

Strategic Corporate Social Responsibility by a Multinational Firm and International Privatization Policies*

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Abstract We consider a multinational global firm that adopts corporate social responsibility (CSR) in two countries and examine international privatization policies with the strategic transmission of CSR. We find that the strategic level of CSR crucially depends on the percentage of the global firm's shares held in each country. We show that single privatization increases (decreases) CSR when the share is small (large), while dual privatization always leads to the highest CSR. We also show that domestic welfare under global standard of CSR, which is set to improve global welfare, is higher (lower) than that under the global firm's strategic CSR when the share is small (large). Finally, we show that dual nationalization is a unique equilibrium in an international privatization choice game, irrespective of imposing the global standard of CSR, which causes global welfare loss.

Keywords Global Firm, Strategic CSR, Global Standard of CSR, International Privatization Policy

JEL Classification L13, L33, D43

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1. INTRODUCTION

In modern economies, most international trade is dominated by a few multinational global firms, which participate heavily in the international multiple activities and account for substantial shares of aggregate trade.¹ Accordingly, research in international trade has changed dramatically over the last twenty years, as attention has shifted from countries and industries toward firms. Many studies have shown that exporting outputs or importing inputs through international transactions can potentially enhance the productive capacity of domestic firms through productivity gains, R&D, and innovation.² The main mechanism proposed in the literature to explain the relation between productivity and engagement with global markets is that technology can be transmitted through the global production.

In recent years, the interest in corporate social responsibility (CSR) from a social demand perspective has grown rapidly in response to globalization, limitations in government regulations, and an increasing societal and media demand for ethical and environmentally responsible business operations.³ CSR has now become a global business strategy and provides significant welfare implications for designing optimal policies.⁴ Subsequently, recent research on oligopoly markets with heterogeneous objective functions has analyzed different forms of market competition in which profit-maximizing firms may compete with other global firms that adopt CSR activities.

¹Using US firm and trade transactions data, for example, Bernard *et al.* (2018) reviewed the shares of aggregate trade in international economics and provided strong evidence in support of interdependencies and complementarities between the margins of global firms from their international participation.

²For example, see Blalock and Gertler (2008), Lileeva and Trefler (2010), Puga and Trefler (2010), and Aw *et al.* (2011) among others.

³Some practical examples include GE's Ecomagination program, Nestle's Creating Shared Values, and Unilever's Simple Living Plan. For comprehensive discussions on recent CSR research, see Bénabou and Tirole (2010), Schreck (2011), Kitzmueller and Shimshack (2012), Crifo and Forget (2015), and Kim *et al.* (2019).

⁴According to KPMG (2015, 2017), CSR activities are indeed a dominant global business practice of the firms, but only 64% of the companies surveyed in 45 countries issued CSR reports, 73% of the top 100 companies reported their CSR activities, and 92% of the world's 250 largest companies (in the 250 Global Fortune Index) performed CSR actions. It shows that global firms are more actively participating in CSR than other domestic firms. Further, more than 60% of the firms in all industry sectors now report on CSR all over the world, with 80% in the American region, 78% in the Asia Pacific region, 77% in Europe, and 52% in Africa. CASS (2017) also reports that an annual average of 71.4% of Chinese listed companies produce CSR reports. This implies that the widely observed phenomenon of different industries and countries where firms' CSR activities are more or less, commonly widespread in the real world.

Among the various motives for CSR, its strategic use in markets with imperfect competition plays an important role. In particular, many theoretical papers utilized an oligopoly model in which the firm adopts consumer surplus as a proxy of its own CSR concerns in the market transactions.⁵ Then, a CSR-related incentive combines both profitability and consumer surplus. The basic idea is that even pure profit-maximizing firms engage in CSR because it may serve as a commitment device for their strategic choices in oligopolistic environments.

Despite the global trend of CSR in internationalization and liberalization, state-owned firms are still highly concentrated in a few strategic sectors such as transportation, telecommunications, power generation, electricity, finance, and energy-related industries, and control large portions of global resources.⁶ In fact, many developed and developing countries have continued to privatize their state-owned firms since the 1980s. Thus, privatization in these industries has attracted extensive policy attention from economics researchers in developed, developing, and transitional economies, such as Eastern Europe, Latin America, and Asia, including China.

In fact, the recent decade has witnessed an increasing application of international mixed oligopoly frameworks where public and private firms compete in the market. Many researchers have found them an extremely useful instrument for analyzing policy interactions between governments and firms in international markets. For example, Fjell and Pal (1996) proposed an economic model of a mixed oligopoly with foreign competitors and investigated the effect of the introduction of foreign private firms on market price and production allocation. Since then, many researchers have investigated the welfare effect of privatization policy in an international mixed market.⁷ In particular, recent research has analyzed different forms of market competition in which profit-maximizing private firms

⁵Many researchers have investigated various aspects of CSR issues, involving horizontal competition (Kopel and Brand, 2012; Matsumura and Ogawa, 2014; Liu *et al.*, 2015; Leal *et al.*, 2018), vertical relations (Goering, 2012, 2014; Brand and Grothe, 2013, 2015; Garcia *et al.*, 2018), environmental CSR (Liu *et al.*, 2015; Hirose *et al.*, 2017, 2020; Lee and Park, 2019; Fukuda and Ouchida, 2020), and international tariffs (Wang *et al.*, 2012; Chang *et al.*, 2014; Chao and Yu, 2006; Manasakis *et al.*, 2018; Liu *et al.*, 2018; Xu and Lee, 2019).

⁶According to an OECD report by Kowalski *et al.* (2013), among the 2000 largest public companies in the world, more than 10% are either SOEs or have significant government ownership; these government-associated companies' sales are equivalent to approximately 6% of the global GDP. For some evidences in China, see Xu *et al.* (2020).

⁷Pal and White (1998, 2003), Yu and Lee (2011), Lee *et al.* (2013), Xu and Lee (2015) and Cato and Matsumura (2015) discussed the relationship between privatization and trade policies, while Lin and Matsumura (2012), Cato and Matsumura (2012), and Xu *et al.* (2017) considered foreign penetration of private firm's ownership. Choi (2015) considered the excess burden of taxation in a unitized mixed oligopoly.

may compete with other private firms that have adopted CSR activities.⁸ However, these works took the level of CSR as an exogenous, given variable that was a normative goal established in the social contract. Further, previous research on mixed markets has focused on the strategic relations between privatization and CSR without considering the global firm in international markets.

In this study, we address strategic motivations for CSR emerging from interactions between global and domestic firms in the context of a mixed market where public and private firms coexist in each country. The development of the global firm in the world market requires reconsideration of the decisions on privatization and CSR in light of international competition where the domestic ownership share of the global firm is important, which might differ among the countries.⁹ In the presence of different ownership shares of the global firm, the examination of the effect of privatization on the CSR decision of a global firm with multiple plants in international markets is a worthwhile endeavor. Our contribution to the theoretical research is to develop a framework that incorporates a wider range of global firms' strategic activities in international mixed markets. To determine the extent to which privatization policy affects CSR, we examine whether a global firm strategically changes the degree of its CSR, depending on privatization policy of each country and the ownership share of the domestic investors, and investigate the effect of CSR on the domestic and global welfares in different countries. Our study adds to the literature by examining whether a global firm's strategic adoption of CSR is an additional potential source of gain from global engagement.¹⁰

We specifically consider triopoly markets in two countries, in which a domestic public firm competes with a domestic private firm as well as a global firm in each country where the global firm may choose the transmission of CSR be-

⁸For example, recent theoretical studies have examined the effect of CSR on tariffs and welfare in international trade, such as Wang *et al.* (2012), Chang *et al.* (2014), Manasakis *et al.* (2018), Liu *et al.* (2018), Wang *et al.* (2018), Cho *et al.* (2019) and Xu and Lee (2019).

⁹For example, government restriction on the foreign ownership among the countries in the Association of Southeast Asian Nations (ASEAN) differ. Thailand government does not permit more than 50% foreign ownership, whereas 100% foreign ownership is allowed in Vietnam. For more descriptions on the investment laws of ASEAN countries are provided in <https://www.iisd.org/sites/default/files/publications/investment-laws-asean-countries.pdf>

¹⁰As related works based on the bilateral mixed oligopoly framework in an international competition, Lee *et al.* (2013) and Xu and Lee (2019) examine policy competitions between tariffs and privatization while Xu and Lee (2015) analyzes strategic relationship between environmental tax and tariffs under different privatization policies between the two countries. Further, Xu *et al.* (2016) incorporates the excess burden of taxation of subsidy/tariff under privatization policies.

havior in both countries.¹¹ Extending analytic framework of Kim *et al.* (2019), we will consider a global firm participating in CSR activities in both countries and focus on the analysis of the effect of privatization policy on the strategic CSR of the global firm by eliminating the trade effect between the countries. We examine four different regimes of privatization policies of each government, that is, (i) dual privatization of public firms in each country (i.e., dual private markets), (ii) dual nationalization of public firms in each country (i.e., dual mixed markets), and (iii) single privatization of one of the public firms in each country (i.e., two asymmetric private and mixed markets). We also compare the equilibrium outcomes of each model and analyze how the privatization policy and the percentage of the global firm's shares held in each country affect the strategic CSR and the domestic and global welfares.

The following are the main findings. First, we show that the effects of privatization on the degree of CSR and welfares depend on the percentage of the global firm's shares held in each country. On one hand, dual privatization policy increases the strategic CSR of the global firm, which could substitute the output-reducing effect of the dual privatization policy. However, dual privatization policy reduces (improves) domestic welfare when the percentage of shares held in this country is low (high), but it always improves global welfare.

On the other hand, when the percentage of the global firm's shares held in one country is small (large), single privatization in this county increases (decreases) the degree of CSR and global welfare, but reduces (improves) domestic (foreign) welfare. Further, single privatization policy in one country leads to the highest domestic welfare in the rival country.

Second, we examine the global standard of CSR, which is set cooperatively to maximize global welfare, and show that the effects of privatization on the global standards also depend on the percentage of the global firm's shares held in each country, while the global CSR is always higher than the strategic CSR. Moreover, domestic welfare under global CSR is higher (lower) than that under strategic CSR when the percentage of shares held in this country is small (large). Further, the global CSR always leads to a higher global welfare. Analyzing global welfare levels, we find that dual privatization policy leads to the highest global welfare when the global firm is equally owned by two countries, while single privatization policy in one country leads to the highest global welfare when the global firm is almost owned by this country.

¹¹Plenty of works assumed an asymmetric market organization where CSR adoption can be endogenously chosen, but only some firms adopt CSR among all firms. For example, Lambertini and Tampieri (2015) and Leal *et al.* (2018) showed that CSR might increase the profits of the CSR-initiated firm than non-CSR firms in the homogeneous product market.

Finally, we investigate an international privatization choice game between two governments and show that irrespective of imposing the global standard of CSR, dual nationalization is a unique Nash equilibrium of the game, which yields the lowest level of CSR and social welfare when the percentage of shares held is intermediate. Therefore, two countries get a global welfare loss in a prisoner's dilemma situation in which both countries choose a nationalization policy even though privatization policy is globally optimal. Therefore, an appropriate global cooperation on international privatization policies is necessary in international markets with a global firm which may adopt CSR.

The remainder of this paper is organized as follows. Section 2 introduces the basic model. In Section 3, we consider four different models and analyze equilibrium outcomes. In Section 4, we compare the results of strategic CSR, domestic welfare, and global welfare in the four models. We also examine the global CSR standard and compare the outcomes with those under strategic CSR. In Section 5, we consider an international privatization choice game between two countries. Section 6 concludes the paper.

2. THE MODEL

Suppose that there are two countries, i and j , where three different firms in each country coexist: a state-owned public firm, a private firm, and a global firm. The global firm is defined as a profit-oriented private firm with a concern for two countries' consumer surplus as a CSR initiative.¹² We assume that the public and private firms supply products only in the domestic market, but the global firm can supply in both markets. We also assume that β percent of the ownership share of the global firm is held in country i and $(1 - \beta)$ percent in country j . We assume that $\beta \in (0, 1)$, which is exogenously given and might differ between the countries.¹³

All firms produce homogeneous products and the consumption of products in country i is denoted as $Q_i = q_{si} + q_{hi} + q_{ci}$, where q_{si} , q_{hi} , and q_{ci} denote the quantities supplied by a public firm, a private firm, and a global firm in country i , respectively, where $i \neq j$. The inverse demand in both markets is symmetric and is given as: $p_i = 1 - Q_i$, where p_i is the market price in country i . Each firm's

¹²Many studies formulated the CSR-initiative by utilizing a theoretical model where the firm adopts consumer surplus as a proxy of its own CSR concerns. For example, see Kopel and Brand (2012), Brand and Grothe (2013), Matsumura and Ogawa (2014), Lambertini and Tampieri (2015), Kopel (2015), Leal *et al.* (2018), Garcia *et al.* (2018), and Xu and Lee (2019) among others.

¹³For instance, β is different between the two countries in the ASEAN countries.

cost function is the same and is assumed to be quadratic, as assumed in mixed oligopoly literature. Then, the profits of the three firms are:

$$\begin{aligned}\pi_{si} &= p_i q_{si} - \frac{1}{2} q_{si}^2, \\ \pi_{hi} &= p_i q_{hi} - \frac{1}{2} q_{hi}^2, \text{ and} \\ \pi_c &= (p_i q_{ci} - \frac{1}{2} q_{ci}^2) + (p_j q_{cj} - \frac{1}{2} q_{cj}^2).\end{aligned}\tag{1}$$

Note that the profit of the global firm in the two countries is $\pi_c = \pi_{ci} + \pi_{cj}$ where $\pi_{ci} = \beta \pi_c$ in country i , and $\pi_{cj} = (1 - \beta) \pi_c$ in country j . Note also that the global firm has a CSR initiative, which takes care of consumer surplus in both markets. Following Xu and Lee (2019), the objective function of the global firm is assumed as follows:

$$G = \pi_c + \alpha(CS_i + CS_j),\tag{2}$$

where $\alpha \in [0, 1]$ represents the degree of a global firm's CSR and $CS_i = 1/2 Q_i^2$ is the consumer surplus in country i , where $i \neq j$. That is, a CSR initiative implies that the private firm adopts consumer surplus as a proxy for its own CSR concerns. Note that the CSR incentive combines both profitability and consumer surplus in a convex combination formula. When a global firm engaged in CSR places a weight on consumer surplus in its objective function, it is analogous with assuming that the firm places a higher weight on output and is thus aggressive in production. Here, $\alpha = 0$ indicates a pure profit-maximizing private firm. Finally, we assume that the global firm strategically chooses its degree of CSR to maximize its profits in Eq. (1). It is worth noting that we adopt a strategic perspective of CSR, which can be used to increase profitability.¹⁴

We define domestic welfare as the sum of consumer surplus and domestic industry profits in each country:

$$\begin{aligned}W_i &= CS_i + \pi_{si} + \pi_{hi} + \pi_{ci}, \text{ and} \\ W_j &= CS_j + \pi_{sj} + \pi_{hj} + \pi_{cj}.\end{aligned}\tag{3}$$

¹⁴Kim *et al.* (2019) reviewed the recent perspective of CSR in the economics literature. In particular, a firm that engages in CSR can earn higher profits in a managerial delegation model where it uses an instrumental CSR to increase its profitability. See, for example, Kopel and Brand (2012), Lambertini and Tampieri (2015), Kopel (2015), Garcia *et al.* (2018), and Lee and Park (2019).

Global welfare is the sum of the two domestic welfares:

$$\bar{W} = W_i + W_j. \quad (4)$$

The objective function of the public firm depends on whether it is privatized or not: the public firm is assumed to maximize domestic welfare in Eq. (3), while the fully privatized firm is assumed to maximize its own profits in Eq. (1).¹⁵

A three-stage game is constructed. In the first stage, the government decides whether to privatize its public firm. In the second stage, the global firm chooses the degree of CSR. In the third stage, upon observing the global firm's degree of CSR in a mixed or private market, the three firms compete in quantities in a Cournot fashion. The subgame perfect Nash equilibrium is solved by backward induction.

3. THE ANALYSIS

In this section, we consider four different models: mixed markets in both countries, private markets in both countries, and two asymmetric private and mixed markets. In the dual mixed markets, both governments symmetrically choose to keep their public ownership, and thus, a public firm competes with both a domestic private firm and a global firm in a mixed oligopoly in both countries. In the dual private markets, both governments symmetrically choose to privatize their public firms, and thus, two domestic private firms compete with the global firm in a private oligopoly in both countries. However, in the asymmetric markets, one government keeps its public firm while the other government chooses to privatize.

3.1. DUAL MIXED MARKETS

In the third stage, the public firm in each market maximizes its domestic welfare. Then, the differentiation of Eq. (3) with respect to q_{si} and q_{sj} , respectively,

¹⁵The privatized firm is assumed to be a pure profit-maximizing firm compared with the global firm with CSR-initiative. This implies that firms behave differently in response to the government policies because of different corporate cultures, values, structures, and strategies. See Post *et al.* (2002) and Liu *et al.* (2018).

yield:

$$\begin{aligned}\frac{\partial W_i}{\partial q_{si}} &= 1 - \beta q_{ci} - q_{hi} - 2q_{si} = 0, \text{ and} \\ \frac{\partial W_j}{\partial q_{sj}} &= 1 - (1 - \beta)q_{cj} - q_{hj} - 2q_{sj} = 0.\end{aligned}\tag{5}$$

For the private firm in each market, the differentiation of Eq. (1) with respect to q_{hi} and q_{hj} , respectively, yield:

$$\begin{aligned}\frac{\partial \pi_{hi}}{\partial q_{hi}} &= 1 - q_{ci} - 3q_{hi} - q_{si} = 0, \text{ and} \\ \frac{\partial \pi_{hj}}{\partial q_{hj}} &= 1 - q_{cj} - 3q_{hj} - q_{sj} = 0.\end{aligned}\tag{6}$$

For the global firm in both markets, the differentiation of Eq. (2) with respect to q_{ei} and q_{ej} , respectively, yield:

$$\begin{aligned}\frac{\partial G}{\partial q_{ei}} &= 1 - 3q_{ci} - q_{hi} - q_{si} + \alpha(q_{ci} + q_{hi} + q_{si}) = 0, \text{ and} \\ \frac{\partial G}{\partial q_{ej}} &= 1 - 3q_{cj} - q_{hj} - q_{sj} + \alpha(q_{cj} + q_{hj} + q_{sj}) = 0.\end{aligned}\tag{7}$$

By solving Eqs. (5)-(7), we derive the equilibrium outputs of the three firms in the third stage as

$$\begin{aligned}q_{si} &= \frac{6 - \alpha - 2\beta - \alpha\beta}{2H_1}, q_{hi} = \frac{2 - 2\alpha + \alpha\beta}{2H_1}, q_{ci} = \frac{2 + 3\alpha}{2H_1}, \text{ and} \\ q_{sj} &= \frac{4 - 2\alpha + 2\beta + \alpha\beta}{2H_2}, q_{hj} = \frac{2 - \alpha - \alpha\beta}{2H_2}, q_{cj} = \frac{2 + 3\alpha}{2H_2}.\end{aligned}\tag{8}$$

where $H_1 = 7 - 2\alpha - \beta + \alpha\beta$ and $H_2 = 6 - \alpha + \beta - \alpha\beta$. Note that (i) $\partial q_{si}/\partial \alpha \geq (\leq) 0$ when $\beta \leq (\geq) 1/3$ and $\partial q_{sj}/\partial \alpha \leq (\geq) 0$ when $\beta \leq (\geq) 2/3$; (ii) $\partial q_{hi}/\partial \alpha < 0$ and $\partial q_{hj}/\partial \alpha < 0$; (iii) $\partial q_{ci}/\partial \alpha > 0$ and $\partial q_{cj}/\partial \alpha > 0$. First, the effect of α on the output of the public firm depends on β . The output of the public firm in country i is increasing in α when β is small, whereas it is decreasing in α when β is large. In other words, when a relatively smaller percentage of

shares in the global firm is held in country i , that is, $0 < \beta < 1/3$, the domestic public firm will produce more products when the global firm pays more attention to CSR. Thus, the public and global firm's products are strategic complements when β is low. Second, the effect of α on the outputs of the private and global firms are independent of β . In particular, the private firm's output decreases in α , whereas the global firm's output increases in α . In other words, when the global firm pays more attention to CSR, it chooses to produce more, whereas the domestic private firm will produce less. Thus, products are strategic substitutes among these two private firms.

The global firm's resulting profit is

$$\pi_c = \frac{1}{8H_1^2H_2^2}(2 + 3\alpha)(6(85 - 2\beta + \beta^2) - \alpha(979 + 62\beta - 62\beta^2) + \alpha^2(358 + 80\beta - 80\beta^2) - \alpha^3(39 + 6\beta - 6\beta^2)). \quad (9)$$

The resulting global welfare is

$$\begin{aligned} \bar{W} = & \frac{1}{4H_1^2H_2^2}(4(1249 + 74\beta - 74\beta^2) - 2\alpha(2078 + 169\beta - 163\beta^2 - 12\beta^3 + 6\beta^4) \\ & + \alpha^2(449 + 507\beta - 485\beta^2 - 44\beta^3 + 22\beta^4) \\ & + 2\alpha^3(98 - 67\beta + 63\beta^2 + 8\beta^3 - 4\beta^4) - \alpha^4(35 - 19\beta + 21\beta^2 - 4\beta^3 + 2\beta^4)). \end{aligned} \quad (10)$$

In the second stage, the global firm chooses its degree of CSR to maximize its own profit in Eq. (9). Thus, the differentiation of Eq. (9) with respect to α yields

$$\begin{aligned} \frac{\partial \pi_c}{\partial \alpha} = & \frac{1}{4H_1^3H_2^2}(2(5196 - 995\beta + 931\beta^2 + 128\beta^3 - 64\beta^4) \\ & - \alpha(101428 + 7205\beta - 7067\beta^2 - 276\beta^3 + 138\beta^4) \\ & + 6\alpha^2(10672 + 2830\beta - 2733\beta^2 - 194\beta^3 + 97\beta^4) \\ & - \alpha^3(14848 + 2635\beta - 2397\beta^2 - 476\beta^3 + 238\beta^4) \\ & + 3\alpha^4(409 - 50\beta + 24\beta^2 + 52\beta^3 - 26\beta^4)) = 0. \end{aligned} \quad (11)$$

Solving Eq. (11), we can find the strategic CSR at equilibrium, but it is too long to write. Thus, we will show the equilibrium results in graphic form in

Fig. 1.¹⁶ We can show that the relationship between strategic CSR and β is a U shape. In particular, strategic CSR is minimized when $\beta = 1/2$, whereas it is maximized when $\beta = 0$ and $\beta = 1$. In other words, the degree of CSR is decreasing in β when the share hold in country i is less than a half, while it is increasing in β when the share hold in country i is more than a half. In particular, we have $\alpha^{MM} = 0.103$ when $\beta = 1/2$, and $\alpha^{MM} = 0.110$ when $\beta = 0$ and $\beta = 1$, where subscript “MM” denotes the equilibrium in the dual mixed markets. Thus, we have $\alpha^{MM} \in [0.103, 0.110]$.

Note that domestic welfare is increasing in β in country i and $W_i^{MM} \in [0.318, 0.395]$. That is, when the larger percentage of shares in the global firm is held in the country it will be better off, whereas it will be worse off when the larger percentage of shares is held in the rival country. Moreover, we also show that the relationship between global welfare and β is inverted U shaped and global welfare is maximized when $\beta = 1/2$. In other words, from the view of global welfare, it is socially desirable when equal shares are held in both countries. Finally, we have $\bar{W}^{MM} \in [0.712, 0.715]$.

3.2. DUAL PRIVATE MARKETS

In the third stage, the fully privatized public firm in each market maximizes its profit in Eq. (1), and thus, the differentiation of Eq. (1) with respect to q_{si} and q_{sj} yield

$$\begin{aligned} \frac{\partial \pi_{si}}{\partial q_{si}} &= 1 - q_{ci} - q_{hi} - 3q_{si} = 0, \text{ and} \\ \frac{\partial \pi_{sj}}{\partial q_{sj}} &= 1 - q_{cj} - q_{hj} - 3q_{sj} = 0. \end{aligned} \tag{12}$$

Solving Eqs. (6), (7) and (12), the equilibrium outputs of three firms are derived as

$$\begin{aligned} q_{si} = q_{sj} = q_{hi} = q_{hj} &= \frac{2 - \alpha}{2(5 - \alpha)}, \text{ and} \\ q_{ci} = q_{cj} &= \frac{1 + \alpha}{5 - \alpha}. \end{aligned} \tag{13}$$

¹⁶Fig. 2 and Fig. 3 also represents the equilibrium domestic and global welfares of the following four cases.

Note that $\frac{\partial q_{si}}{\partial \alpha} = \frac{\partial q_{sj}}{\partial \alpha} = \frac{\partial q_{hi}}{\partial \alpha} = \frac{\partial q_{hj}}{\partial \alpha} < 0$ and $\frac{\partial q_{ci}}{\partial \alpha} = \frac{\partial q_{cj}}{\partial \alpha} > 0$. That is, the output of the private firm is decreasing in α , whereas the output of the global firm is increasing in α . Products are also strategic substitutes among the private and global firms.

The profit of the global firm is

$$\pi_c = \frac{3(1 - \alpha^2)}{(5 - \alpha)^2}. \quad (14)$$

The resulting global welfare is

$$\bar{W} = \frac{3(2 - \alpha)(6 + \alpha)}{2(5 - \alpha)^2}. \quad (15)$$

In the second stage, the global firm chooses its degree of CSR to maximize its own profit in Eq. (14). Thus, the differentiation of Eq. (14) with respect to α yields

$$\alpha^{PP} = \frac{1}{5}. \quad (16)$$

where subscript ‘‘PP’’ denotes the equilibrium in the dual private markets. Note that the strategic CSR is independent of β . In the dual private markets, the profit of the global firm is independent of β , thus, the percentage of shares held in each country does not affect the degree of CSR.

Domestic welfare and social welfare are

$$W_i^{PP} = \frac{77}{256} + \frac{\beta}{8}, W_j^{PP} = \frac{109}{256} - \frac{\beta}{8}, \text{ and } \bar{W}^{PP} = \frac{93}{128} = 0.726. \quad (17)$$

Note that domestic welfare in country i (j) is increasing (decreasing) in β , and $W_i^{PP} \in [0.301, 0.426]$. Moreover, global welfare is independent of β in the dual private markets.

Below, we compare the results in the dual mixed markets with those in the dual private markets, and examine the effect of privatization policy by both countries.

Lemma 1. *Dual privatization policy increases the global firm’s strategic CSR.*

The output of the global firm is increasing in α and products among the private firms are strategic substitutes. Thus, when both governments choose to privatize their public firms, the global firm pays more attention to CSR, which can reduce this output-reducing effect of privatization policy, but increases the

profit of the global firm from the increasing degree of CSR. Thus, the dual privatization policy and strategic CSR are complements.

Lemma 2. *Dual privatization policy reduces (improves) domestic welfare when β is low (high) in its domestic market, but it always improves global welfare.*

When both governments privatize their public firms simultaneously, one government could be better off ex-post privatization only when it has a larger percentage of the share in the global firm. Moreover, from the viewpoint of global welfare, the dual privatization policy is always better for both countries.

3.3. PRIVATE-MIXED MARKETS

We now consider an asymmetric case with the private-mixed markets in which only the government in country i chooses to privatize its public firm, while the government in country j chooses not to in the first stage. Thus, the global firm competes in a private (mixed) market in country i (j).

In the third stage, the equilibrium outputs of the three firms in country i and j are the same as those in Eqs. (13) and (8). Then, the resulting profit of the global firm is

$$\begin{aligned} \pi_c = & [12(61 + 12\beta + \beta^2) - 4\alpha(41 + 92\beta + 6\beta^2) - \alpha^2(973 + 340\beta) \\ & + 2\alpha^3(179 + 140\beta + 12\beta^2) - 3\alpha^4(11 + 12\beta + 4\beta^2)]/8(5 - \alpha)^2H_2^2. \end{aligned} \quad (18)$$

The resulting global welfare is

$$\begin{aligned} \bar{W} = & [4(649 + 208\beta + 9\beta^2) - 2\alpha(842 + 629\beta + 117\beta^2) + \alpha^2(69 + 425\beta + 92\beta^2) \\ & + 2\alpha^3(41 - 5\beta - \beta^2) - \alpha^4(10 + 5\beta + 4\beta^2)]/4(5 - \alpha)^2H_2^2. \end{aligned} \quad (19)$$

In the second stage, the global firm maximizes its profit in Eq. (18) and chooses its degree of CSR:

$$\begin{aligned} \frac{\partial \pi_c}{\partial \alpha} = & \frac{3(1 - 5\alpha)}{(5 - \alpha)^3} - \frac{5(3 + \alpha)(2 + 3\alpha)^2}{4(1 - \alpha)^2H_2^3} + \frac{(2 + 3\alpha)(19 + 21\alpha)}{4(1 - \alpha)^2H_2^2} - \frac{1 + 4\alpha}{(1 - \alpha)^2H_2} \\ = & 0. \end{aligned} \quad (20)$$

Note that the strategic CSR is decreasing in β and $\alpha^{PM}(\beta = 0) = 0.197$ while $\alpha^{PM}(\beta = 1) = 0.106$. Thus, we have $\alpha^{PM} \in [0.106, 0.197]$, where subscript “PM” denotes the equilibrium in the private-mixed markets. Note that the domestic welfare in country i (j) is also increasing (decreasing) in β . Then, we have $W_i^{PM} \in [0.301, 0.393]$. Global welfare is decreasing in β in the private-mixed markets. That is, global welfare is maximized when one country chooses an earlier privatization and the rival country holds all shares of the global firm. Then, we have $\bar{W}^{PM} \in [0.710, 0.730]$.

Below, we compare the results in the dual mixed markets and those in the private-mixed markets, and examine the effect of privatization policy by both countries. The following lemma shows the effect of the ex-post privatization in county i on the degree of the strategic CSR and welfares.

Lemma 3. *Single privatization in county i increases (decreases) the degree of CSR when β is low (high).*

When the government in country i chooses to privatize its public firm, the global firm mostly pays more attention to CSR, which can reduce the output-reducing effect of privatization policy. However, if the shares of this global firm are all held in the rival country j , the ex-post privatization in country i could lead to a decrease in the strategic CSR of the global firm.

Lemma 4. *Single privatization in county i reduces (improves) domestic (foreign) welfare whereas it improves (reduces) global welfare when β is low (high).*

This implies that the domestic government which privatizes its public firm could be worse off because of this earlier privatization, while the foreign government will be better off. However, the effect on global welfare depends on the relative share in the global firm. In particular, when the shares in the global firm are all held in the rival country j , the single privatization in country i reduces global welfare.

3.4. MIXED-PRIVATE MARKETS

As a reversed case, we can also consider an asymmetric case with mixed and private markets in which the government in country i decides to privatize its public firm while the government in country j decides not to privatize in the first stage. Then, the global firm competes in a private (mixed) market in country i (j). In this case, however, if we change i to j and β to $1 - \beta$, the results are the same as those in the previous model with private and mixed markets in each country. Therefore, we exclude the detailed analysis. We use the subscript “MP” to denote the equilibrium in the mixed-private markets.

4. DISCUSSION ON THE CSR INITIATIVE

4.1. COMPARISONS OF STRATEGIC CSR

Proposition 1. *Dual privatization policy always leads to the highest degree of the strategic CSR, whereas dual nationalization (single privatization) policy leads to the lowest degree of the strategic CSR when β is (not) intermediate.*

Figure 1: Comparison of the strategic CSR

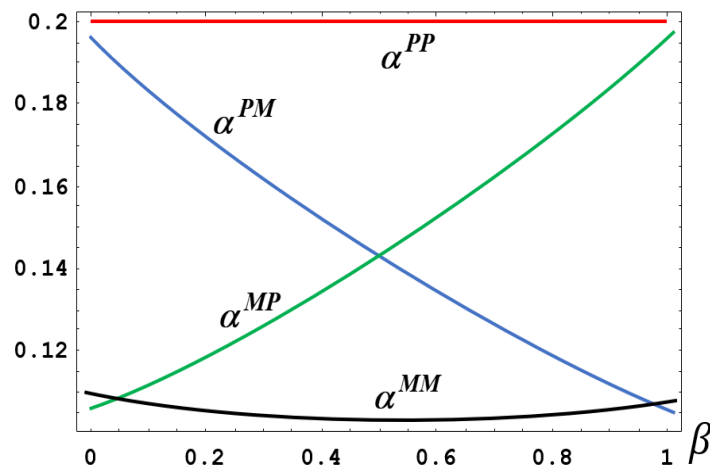


Fig. 1 shows the comparison of the strategic CSR of the four models. First, when the two governments simultaneously choose to privatize their public firms, the global firm will be more aggressive and thus always choose the highest degree of CSR, which could reduce the output-reducing effect of the dual privatization policy. Second, when the two governments simultaneously choose not to privatize their public firms, the global firm will be less aggressive and thus chooses the lowest degree of CSR when its shares are almost the same in both countries, that is, β is intermediate. Otherwise, single privatization leads to the lowest degree of CSR when the shares in the global firm are almost fully held in the opposite country.

Proposition 2. *Single privatization policy leads to the lowest (highest) domestic welfare in its own (rival) country.*

Figure 2: Comparison of domestic welfare

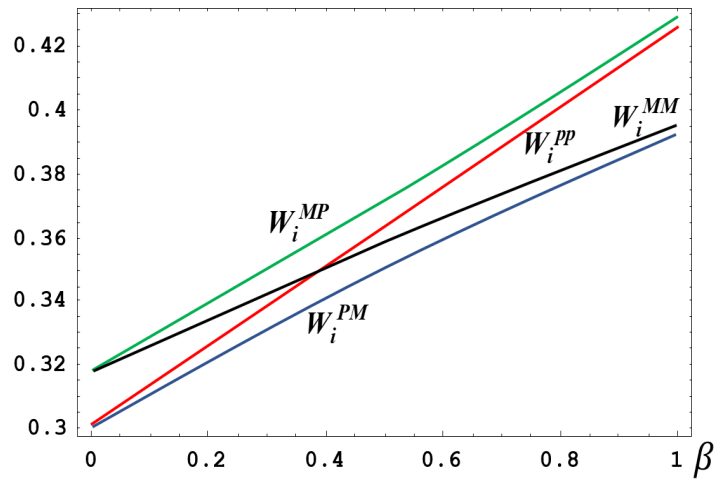


Figure 3: Comparison of global welfare

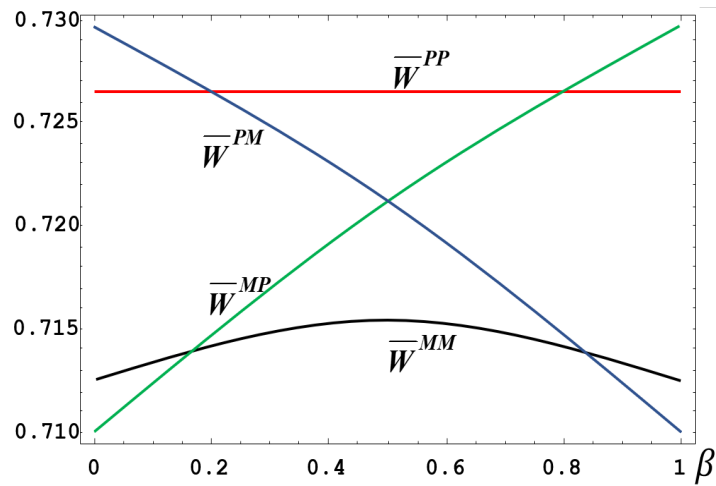


Fig. 2 shows the comparison of domestic welfare of the four models while Fig. 3 shows the comparison of global welfare of the four models. It shows that when the public firm competes with both the domestic private firm and the global firm, the local government will benefit the most from the later privatization policy decision, whereas it will lose the most from an early decision. Hence, both governments will hesitate to choose privatization before the other country. We will discuss this result in an international privatization choice game in the next section.

4.2. COMPARISONS WITH GLOBAL CSR STANDARDS

Below, we can imagine the case that both countries can cooperatively set the global CSR standard which can maximize global welfare and impose to the global firm to meet this global CSR standard under the global guideline, for example, proposed by the OECD.¹⁷ Then, the global CSR standard can lead to a higher global welfare, compared to strategic CSR by a global firm. We can consider four different models and examine the global CSR standard in each case, respectively.

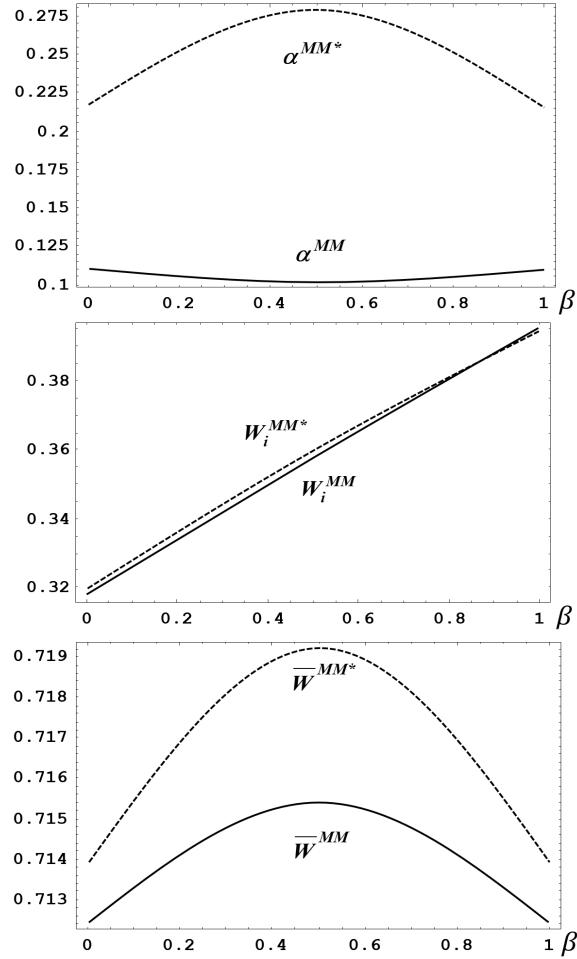
First, we consider the global CSR standard in the dual mixed markets. Then, the differentiation of Eq. (10) with respect to α , i.e., $\frac{\partial \bar{W}}{\partial \alpha} = 0$, yields the global CSR standard.¹⁸ Note that the relationship between the global CSR standard and β is inverted-U shaped. That is, the global CSR standard increases first and then decreases with β , and it is higher than the strategic CSR. The global standard is maximized when $\beta = 1/2$, while it is minimized when $\beta = 0, 1$. Then, we have $\alpha^{MM*}(\beta = 0, 1) = 0.278$ and $\alpha^{MM*}(\beta = 1/2) = 0.215$. Thus, we have $\alpha^{MM*} \in [0.712, 0.715]$.

¹⁷It is becoming more common that global policy standards for international CSR are suggested for multinational global firms. The European Commission promotes CSR in the EU and encourages firms to adhere to international guidelines and principles. The ISO 26000 guidance on social responsibility was published in 2010, and the updated OECD guidelines for multinational enterprises and the UN guiding principles on business and human rights were released in 2011. Furthermore, the Global Reporting Initiative (GRI) provides a globally applicable framework for drawing up sustainability reports in accordance with internationally recognized criteria (see Aaronson, 2007; Vidal-Leon, 2013).

¹⁸We show the equilibrium CSR and welfares and the comparison with those under strategic CSR in MM case in Fig. 4. Accordingly, Fig. 5 and Fig. 6 represents the comparisons in PP case and PM case.

Lemma 5. *In the dual mixed markets, domestic welfare under global CSR standard is higher (lower) than that under strategic CSR when β is low (high) in country i ;*

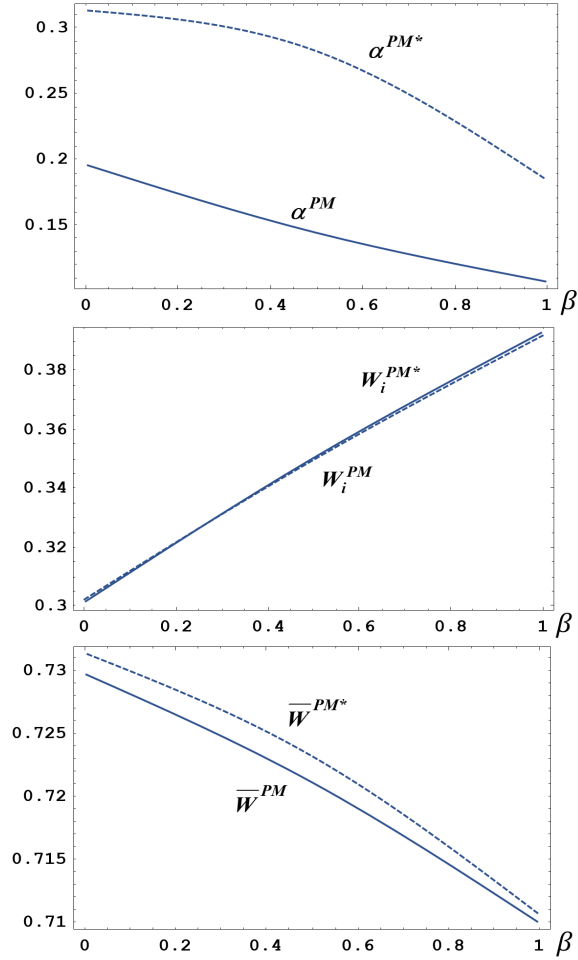
Figure 4: Comparison of the CSRs and welfares in MM case



Second, we consider the global CSR standard in the dual private markets. Then, the differentiation of Eq. (15) with respect to α yields $\alpha^{PP*} = 2/7 = 0.286$. Thus, the global CSR standard is independent of β , and it is higher than the strategic CSR. Comparing the results, we obtain: (i) $\alpha^{PP*} = 2/7 > \alpha^{PP} = 1/5$; (ii) $W_i^{PP*} - W_i^{PP} = (27 - 32\beta)/30976 \geq (\leq) 0$ when $\beta \leq (\geq) 0.844$; (iii) $\bar{W}^{PP*} = 88/121 > \bar{W}^{PP} = 93/128$. Thus, we have the following lemma.

Lemma 6. *In the dual private markets, domestic welfare under global CSR is higher (lower) than that under strategic CSR when β is low (high) in country i ;*

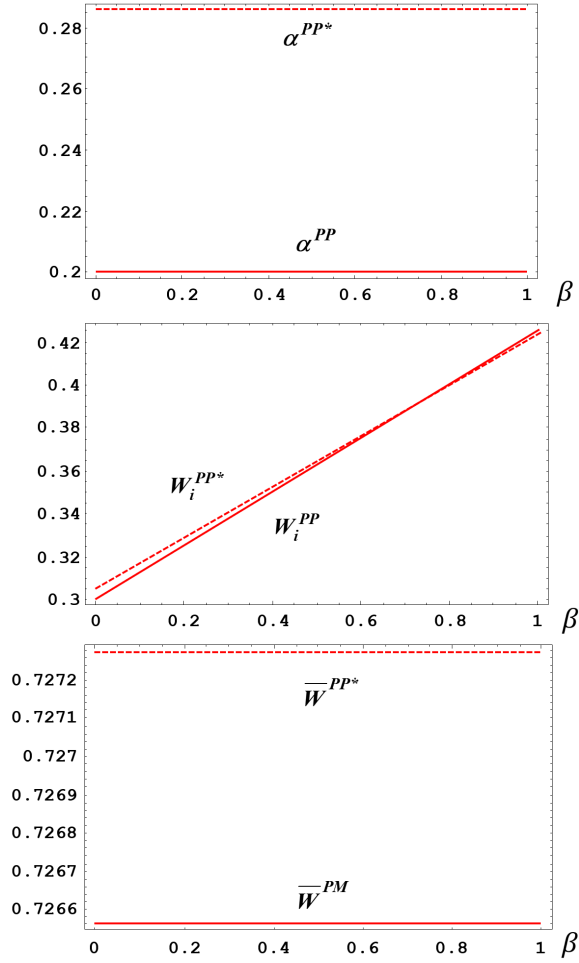
Figure 5: Comparison of the CSRs and welfares in PP case



Finally, we consider the global CSR standard under an asymmetric case in the private and mixed markets. Thus, the differentiation of Eq. (19), i.e., $\frac{\partial \bar{W}}{\partial \alpha} = 0$, yields the global CSR standard. Note that the global CSR standard is decreasing in β . That is, $\alpha^{PM*}(\beta = 0) = 0.312$ and $\alpha^{PM*}(\beta = 1) = 0.184$. Thus, we have $\alpha^{PM*} \in [0.184, 0.312]$.

Lemma 7. *In the private-mixed markets, domestic welfare under global CSR is higher (lower) than that under strategic CSR when β is low (high) in country i ;*

Figure 6: Comparison of the CSRs and welfares in PM case



Proposition 3. *Regardless of privatization policies between the two countries, the global CSR standard is higher than the strategic CSR, and it always leads to a higher global welfare.*

This finding implies that rather than considering CSR on a voluntary basis, active global guidelines are necessary for promoting it. Furthermore, the effect

of the global CSR standard on domestic welfare depends on β , whereas it leads to a higher (lower) domestic welfare when β is low (high) in country i . Hence, the global CSR guideline is more effective for domestic welfare when the share percentage of the global firm's shares held is relatively small.

5. INTERNATIONAL PRIVATIZATION CHOICE GAME

In this section, we extend the analysis into an international privatization choice game in which each country chooses its privatization policy non-cooperatively and simultaneously to maximize its domestic welfare in the beginning of the game. Then, we can consider the following privatization choice game in Table 1.

Country i, j	Nationalization	Privatization
Nationalization	(W_i^{MM}, W_j^{MM})	(W_i^{MP}, W_j^{MP})
Privatization	(W_i^{PM}, W_j^{PM})	(W_i^{PP}, W_j^{PP})

Table 1: Privatization choice game

Proposition 4. *In the privatization choice game, the unique Nash equilibrium is (W_i^{MM}, W_j^{MM}) .*

Proof. Comparing domestic welfare in country i and j , we can obtain that $W_i^{MP} > W_i^{MM} \geq (\leq) W_i^{PP} > W_i^{PM}$ and $W_j^{PM} > W_j^{PP} \geq (\leq) W_j^{MM} > W_j^{MP}$ when $\beta \leq (\geq) 0.383$. \square

This implies that the equilibrium of the international privatization choice game is dual nationalization policy, which is consistent with the result in Xu *et al.* (2016) and Xu and Lee (2019).¹⁹ Our analysis also indicates that the equilibrium yields the lowest CSR level and domestic welfare when β is intermediate. However, dual privatization policy yields the highest CSR level and domestic welfare when β is intermediate.

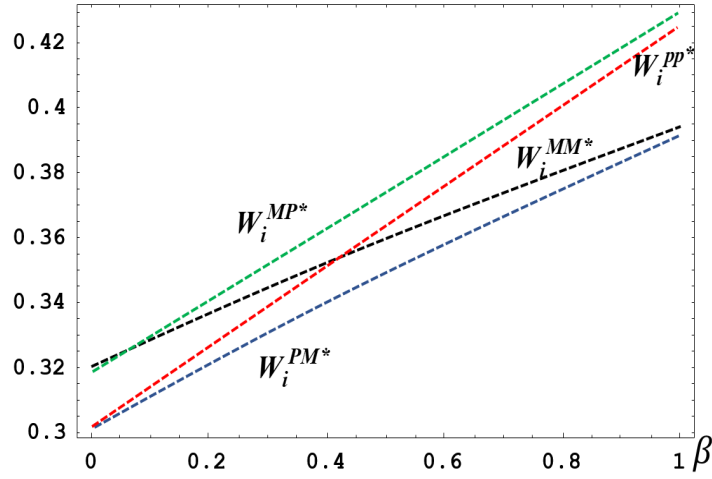
We now compare global welfare in the equilibrium. From Fig. 3, we can find that dual privatization policy leads to the highest global welfare when β is intermediate, while single privatization policy leads to the highest global welfare

¹⁹Xu *et al.* (2016) and Xu and Lee (2019) considered an excess burden of taxation and the impact of CSR on policy interaction between tariffs and privatization, respectively, and showed that both countries choose dual nationalization policy in the Nash equilibrium in an international privatization choice game.

when β is relatively low or quite high. Thus, the equilibrium of the international privatization choice game never achieves the highest global welfare. This finding suggests a prisoner's dilemma in the international privatization choice game, which yields global welfare loss under strategic CSR by a global firm.²⁰

Finally, we can also examine the international privatization choice game under global standard of CSR. Then, we can show that the equilibrium of the international privatization choice game under global standard of CSR also never achieves the highest global welfare.²¹

Figure 7: Comparison of domestic welfares under global CSR



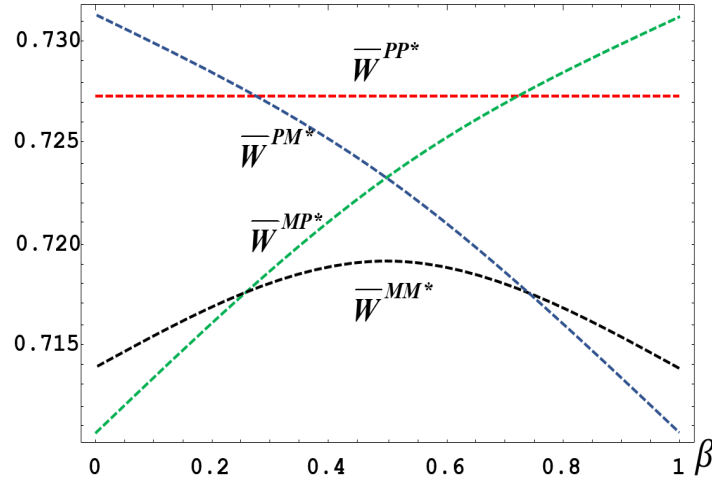
Proposition 5. *In the international privatization choice game, irrespective of imposing a global standard of CSR, the Nash equilibrium cannot yield the highest global welfare.*

This finding implies that an appropriate global cooperation on international privatization policies is necessary in international mixed markets with a global firm, which may adopt CSR. It is also noteworthy that it is globally optimal when the ownership share of the global firm is equal to both countries under the same demand and cost structures in the international competition.

²⁰The results of prisoner's dilemma game usually appear in the analysis of privatization choice game in the international mixed oligopolies. For example, Xu and Lee (2015, 2019) examined the interactions with tariffs or emission taxes in an international trade model in mixed markets and emphasized the cooperativeness in trade policies.

²¹From the Fig. 7 and Fig. 8, comparing domestic welfare in country i and j under global standards, we can obtain that $W_i^{MP*} > W_i^{MM*} \geq (\leq) W_i^{PP*} > W_i^{PM*}$ and $W_j^{PM*} > W_j^{PP*} \geq (\leq) W_j^{MM*} > W_j^{MP*}$ when $\beta \leq (\geq) 0.425$. Thus, the unique Nash equilibrium is (W_i^{MM*}, W_j^{MM*}) .

Figure 8: Comparison of global welfares under global CSR



6. CONCLUSION

We considered a global firm's strategic CSR in international mixed markets and examined the relationship between the strategic level of CSR by the global firm and privatization policy in both countries. We showed that the equilibrium outcomes depend crucially on the percentage of the global firm's shares held in each country. In particular, we showed that single privatization policy increases (decreases) the degree of CSR when the percentage of shares held is small (large), while dual privatization policy always leads to the highest degree of CSR. We also considered the global standard of CSR and showed that domestic welfare under global standard of CSR is higher (lower) than that under strategic CSR when the percentage of shares held is small (large). Finally, we investigated an international privatization choice game between two governments and showed that dual nationalization policy is a unique Nash equilibrium, even though privatization policy is globally optimal. Therefore, an appropriate global cooperation on international privatization policies is necessary in international mixed markets with a global firm, which may adopt CSR.

The findings of our study provide important policy implications for both governments in designing non-cooperative privatization policies in an era where the CSR initiatives of global firms have become a global issue for society. We propose that rather than allowing a global firm's CSR on a voluntary basis, there should be active and cooperative global guidelines for promoting it. Therefore,

an ambitious global regulatory framework that meets global standards is required for global firms to promote a higher degree of CSR in international trade.

However, future research avenues remain. First, alternative scenarios such as a symmetric CSR situation in which the domestic firm also engages in CSR activities²², various competition modes with product differentiation, and more general specifications for the demand and cost functions between firms should be studied. Second, we regarded CSR as a proxy of consumer surplus, whereas a recent approach examines strategic CSR under which firms use CSR activities as an instrument to reduce the social cost or create positive externalities.²³ Finally, since we provided various possibilities in the theoretical examinations, many empirical predictions should be tested with dataset in the future work. Extending our analysis to different CSR activities would thus also be another direction for future research.

²²As mentioned in footnote 4, it is widely observed that global firms' CSR activities are more than those of domestic firms in different industries and countries in the real world. However, the practical evidences in KPMG (2015, 2017) also indicates that more firms are more actively and increasingly participating in CSR in recent years. See Cho *et al.* (2019).

²³The practical motivations and analysis of different types of CSR are discussed in Cho and Lee (2017) and Hirose *et al.* (2020), which indicates that governments or industry associations can choose other moderate measures to stimulate and induce firms to better integrate social concerns into business routines.

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