C72, D21, D43, F23, L33

Introduction

The analysis by Fershtman (1990) examined a mixed duopoly in which the government owns a partial share of a firm that is the Cournot competitor of a private firm. Since then, the theoretical analysis of partial privatization of state-owned public firms has received significant attention and has been extensively studied by many economists (e.g., Matsumura 1998; Matsumura and Kanda 2005; Tomaru 2006; Fujiwara 2007; Lu and Poddar 2007; Ishibashi and Kaneko 2008; Saha and Sensarma 2008; Artz et al., 2009; Roy chowdhury 2009; Wang et al., 2009; Heywood and Ye 2010; Ohnishi 2010). However, these studies consider mixed markets with domestic firms and do not include foreign firms.¹

Some studies include foreign firms. For example, Chang (2005) examines a Cournot mixed duopoly in which a public firm competes against a foreign private firm, and shows that neither full nationalization nor full privatization is optimal. Chao and Yu (2006) study the effects of partial privatization or foreign competition on optimum tariffs by using a quantity-setting mixed oligopoly with one public and one or more foreign firms, and shows that foreign competition lowers the optimal tariff rate but partial privatization raises it. Han and Ogawa (2008) investigate privatization policy in a quantity-setting international mixed market with two countries, and shows that neither pure welfare-maximizing behavior nor pure profit-maximizing behavior is optimal; that is, the optimal solution is partial privatization. In addition, Wang and Lee (2010) consider an international mixed oligopoly model with asymmetric costs and partial privatization, and find that when the marginal cost of the privatized firm exceeds a critical value, maximum-revenue tariff is higher than optimum-welfare tariff. However, these studies examine international mixed market models with quantity-setting firms, and show that the optimal degree of privatization exhibits neither full privatization nor full nationalization but

¹ International mixed oligopolies are common in developed and developing countries as well as in former communist countries. Public firms compete against foreign private firms in many industries such as the airline, banking, life insurance, steel, shipbuilding, and tobacco. In the tobacco industries of Austria, China, France, Italy, Russia, Japan, Spain, Turkey, etc, we can find real-world examples in which public firms compete or competed against foreign private firms such as Philip Morris and R. J. Reynolds.

partial privatization. There are few papers analyzing partial privatization in international mixed market models with price-setting firms.²

Therefore, we consider a price-setting mixed model in which a domestic public firm competes against a foreign private firm. We extend the analysis of Ohnishi (2010), which investigates a price-setting mixed duopoly model involving a domestic public firm and a domestic private firm to reassess the welfare effect of partial privatization. We examine the welfare effects of privatization by considering two international mixed duopoly games with price competition. The first game is as follows. In the first stage, the domestic government chooses the level of privatization to maximize domestic social welfare. In the second stage, observing the level of privatization, the firms simultaneously and independently choose prices. The second game is as follows. In the first stage, the government chooses the level of privatization to maximize domestic social welfare. In the second stage, observing the level of privatization, the domestic firm choose its price. In the third stage, observing the level of privatization and the domestic firm's price, the foreign firm choose its price.

This paper demonstrates that neither full nor partial privatization is optimal in the two international mixed duopoly games with price competition.

The Basic Model

Let us consider a price-setting mixed duopoly model in which a domestic public firm (firm D) competes with a foreign private firm (firm F). In the remainder of this paper, when i and j are used to refer to firms in an expression, they should be understood to refer to D and F with $i \neq j$. These firms produce imperfectly substitutable goods. There is no possibility of entry or exit. Following Bárcena-Ruiz (2007), we assume that all the consumers are of the same type and the representative consumer maximizes the following utility function:

$$U(q_D, q_F) - p_D q_D - p_F q_F \tag{1}$$

² The analysis by Ohnishi (2011) considers a price-setting mixed duopoly model in which a domestic public firm and a foreign private firm produce complementary goods and demonstrates that partial privatization is optimal for social welfare.

where q_i denotes the quantity of good i and p_i is the price of good i . The utility function $U(q_D, q_F)$ is quadratic, strictly concave and symmetric with respect to q_D and q_F :

$$U(q_D, q_F) = a(q_D + q_F) - \frac{1}{2}(q_D^2 + 2bq_Dq_F + q_F^2) \quad (2)$$

where a is a constant and $b \in (0, 1)$ denotes a measure of the degree of substitutability among products. The demand function is represented as:

$$q_i = \frac{a(1-b) - p_i + bp_j}{1-b^2} \quad (3)$$

For simplicity, we assume that $a = 1$ and $b = 0.5$. Each firm's profit is given as:

$$\pi_i = (p_i - c_i)q_i \quad (4)$$

where c_i is the marginal cost of firm i . Since the result of this paper is not affected by c_i , we normalize it to zero. Firm F aims to maximize its own profit. Furthermore, domestic social welfare is given as:

$$W = CS + \pi_D \quad (5)$$

where CS denotes domestic consumer surplus.

The objective function of firm D is represented as:

$$V = \theta\pi_D + (1-\theta)W \quad (6)$$

where $\theta \in [0, 1]$ denotes the level of privatization. That is, if $\theta = 0$ firm D is purely public, whereas if $\theta = 1$ it is purely private.

We consider the following two games: (B) both firms simultaneously select p_D and p_F ; (S) firm D selects p_D , and firm F selects p_F after observing p_D . Throughout this paper, we use subgame perfection as the equilibrium concept.

Results

In this section, we examine the welfare effects of privatization in the international mixed duopoly model.

Game B

This game is constructed by the following two-stage decision-making. In the first stage, the domestic government chooses the level of privatization, θ , to maximize domestic social welfare. In the second stage, observing θ , the firms simultaneously and independently choose prices.

The equilibrium of Game B can be derived as follows:

$$p_D = \frac{5\theta}{7\theta + 8},$$

$$p_F = \frac{3\theta + 2}{7\theta + 8},$$

$$q_D = \frac{20}{3(7\theta + 8)},$$

$$q_F = \frac{4(3\theta + 2)}{3(7\theta + 8)}.$$

Comparative static results yield $dp_D/d\theta > 0$, $dp_F/d\theta > 0$, $dq_D/d\theta < 0$, and $dq_F/d\theta > 0$. Thus, the privatization increases each firm's price and firm F's output, and decreases firm D's output. Furthermore, the profits and consumer surplus can be expressed as follows:

$$\pi_D = \frac{100\theta}{3(7\theta + 8)^2} \tag{7}$$

$$\pi_F = \frac{4(3\theta + 2)^2}{3(7\theta + 8)^2} \tag{8}$$

$$CS = \frac{8(3\theta^2 + 9\theta + 13)}{3(7\theta + 8)^2} \quad (9)$$

In the first stage, the government chooses the level of privatization. Substituting (7) and (9) into (5), the objective function of the government is obtained as:

$$W = \frac{4(6\theta^2 + 43\theta + 26)}{3(7\theta + 8)^2} \quad (10)$$

The maximization of (10) with respect to θ is derived from $dW/d\theta$, and therefore $\theta = -4/41 \approx -0.098$. When $\theta = 0$, $W = 13/24 \approx 0.542$, and when $\theta = 1$, $W = 4/9 \approx 0.444$. When $0 \leq \theta \leq 1$, W is a strictly decreasing function of θ . This is stated by the following proposition.

Proposition 1. In the price-setting international mixed duopoly game with simultaneous move, neither full nor partial privatization is a reasonable choice for the government that wishes to maximize domestic social welfare; that is, the optimal solution is full nationalization.

Game S

We consider the following Stackelberg game. In the first stage, the domestic government chooses θ to maximize domestic social welfare. In the second stage, observing θ , firm D chooses p_D . In the third stage, observing θ and p_D , firm F chooses p_F .

The equilibrium of Game S can be derived as follows:

$$p_D = \frac{11\theta - 1}{13\theta + 15},$$

$$p_F = \frac{12\theta + 7}{2(13\theta + 15)},$$

$$q_D = \frac{41 - 6\theta}{3(13\theta + 15)},$$

$$q_F = \frac{2(12\theta + 7)}{3(13\theta + 15)}.$$

Furthermore, the profits, consumer surplus and social welfare can be expressed as follows:

$$\pi_D = \frac{(11\theta - 1)(41 - 6\theta)}{3(13\theta + 15)^2} \quad (11)$$

$$\pi_F = \frac{(12\theta + 7)^2}{3(13\theta + 15)^2} \quad (12)$$

$$CS = \frac{156\theta^2 + 360\theta + 817}{6(13\theta + 15)^2} \quad (13)$$

$$W = \frac{24\theta^2 + 1274\theta + 735}{6(13\theta + 15)^2} \quad (14)$$

When $\theta = 0$, $W = 49/90 \approx 0.544$, and when $\theta = 1$, $W = 2033/4704 \approx 0.432$. When $0 \leq \theta \leq 1$, W is a strictly decreasing function of θ . This is stated by the following proposition.

Proposition 2. In the price-setting international mixed duopoly game with firm D as leader, the welfare-maximizing choice for the government is full nationalization.

Conclusion

We have investigated privatization policy in a price-setting mixed duopoly where a domestic public firm competes against a foreign private firm. The home government chooses the degree of privatization to maximize domestic social welfare. First, we have considered Bertrand-Nash competition. Second, we have considered Stackelberg competition with the domestic firm being the leader. We have demonstrated that partial privatization is not optimal for domestic social welfare in the two international mixed duopoly games with

price competition. As a result, we find that this result is quite different from those of quantity-setting international mixed market models.

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