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# *Ex-ante* versus *ex-post* privatization policies with foreign penetration in free-entry mixed markets☆

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ABSTRACT

This study investigates the impact of the timing of privatization and liberalization policies on the degree of privatization and number of entering firms in free-entry mixed markets. We formulate two models: *ex-post* privatization and *ex-ante* privatization. In the former, the government liberalizes the market and then privatizes the public firm, whereas the order of the policies is reversed in the latter. We find that *ex-ante* privatization yields a higher (lower) level of privatization and a larger (smaller) equilibrium number of entering private firms when foreign ownership in private firms is high (low). We also show that the optimal level of privatization is increasing (decreasing) in the share of foreign ownership in the *ex-ante* (*ex-post*) privatization case. Finally, we find that although both the *ex-ante* and the *ex-post* privatization cases yield the same consumer welfare, *ex-ante* privatization always yields higher social welfare than *ex-post* privatization.

## 1. Introduction

Owing to the trend toward economic liberalization, which involves the privatization of public firms and abolition of entry restrictions, new entries of private firms are taking place in many mixed oligopolies in developed and developing countries. Those industries include banking, insurance, health care, hospitals, education, telecommunications, electricity, natural gas, airlines, railways, and so on. However, some governments still hold a large share in public companies privatized gradually over recent decades, including, for instance, Japan Post (Japan's largest bank), NTT (Japan's largest telecommunication company), and KEPCO (Korea's largest electric power corporation).[1] During the privatization of these companies, even though the government decided its privatization policy before the entry of private firms, it also reduced its public ownership share gradually after entry.

The optimal privatization policies adopted in mixed oligopoly in free-entry markets has been the subject of recent research. As a seminal paper, Matsumura and Kanda (2005) showed that full nationalization is always optimal in the long run under free entry when private firms are owned by domestic investors. Cato and Matsumura (2012) showed that partial privatization is optimal when private firms are owned by foreign investors. Brandao and Castro (2007) showed that the presence of a public firm can serve as an alternative

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[1] Historical and practical evidence is provided by Lee (2006) for Korea's telecommunications and electricity industries and Lee, Matsumura, and Sato (2016) for Japan's telecommunications and banking industries.

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to direct entry regulations in precluding the excess-entry problem.[2]

The recent literature on mixed oligopoly in free-entry markets is rich and diverse.[3] Cato (2008) incorporated environmental externalities, Wang and Chen (2010) and Cato (2012) considered firms' cost efficiency gaps, and Wang, Lee, and Hsu (2014) examined foreign competitors in a free-entry market. These studies provided reasonable explanations of the persistence of public firms in certain industries. Ino and Matsumura (2010) investigated the leader–follower relationship, while Cato and Matsumura (2013) and Matsumura and Okumura (2013) investigated the privatization neutrality theorem.[4] Concerning on international trade, Matsumura and Okumura (2014) compared tariff and quota policies, and Cato and Matsumura (2015) and Wang (2016) examined the optimal trade policy in free-entry markets. However, none of these studies has paid attention to the impact of the timing of a game between privatization and liberalization policies.

This study investigates the impact of foreign penetration on privatization and liberalization policies in a free-entry market.[5] We examine two scenarios in which the government chooses the optimal level of privatization before or after private firms enter the market. In one model, the government liberalizes the market and then privatizes the public firm (termed *ex-post* privatization), while the order of the policies is reversed in the other model (*ex-ante* privatization).

Matsumura (1998), Han and Ogawa (2007), and Lin and Matsumura (2012) showed that the optimal level of privatization is never zero regardless of the number of firms and the share of foreign ownership in private firms in restricted-entry markets.[6] By contrast, Matsumura and Kanda (2005) showed that it is zero if the privatization policy is determined before entry and the foreign ownership share in private firms is zero. Therefore, we expect the optimal level of privatization to be higher when the privatization policy is decided after entry. However, we show that this is not always true, finding instead that the results depend on the share of foreign ownership in private firms. We find that *ex-ante* privatization yields a higher (lower) level of privatization and a larger (smaller) number of private firms when foreign ownership is high (low). We also show that although both the *ex-ante* and the *ex-post* privatization cases yield the same consumer surplus, the former always yields higher social welfare. This finding suggests that earlier privatization improves welfare without affecting consumer surplus. Moreover, the difference in the timing of a game in privatization and liberalization policies produces another contrasting policy implication. We show that the optimal level of privatization is increasing (decreasing) in the foreign ownership share in private firms if privatization is implemented before (after) the entry of private firms.

The remainder of this paper is organized as follows. Section 2 presents the basic model. Section 3 analyzes the *ex-ante* and *ex-post* privatization models and presents a comparative analysis of the two cases. Section 4 concludes the study.

## 2. Model

We consider a mixed oligopoly market in which $n + 1$ operating firms produce homogeneous products. Firm 0 is a (partially privatized) public firm jointly owned by both the government and the domestic private sector. The share of private ownership is denoted by $\theta \in [0, 1]$. Firm $i$ $(=1,2,\ldots, n)$ is a private firm owned by both domestic and foreign investors.

The inverse demand function is $P = \alpha - Q$, where $Q$ is the market output and $\alpha$ is a positive constant. The cost functions are given as $C(q^j) = (q^j)^2/2 + F (j = 0, 1, \ldots,n)$, where $(q^j)^2/2$ is the production cost and $F$ is the fixed (sunk) cost. Then, the profits of the public firm and private firm are $\pi^j = Pq^j - (q^j)^2/2 - F$, where $j = 0, 1, \ldots,n$. Consumer surplus and producer surplus are denoted as $CS = Q^2/2$ and $PS = \pi^0 + \sum_{i=1}^{n} (1 - \beta)\pi^i$, where $\beta \in [0, 1]$ is the ownership share of foreign investors in private firm $i$.[7]

We consider a free-entry market in which private firms can enter the market without any entry regulation. Then, the number of private firms is determined at the point where the profit of the private firm is zero. Social welfare is defined as the sum of consumer surplus and producer surplus (i.e., $W = CS + PS$).

A firm's objective functions are subject to its ownership structure. According to Matsumura (1998), a private firm seeks profit maximization, whereas a public firm's objective $V$ is the share-weighted objectives between both social welfare and profits (i.e., $V = \theta\pi^0 + (1 - \theta)W$). We can interpret $\theta \in [0, 1]$ as the level of privatization, where $\theta = 0$ implies full nationalization, $\theta = 1$ implies full privatization, and $\theta \in (0, 1)$ implies partial privatization.

To analyze the optimal level of privatization in free-entry mixed oligopoly, we examine two cases. The first one is *ex-ante* privatization, in which the government chooses the optimal level of privatization before private firms enter the market. The other is *ex-post* privatization, in which the government chooses the optimal level of privatization after private firms enter the market.

[2] The excess-entry problem in private oligopolies was first discussed by Mankiw and Whinston (1986), Suzumura and Kiyono (1987), and Lahiri and Ono (1988).

[3] In various contexts, contrasting implications are obtained in free-entry markets, and thus the literature on the analysis of free-entry markets in both private and mixed oligopolies is nascent. See Etro (2007), Lahiri and Ono (1995, 2007), Ino and Matsumura (2012), and Hattori and Yoshikawa (2016) for further details.

[4] Privatization neutrality theorem states that privatization does not affect welfare regardless of time structure, competition mode, the number of firms, product differentiation, and the degree of privatization under the optimal output subsidy. It has been intensively discussed in White (1996), Poyago-Theotoky (2001), and Tomaru and Saito (2010). However, Matsumura and Tomaru (2012, 2013) showed that this theorem is failed under the existence of either foreign competitors or excess burden of taxation.

[5] As shown by Corneo and Jeanne (1994), Fjell and Pal (1996), and Pal and White (1998), public firms' behavior drastically changes in the presence of foreign firms in product markets because it affects the objectives of public firms. Thus, foreign penetration in the product market is intensively discussed in the literature on mixed oligopoly. See also Barcena-Ruiz and Garzon (2005), Wang and Chen (2011), Lin and Matsumura (2012), Cato and Matsumura (2015), and Wang and Tomaru (2015).

[6] This holds true even when private firms do not maximize profits. See Matsumura and Okamura (2015).

[7] We can interpret the share of foreign ownership as indicating the level of market openness in financial markets (Haraguchi and Matsumura, 2014).