



Munich Personal RePEc Archive

**Strategic corporate social responsibility
and tariff policies: The timing of
commitments and policy implications**

Xu, Lili and Lee, Sang-Ho

Dalian Maritime University, Chonnam National University

June 2021

Online at <https://mpra.ub.uni-muenchen.de/108499/>
MPRA Paper No. 108499, posted 30 Jun 2021 06:42 UTC

Strategic corporate social responsibility and tariff policies: The timing of commitments and policy implications

Lili Xu^a and Sang-Ho Lee^{b*}

^a Department of Economics and Trade, Dalian Maritime University, 1 Linghai Road, Dalian, 116026, China; lilixuchonnam@hotmail.com

^b Department of Economics, Chonnam National University, 77 Yongbong-Ro, Bukgu, Gwangju, 61186, Republic of Korea; sangho@jnu.ac.kr

* Correspondence: sangho@jnu.ac.kr; Tel.: +86-431-8472-9683; Fax: +82-62-530-1559

Abstract: This study considers commitments between tariff policy and corporate social responsibility (CSR) activities, and compares both domestic CSR and foreign CSR. We show that the committed tariff yields lower tariff and higher CSR under domestic CSR, resulting in higher welfare and lower profits, while it might be reversed under foreign CSR if the substitutability is low, which results in lower welfare and profits. Finally, the committed tariff is a desirable equilibrium of an endogenous timing game under domestic CSR, whereas the committed CSR can be under foreign CSR if the substitutability is low.

Keywords: Strategic CSR, trade policy; committed tariff, committed CSR; international duopoly

JEL Classification: H21, L13, M14, O24

1. INTRODUCTION

In the last decade, since Porter and Kramer (2006, 2011) proposed a “doing well by doing good” (win-win) strategy in the analysis of comparative advantage to corporate social responsibility (CSR), strategic CSR activities have recently become a concurrent policy agenda in the world.¹ In business and economics research, the shareholder regards CSR as an important tool to enhance corporate soft power, which reflects the voluntary desires of managers or board members to participate in self-regulation for profit creation. Many studies have explored the critical use of CSR activities in an imperfectly competitive market dominated by a few firms that maximize their profits. For example, many works in the theory of oligopoly have formulated the strategic motivations for fulfilling CSR in a model where the owner can impose a strategic level of CSR on the managers’ decisions, and showed that profit-maximization can be a motive for private firms that engage in CSR activities.²

Meanwhile, as economic liberalization and globalization are gradually becoming major trends, the rapid development of global firms that account for a substantial share of total trade plays an important role in international trade.³ The research focus has also shifted from industries and countries to global firms. One of the hot policy issues in international economics is explaining the relationship between global firms’ strategies and government’s policies. For example, as a global business strategy, the popularity of strategic CSR among global firms has grown rapidly in international competition. This phenomenon strongly requires the analysis of welfare implications to develop appropriate policies. The research on imperfectly competitive oligopoly markets where global firms might adopt CSR activities, has recently gained prominence.⁴

In the design of government tariff policies in the literature of international economics, research has analyzed different kinds of market competition with heterogeneous objectives, such as CSR initiatives and welfare concerns.⁵ Wang et al. (2012) explored the strategic tariff policy toward foreign exporting

¹ Various surveys have shown that firms are concerned about the global phenomenon of CSR, for instance, the KPMG (2015) and UN Global Compact-Accenture CEO Study (2016). Data from the PWC Global CEO Survey (2016) showed that more than half of the CEOs regard CSR as an essential strategy and believe that corporate social value plays an important role in attracting high-level human resources. Schreck (2011) and Crifo and Forget (2015) presented comprehensive economic discussions of CSR trends, and Planer-Friedrich and Sahm (2018) and Hirose et al. (2020) reviewed different shareholder strategies in CSR activities.

² For instance, the CSR-firm can be regarded as consumer-friendly if the firm cares for consumer surplus in market transactions, while it can be regarded as environment-friendly when it cares for environmental quality in production. See Goering (2014), Brand and Grothe (2015), Fanti and Buccella (2017), and Xu and Lee (2021) for consumer-friendly firms; and Hirose et al. (2020), Lee and Park (2021), and Xu et al. (2021) for environment-friendly firms.

³ Bernard et al. (2018) found strong evidence of complementarities and interdependencies in the profits that multinational firms obtained from international trade.

⁴ In many developed countries, CSR is gradually becoming a top priority in sustainable development. This requires research on measures taken by governments, enterprises, and other institutions to improve the performance of CSR. See Xu and Lee (2019, 2021).

⁵ Lee et al. (2013), Xu et al. (2016), and Xu and Lee (2019) explored the relationship between privatization and import tariff policies in a mixed market, and investigated the impact of social concerns, such as consumer surplus

firms in an international duopoly, and found that consumer-friendly initiatives are beneficial not only for the foreign firm, but also for the importing country's consumers and government. Chang et al. (2014) extended the analysis to domestic and foreign CSR situations and showed that both the foreign and domestic firms' profits increase under domestic CSR; however, under foreign CSR, the foreign firm's profit and the import tariff increase. Cho et al. (2019) examined the strategic trade policy with domestic or foreign CSR under both Cournot and Stackelberg competition modes, and found that the optimal import tariff is lowest under a domestic (foreign) firm's leadership if the CSR level is relatively low (high). Manasakis et al. (2018) compared different entry modes for multinational firms and found that their CSR investments are higher under foreign direct investment than under exports. Liu et al. (2018) considered taxation cost and examined the strategic substitutability/complementarity between import tariffs and CSR activities, while Xu and Lee (2019) extended previous analyses to a mixed oligopoly in which public firms compete with CSR-firms in a bilateral trade model and also investigated the strategic relations between tariffs and CSR.

However, all these works considered an exogenously given level of CSR, which is an item stipulated in the social contract, and further adopted an exogenously committed policy model, in which the government can decide an import tariff rate in the beginning, and the firm then competes with strategic behaviors. It is logical to consider this sequential timing, if the committed import tariff policy can affect the strategic decisions of the firm. However, in the process of policy-making, this time sequence might not always be feasible, if we incorporate strategic commitment of CSR by the firm. If the government cannot commit to import tariffs, firms might have an incentive to commit CSR level in advance because the government can ratchet up the ex-post tariff rate.⁶ Therefore, it is worthwhile exploring the strategic relationship between CSR activities and import tariff policy by incorporating different timings of these commitments.

The credibility of policy commitments is one of the contemporary issues absent from the traditional analysis. Accordingly, the strategic commitment to import tariffs determined by the government is also at the heart of such analyses in international policy. Kabiraj and Marjit (2003) issued the tariff-induced technology transfer and compared the optimal tariff with and without precommitment on the part of the local government. Mukherjee and Pennings (2006) further showed that commitment to the tariff rate by the domestic government increases domestic welfare as compared to non-commitment case. Kabiraj and Kabiraj (2017) considered the nature of the tariff policy and technology transfer, that is, whether the local government pre-commits to tariff policy, and discussed the possibility of tariff-induced

and environmental quality, on strategic interactions between privatization policy and import tariffs using an international bilateral trade model.

⁶ Before the government formulates public policies, the private firm may have a first-mover advantage by fulfilling CSR to expand market share. In particular, Ino and Miyaoka (2020) provided empirical evidence related to commitment issues in real life. Further, Garcia et al. (2018), Leal et al. (2018), Lee et al. (2018), and Xu and Lee (2018) explored some time-inconsistency issues to be solved by CSR-firms.

technology transfer with fixed fee licensing. Furthermore, Xu et al. (2021) analyzed the strategic relation between partial privatization policy determined by the government and CSR activities decided by the firms in either bilateral or unilateral mixed markets, respectively, and showed the critical role of foreign penetration in the resulting welfare.⁷ Finally, Xu and Lee (2021) investigated the impact of corporate profit tax on CSR and emphasized the strategic relationship between CSR and foreign penetration under the committed government policies.⁸

In this research line, we examine an interplay between firms' decisions on CSR activities and the government's decision on import tariffs by emphasizing the interaction between the timings of different commitments. We incorporate both possibilities, that is, the firm's commitment to strategic CSR and the government's commitment to optimal import tariff, before or after the other player makes a decision. We then highlight the important role of the nationality of a CSR firm under the domestic and foreign CSR scenarios. Our contribution is to explore and understand the firm's optimal CSR initiatives and the strategic interplay with the government's import tariff policy, and provide policy implications of the timing of commitments.

Specifically, we examine two different timings of the games: the committed tariff case with an order of Tariff-then-CSR and the committed CSR case with an order of CSR-then-tariff. In the former, the government determines the tariff level, and then the firm decides the level of CSR. The latter is the reverse of the former, where the firm decides the CSR level before the government determines the tariff level. We investigate the impact of the timing of commitments between CSR and import tariff policy on the CSR-firm's profits and welfare.

The main findings are as follows. First, under domestic CSR, the committed tariff game always yields lower tariffs and higher CSR than the committed CSR game, independently of product substitutability. This indicates that the two situations lead to opposite decisions of the owner of a CSR-firm and the government. Additionally, the committed tariff game yields higher output for a domestic firm, lower output for a foreign firm, and higher total output for the industry than the committed CSR game. However, the committed tariff game always yields lower profits for the CSR-firm and higher welfare for society than the committed CSR game under domestic CSR. That is, the owner of the CSR-firm and the government have opposite preferences under domestic CSR: The government prefers the committed tariff game, whereas the owner of the CSR-firm prefers the committed CSR game. Therefore,

⁷ In the literature on mixed oligopoly, recent studies have examined different timings of the commitments between local government and firms in a time-inconsistent framework. See, for example, Xu et al. (2017), Chen et al. (2019), Ino and Miyaoka (2020), and Haraguchi and Matsumura (2020a, b).

⁸ In an empirical study, Suto and Takehara (2018) examined the impact of foreign ownership on Japanese firms' corporate social performance and showed that an increase in foreign ownership improves CSP. Using the data on the CSR rating scores of firms in China from 2009 to 2018, Guo and Zheng (2021) also found that foreign ownership has a significant positive impact on CSR in China.

a flexible import tariff that lacks prior commitment to future import tariffs might yield worse domestic welfare.

Second, under foreign CSR, the relationship between optimal tariffs, strategic CSR, the firm's output, and social welfare under foreign CSR, depends crucially on product substitutability. In particular, the committed tariff game yields lower (higher) CSR and higher (lower) tariff than the committed CSR game if product substitutability is low (high). Furthermore, the committed game yields higher (lower) output for the domestic firm and lower (higher) output for both the foreign firm and the industry than the committed CSR game if the product substitutability is low (high). However, the committed tariff game yields lower (higher) social welfare and lower (higher) profits for society and the CSR-firm than the committed CSR game if the product substitutability is low (high). Therefore, the owner of the CSR-firm and the government may have the same preference under foreign CSR: Both prefer the committed CSR (committed tariff) game if the product substitutability is low (high).

Finally, we examine an endogenous timing game and find that the committed tariff game is a unique Nash equilibrium under domestic CSR that is always socially desirable; however, both the committed tariff and the committed CSR games are Nash equilibria under foreign CSR. In particular, the committed CSR (committed tariff) game is a Nash equilibrium under foreign CSR that is only socially desirable if the product substitutability is low (high). Therefore, the committed tariff game is a socially desirable Nash equilibrium that if the product substitutability is high, which is independent of the type of CSR.

This study is organized as follows. In Section 2, we formulate the basic model. We examine the committed tariff game and the committed CSR game under domestic CSR in Section 3 and under foreign CSR in Section 4. In Section 5, we consider an endogenous timing game between a CSR-firm and the government, and compare the equilibrium between domestic and foreign CSR scenarios. The final section concludes this study.

2. BASIC MODEL

We consider a duopoly market in which a domestic firm (firm 1) and a foreign firm (firm 2) provide differentiated services or produce differentiated products in a home country. Following Dixit (1979), a representative consumer's utility function is $U(q_1, q_2) = q_1 + q_2 - \frac{1}{2}(q_1^2 + 2bq_1q_2 + q_2^2)$, where q_i is the output of firm i and $b \in (0, 1)$ denotes the degree of product differentiation. In particular, a higher b represents a lower product differentiation or higher substitutability. Then, firm i 's inverse demand function is $p_i = 1 - q_i - bq_j$, $i = 1, 2, i \neq j$, where p_i is the price of firm i . The market output and consumer surplus are $Q = q_1 + q_2$ and $CS = \frac{1}{2}(q_1^2 + 2bq_1q_2 + q_2^2)$, respectively. It is noted that

higher substitutability increases the consumer surplus despite reducing consumers' willingness to pay for products.

We assume that the firm's production cost function is symmetric and takes a quadratic form, $C_i(q_i) = \frac{1}{2}q_i^2 + F$, where $F = 0$ without loss of generality. Furthermore, the government imposes a tariff on the imports produced by a foreign firm, where the import tariff is denoted by t . The government's import tariff revenue is then $T = tq_2$, and the domestic and foreign firms' profits are

$$\begin{aligned}\pi_1 &= p_1q_1 - \frac{1}{2}q_1^2 \text{ and} \\ \pi_2 &= p_2q_2 - \frac{1}{2}q_2^2 - tq_2.\end{aligned}\tag{1}$$

Social welfare is denoted as the sum of the profit of the domestic firm, consumer surplus, and import tariff revenue:

$$W = \pi_1 + CS + T.\tag{2}$$

Regarding the firms' objective functions, we consider the existence of managerial delegation in one of the firms. The owner of the firm maximizes the profits but specifies concern for consumer welfare as a CSR initiative to the manager, who then maximizes profits and a portion of consumer surplus. This indicates that firms behave as a CSR-firm that not only seek profit maximization but are also aware of the consumer. Thus, the manager's objective function is

$$V_i = \pi_i + \alpha CS,\tag{3}$$

where $\alpha \in [0,1]$ denotes the level of CSR and $i = 1,2, i \neq j$. Note that $\alpha = 0$ indicates that firm i is a private firm pursuing absolute profits. Furthermore, the owner of a CSR-firm determines the CSR level to maximize own profit π_i in Eq. (1).

In the following sections, we examine two scenarios: (i) a domestic CSR scenario in which the domestic firm might fulfill CSR whereas the foreign firm is a pure profit-maximizing firm; and (ii) a foreign CSR scenario in which a foreign firm might fulfill CSR whereas the domestic firm is a pure profit-maximizing firm. We then examine two different timing of import tariffs and CSR: The committed tariff case with an order of Tariff-then-CSR (named as T game) and the committed CSR case with an order of CSR-then-tariff (named as C game).

The game runs as follows. In the T game, the government determines the optimal tariff rate before the owner of a CSR-firm decides the strategic CSR level. The order of the policy is reversed in the C game. In the final stage, two firms compete in Cournot. We solve the subgame perfect Nash equilibrium through backward induction.

3. DOMESTIC CSR

We first consider a domestic CSR scenario in which the domestic firm might engage in CSR activities. In the final stage, the domestic and foreign firms decide their quantities simultaneously. In particular, the managers of the domestic and foreign firms take differentiations of $V_1 = \pi_1 + \alpha CS$ in Eq. (3) and π_2 in Eq. (2) with respect to q_1 and q_2 , respectively. Then, we have the following outputs:

$$q_1 = \frac{3-b(1-t)(1-\alpha)}{9-b^2+\alpha b^2-3\alpha}, q_2 = \frac{(1-t)(3-\alpha)-b}{9-b^2+\alpha b^2-3\alpha}. \quad (5)$$

From Eq. (5), we show that the domestic firm's output increases with tariff rate, whereas the foreign firm's output decreases with tariff rate; that is, $\partial q_1/\partial t > 0$ and $\partial q_2/\partial t < 0$. We also show that the domestic firm's output increases with CSR level, whereas the foreign firm's output decreases with CSR level; that is, $\partial q_1/\partial \alpha > 0$ and $\partial q_2/\partial \alpha < 0$. Finally, the total output decreases with tariff rate and increases with CSR level; that is, $\partial Q/\partial t < 0$ and $\partial Q/\partial \alpha > 0$. In other words, the effects of tariff policy and CSR activities on the total outputs are opposite.

The profits of the firms and welfare are

$$\pi_1 = \frac{(3-b(1-t)(1-\alpha))(9-6\alpha+2b^2\alpha-b(1-t)(3+\alpha))}{2(9-b^2+\alpha b^2-3\alpha)^2}, \pi_2 = \frac{3(b-(1-t)(3-\alpha))^2}{2(9-b^2+\alpha b^2-3\alpha)^2},$$

$$W = \frac{45+4t(3-\alpha)^2-5t^2(3-\alpha)^2-(24-\alpha)\alpha+2b^3(1-\alpha)(1-(1-t)\alpha)+b^2(4t^2(1-\alpha)+2(5-\alpha)\alpha-2t(1-\alpha^2)-7)+2b((7-3\alpha)\alpha-t(3+\alpha(4-3\alpha))-6)}{2(9-b^2+\alpha b^2-3\alpha)^2}. \quad (6)$$

In the following, we examine a tariff-then-CSR situation and a CSR-then-tariff situation, and then compare the main results between these two different timelines.

3.1 Tariff-then-CSR game

We first examine a tariff-then-CSR situation in which the government chooses the optimal import tariff rate in the first stage. In the second stage, the owner of a domestic firm determines the CSR level that maximizes its own profit. Differentiating π_1 in Eq. (6) with respect to α , we obtain the following result:

$$\alpha = \frac{b^2(3-b+bt)}{9+6b-3b^2-b^3-6bt+b^3t}. \quad (7)$$

Eq. (7) shows that the level of CSR increases with tariff rate; that is, $\partial \alpha/\partial t > 0$, implying that the domestic firm intends to determine a higher CSR if the government imposes a relatively high tariff. Thus, import tariff policy and CSR activities are complementary.

The resulting social welfare is

$$W = \frac{b^4(1-t)(1+11t)+6b^3(7-t)-9b^2(15+10t-14t^2)-54b(2+t)+81(5+4t-5t^2)}{18(9-2b^2)^2}. \quad (8)$$

In the first stage, the government chooses import tariffs that maximize welfare. Then, differentiating W in Eq. (8) with respect to t , we have the following committed tariff:

$$t^T = \frac{(3-b)(54+9b-12b^2-5b^3)}{405-126b^2+11b^4}, \quad (9)$$

where the superscript T denotes equilibrium outcomes in the T game under domestic CSR. Eq. (9) shows that the government always imposes a positive tariff when it moves before the domestic firm and the committed tariff decreases with b ; that is, $0 < t^T < 1$ and $\partial t^T / \partial b < 0$. In addition, we consider a situation in which no firms engage in CSR, that is, $\alpha = 0$. From Eq. (6), we can obtain the optimal tariff without CSR, that is, $t^{T*} = \frac{(3-b)(6+b)}{45-4b^2}$. Comparing these equilibrium results, we have $t^T < t^{T*}$. Thus, the promotion of CSR decreases the optimal tariff in the T game.

The strategic level of CSR is

$$\alpha^T = \frac{b^2(5-b)(3-b)(3+b)}{135+54b-51b^2-15b^3+6b^4+b^5}. \quad (10)$$

Eq. (10) shows that the domestic firm always engages in CSR activities if it moves after the government; that is, $0 < \alpha^T < 1$. Furthermore, the strategic CSR of the domestic firm increases with b ; that is, $\partial \alpha^T / \partial b > 0$.

The equilibrium outputs and prices of the domestic and foreign firms are

$$\begin{aligned} q_1^T &= \frac{3(5-b)(9-b^2)}{405-126b^2+11b^4}, \quad q_2^T = \frac{81-36b-18b^2+6b^3+b^4}{405-126b^2+11b^4}, \\ p_1^T &= \frac{(5-b)(3-b)(3+b)(6-b^2)}{405-126b^2+11b^4}, \quad p_2^T = \frac{324-99b-81b^2+9b^3+7b^4}{405-126b^2+11b^4}. \end{aligned} \quad (11)$$

From Eq. (11), we see that the domestic firm's output decreases (increases) with b when it is low (high), whereas the foreign firm's output always decreases with b ; that is, $\partial q_1^T / \partial b < 0$ when $b \in (0, 0.536)$ and $\partial q_1^T / \partial b > 0$ when $b \in (0.536, 1)$, but $\partial q_2^T / \partial b < 0$. We also find that the firm's price always decreases with b ; that is, $\partial p_i^T / \partial b < 0$ where $i = 1, 2, i \neq j$. Finally, irrespective of product substitutability, the domestic firm produces more products and sets lower prices than the foreign firm; that is, $q_1^T > q_2^T$ and $p_1^T < p_2^T$.

The equilibrium market output is

$$Q^T = \frac{216-63b-33b^2+9b^3+b^4}{405-126b^2+11b^4}. \quad (12)$$

Note that the total output decreases with b ; that is, $\partial Q^T / \partial b < 0$.

The domestic and foreign firms' profits are

$$\pi_1^T = \frac{3(5-b)^2(9-2b^2)(9-b^2)^2}{2(405-126b^2+11b^4)^2}, \quad \pi_2^T = \frac{3(81-36b-18b^2+6b^3+b^4)^2}{2(405-126b^2+11b^4)^2}. \quad (13)$$

Eq. (13) shows that the firm's profit decreases with b ; that is, $\partial \pi_i^T / \partial b < 0$, where $i = 1, 2, i \neq j$. Furthermore, the domestic firm earns more profits than the foreign firm; that is, $\pi_1^T > \pi_2^T$.

Finally, social welfare is

$$W^T = \frac{261-72b-48b^2+12b^3+b^4}{2(405-126b^2+11b^4)}. \quad (14)$$

From Eq. (14), we see that social welfare decreases with b ; that is, $\partial W^T / \partial b < 0$.

3.2 CSR-then-tariff game

We then examine a CSR-then-tariff situation in which the owner of a domestic firm determines the strategic CSR level before the government decides the import tariff rate. Differentiating W in Eq. (6) with respect to t , we have

$$t = \frac{18-3b-b^2-(12+4b-b^3)\alpha+(2+3b+b^2-b^3)\alpha^2}{5(3-\alpha)^2-4b^2(1-\alpha)}. \quad (15)$$

Eq. (15) shows that the tariff decreases with CSR level; that is, $\partial t / \partial \alpha < 0$. In other words, the government intends to impose a lower tariff if the domestic firm chooses a relatively high level of CSR from the beginning. Thus, the tariff policy and CSR activities are substitutes. Note that this monotonic relationship in the C game is opposite to that in the T game.

Substituting Eq. (15) into π_1 in Eq. (6), we have the domestic firm's profit:

$$\pi_1 = \frac{(9(5-b)-5(9-b^2)\alpha+(10+b-b^2)\alpha^2)(5(3-\alpha)-b(1-\alpha)(3-\alpha+b\alpha))}{2(5(3-\alpha)^2-4b^2(1-\alpha))^2}. \quad (16)$$

In the first stage, the owner of a domestic firm determines the strategic CSR that maximizes its own profit. Differentiating π_1 in Eq. (16) with respect to α , we have $\partial \pi_1 / \partial \alpha < 0$ for all $b \in (0, 1)$. This implies that the strategic CSR is

$$\alpha^C = 0. \quad (17)$$

where the superscript C denotes equilibrium outcomes in the C game under domestic CSR. Eq. (17) shows that the domestic firm does not engage in CSR activities if it moves before the government, independent of product substitutability. This is because no CSR can induce the highest tariff, which is flexible to protect domestic markets. Note that this finding is different from the T game, in which the domestic firm intends to engage in CSR activities if it moves after the committed tariff is determined by the government.

The optimal tariff is

$$t^C = \frac{(3-b)(6+b)}{45-4b^2}. \quad (18)$$

Eq. (18) shows that the government always imposes a positive tariff when it moves after the domestic firm; that is, $0 < t^C < 1$. Furthermore, the flexible tariff increases with b ; that is, $\partial t^C / \partial b < 0$.

The equilibrium outputs and prices of the domestic and foreign firms are

$$q_1^C = \frac{3(5-b)}{45-4b^2}, q_2^C = \frac{9-4b}{45-4b^2}, p_1^C = \frac{6(5-b)}{45-4b^2}, p_2^C = \frac{36-b(11+b)}{45-4b^2}. \quad (19)$$

From Eq. (19), we see that the output of each firm decreases with b , and the domestic firm produces more products than the foreign firm; that is, $\partial q_i^C / \partial b < 0$ and $q_1^C > q_2^C$. Thus, the price of each firm decreases with b , and the domestic firm sets lower prices than the foreign firm; that is, $\partial p_i^C / \partial b < 0$ and $p_1^C < p_2^C$.

The equilibrium market output is

$$Q^C = \frac{24-7b}{45-4b^2}. \quad (20)$$

Note that the total output decreases with b ; that is, $\partial Q^C / \partial b < 0$.

The domestic and foreign firms' profits are

$$\pi_1^C = \frac{27(5-b)^2}{2(45-4b^2)^2}, \pi_2^C = \frac{3(9-4b)^2}{2(45-4b^2)^2}. \quad (21)$$

Eq. (21) shows that the profit decreases with b ; that is, $\partial \pi_i^C / \partial b < 0$. Furthermore, the domestic firm earns more profits than the foreign firm; that is, $\pi_1^C > \pi_2^C$.

Finally, the resulting social welfare is

$$W^C = \frac{29-8b}{2(45-4b^2)}. \quad (22)$$

From Eq. (22), we see that social welfare decreases with b ; that is, $\partial W^C / \partial b < 0$.

3.3 Comparisons under domestic CSR

We now compare equilibrium outcomes between the T game and the C game under domestic CSR and provide some policy-relevant implications.⁹

Proposition 1: *Tariff-then-CSR yields higher CSR and lower tariff than CSR-then-tariff under domestic CSR.*

Proposition 1 shows that the relationship between CSR and tariff in the two situations under domestic CSR is opposite, that is, $\alpha^T > \alpha^C$ and $t^T < t^C$. This is because the government intends to choose a lower tariff when it moves first to induce the domestic firm to engage in more CSR; that is, $\partial \alpha / \partial t < 0$, and thus, the committed tariff in the T game is lower than the flexible tariff in the C game. This implies that import tariff policy and CSR activities are substitutes.

Proposition 2: *Tariff-then-CSR yields higher (lower) output for the domestic (foreign) firm than CSR-then-tariff under domestic CSR.*

⁹ We show proofs of all the propositions in the Appendix.

Proposition 2 shows that the relationship between the two situations under domestic CSR is also opposite, regarding the output decisions of the two firms. In particular, if the domestic firm fulfills CSR, the T game yields higher output and lower price for the domestic firm than the C game; that is, $q_1^T > q_1^C$ and $p_1^T < p_1^C$. Furthermore, CSR activities have a positive effect whereas the tariff policy has a negative effect on the domestic firm's output; that is, $\partial q_1 / \partial \alpha > 0$ and $\partial q_1 / \partial t < 0$. From Proposition 1, the output-increasing effect of a higher CSR and a lower tariff policy in the T game leads to higher output for the domestic firm in the T game.

Proposition 2 also indicates that the T game yields lower output and lower price for the foreign firm than the C game; that is, $q_2^T < q_2^C$ and $p_2^T < p_2^C$. Note that both the tariff policy and CSR activities have a negative effect on the foreign firm's output; that is, $\partial q_2 / \partial t < 0$ and $\partial q_2 / \partial \alpha < 0$. From Proposition 1, the output-decreasing effect of a higher CSR dominates the output-increasing effect of a lower tariff in the T game, and thus, the T game yields lower output for the foreign firm than the C game. Finally, we can also show that the T game generates higher total output for the industry than the C game; that is, $Q^T > Q^C$. That is, the increased domestic firm's output dominates the decreased foreign firm's output; thus, the T game always leads to higher total output, implying that the total output is always higher if the government chooses import tariff rates before a domestic firm chooses the CSR level.

Proposition 3: *Tariff-then-CSR always yields higher social welfare for society and lower profits for the CSR-firm than CSR-then-tariff under domestic CSR.*

Proposition 3 states that the relationship of social welfare and profit of the CSR-firm in the two situations is opposite under domestic CSR. In particular, we find that the domestic firm obtains more benefit from precedence, as does the government. Since the owner of a domestic firm and the government have opposite preferences, a first-mover advantage exists. It also indicates that flexible import tariffs that lack a commitment to future import tariff policy in a time-consistent framework may yield worse domestic welfare.¹⁰

4. FOREIGN CSR

In this section, we consider a foreign CSR scenario in which the foreign firm might engage in CSR activities. In the third stage, the optimal decisions of the managers of the domestic and foreign firms are found through differentiating π_1 in Eq. (2) and $V_2 = \pi_2 + \alpha CS$ in Eq. (3) with respect to q_1 and q_2 , respectively, yielding the following outputs:

¹⁰ In a time-consistent framework with privatization policy, Xu et al. (2017), Chen et al. (2019), and Haraguchi and Matsumura (2020 b) showed that flexible privatization may yield welfare loss with commitment to an ex-ante privatization.

$$q_1 = \frac{3-b+bt-\alpha}{9-b^2-3\alpha+b^2\alpha} \text{ and } q_2 = \frac{3-b-3t+b\alpha}{9-b^2-3\alpha+b^2\alpha}. \quad (23)$$

Eq. (23) shows that the domestic firm's output increases with tariff rate, whereas the foreign firm's output decreases with tariff rate; that is, $\partial q_1/\partial t > 0$ and $\partial q_2/\partial t < 0$. Second, the output of each firm decreases with CSR level; that is, $\partial q_i/\partial \alpha < 0$. Finally, the total outputs decrease with tariff rate, while decreasing with CSR level; that is, $\partial Q/\partial t < 0$. Thus, the effect of tariff policy and CSR activities on total output is the same as that under domestic CSR, but the magnitude differs.

The CSR-firm's profit and social welfare are

$$\pi_2 = \frac{(3-b-3t+b\alpha)(2b^2(1-t)\alpha-b(3+\alpha)+3(1-t)(3-2\alpha))}{2(9-b^2+\alpha b^2-3\alpha)^2},$$

$$W = \frac{2(12-4b-3b^2+b^3+9t-8bt-3b^2t+b^3t-9t^2+3b^2t^2)\alpha+(4-b^2-6bt+2b^3t)\alpha^2}{2(9-b^2+\alpha b^2-3\alpha)^2}. \quad (24)$$

In the following, we examine a tariff-then-CSR situation and a CSR-then-tariff situation, then compare the main results between these two different timelines under foreign CSR.

4.1 Tariff-then-CSR game

We first examine the T game. In the second stage, the owner of the foreign firm determines the CSR level that maximizes its own profit. Differentiating π_2 in Eq. (24) with respect to α , we have

$$\alpha = \frac{b^2(3-b-3t)}{9+6b-3b^2-b^3-9t+3b^2t}. \quad (25)$$

Eq. (25) shows that the CSR level decreases with tariff rate; that is, $\partial \alpha/\partial t < 0$. Thus, the foreign firm determines a lower CSR if the government imposes a relatively high tariff. This indicates that import tariff policy and CSR activities are substitutes, which is opposite to the result under domestic CSR.

In the first stage, differentiating W with respect to t , we have the following committed tariff:

$$t^{TF} = \frac{6-b}{15}, \quad (26)$$

where the superscript TF denotes equilibrium outcomes in the T game under foreign CSR. Eq. (26) shows that the government always imposes a positive tariff on the foreign firm if it fulfills CSR, and the committed tariff decreases with b ; that is, $0 < t^{TF} < 1$ and $\partial t^{TF}/\partial b < 0$. In addition, we consider a situation where no firms engage in CSR, that is, $\alpha = 0$. From Eq. (34), we obtain the optimal tariff without CSR, that is, $t^{TF*} = \frac{(3-b)(6+b)}{45-4b^2}$. Comparing these equilibrium results, we have $t^{TF} < t^{TF*}$.

Thus, the promotion of CSR decreases the optimal tariff in the T game under foreign CSR.

The strategic CSR of the foreign firm is

$$\alpha^{TF} = \frac{b^2(9-4b)}{3(9+11b-3b^2-2b^3)}. \quad (27)$$

Eq. (27) shows that the foreign firm intends to engage in CSR activities if it moves after the government, and the strategic CSR of the foreign firm increases with b ; that is, $0 < \alpha^{TF} < 1$ and $\partial\alpha^{TF}/\partial b > 0$.

The CSR-firm's profit and social welfare are

$$\pi_2^{TF} = \frac{(9-4b)^2}{150(9-2b^2)} \text{ and } W^{TF} = \frac{87-24b-8b^2}{30(9-2b^2)}. \quad (28)$$

Note that both social welfare and the profit of the foreign firm decrease with b ; that is, $\partial\pi_2^{TF}/\partial b < 0$ and $\partial W^{TF}/\partial b < 0$.

We next compare the main results between domestic and foreign CSRs in the T game.

Lemma 1: *In the T game, we obtain the following relationships:*

- (i) $t^T \gtrless t^{TF}$ when $b \lesseqgtr 0.494$ and $\alpha^T > \alpha^{TF}$;
- (ii) $\pi_2^T \lesseqgtr \pi_2^{TF}$ and $W^T \lesseqgtr W^{TF}$ when $b \gtrless 0.156$.

Lemma 1 implies that the committed tariff may be higher or lower under domestic CSR than under foreign CSR, depending upon product substitutability. In particular, if the products are less substitutable, when the government chooses a lower tariff on the imported products, it induces the foreign firm to engage in more CSR activities. Contrariwise, if the products are more substitutable, when the government chooses a higher tariff on the imports, it induces the foreign firm to engage in less CSR activities. Lemma 1 also shows that the domestic firm chooses higher CSR than the foreign firm in the T game. Thus, the domestic firm decides to engage in more CSR activities if the government moves first. Finally, the promotion of foreign CSR always increases its profit in the T game, but its effect on social welfare depends on product substitutability. Specifically, if the firm engages in CSR activities, society will be better (worse) off when the products are less (more) substitutable.

4.2 CSR-then-tariff game

We then examine the C game. In the second stage, the government decides the import tariff rate that maximizes welfare. Differentiating W in Eq. (24) with respect to t , we obtain the import tariff

$$t = \frac{18-3b-b^2-(9-8b-3b^2+b^3)\alpha-(3b-b^3)\alpha^2}{45-4b^2-18\alpha+6b^2\alpha}. \quad (29)$$

Eq. (29) shows that the tariff decreases with CSR level; that is, $\partial t/\partial\alpha < 0$. Thus, the government intends to impose a lower tariff if the foreign firm chooses a high level of CSR. This implies that tariff policy and CSR activities are substitutes in the C game under foreign CSR, which is the same as under domestic CSR.

The profit of the foreign firm is

$$\pi_2 = \frac{(9-4b+3b\alpha)(27-12b-(18+13b-6b^2)\alpha+2b(3-b^2)\alpha^2)}{2(45-4b^2-18\alpha+6b^2\alpha)^2}. \quad (30)$$

In the first stage, differentiating π_2 with respect to α , we have (i) $\partial\pi_2/\partial\alpha < 0$ when $b \in [0.272, 1)$ and (ii) $\partial\pi_2/\partial\alpha = 0$ when $b \in (0, 0.272)$. Thus, the equilibrium outcomes depend on the product substitutability as follows: First, (i) when $b \in [0.272, 1)$, the level of strategic CSR is $\alpha^{CF} = 0$. The optimal tariff is then $t^{CF} = \frac{(3-b)(6+b)}{45-4b^2}$, where the superscript CF denotes equilibrium outcomes in the C game under foreign CSR. The foreign firm's profit and social welfare are $\pi_2^{CF} = \frac{3(9-4b)^2}{2(45-4b^2)^2}$ and $W^{CF} = \frac{29-8b}{2(45-4b^2)}$. Second, (ii) when $b \in (0, 0.272)$, the level of strategic CSR is: $\alpha^{CF} = \frac{3^{2/3}b^2(3-b^2)^2(54-33b-18b^2+4b^3)(54+21b-18b^2+4b^3)+3b^2(3-b^2)(45-4b^2)H_1-3^{1/3}H_1^2}{18b^2(3-b^2)^2H_1}$, where H_2 is described in a footnote,¹¹ but it is long and complicated. Thus, we determine the figures of the optimal tariff, the foreign firm's profit, and social welfare, showing that $t^{CF} > \frac{(3-b)(6+b)}{45-4b^2}$ when $0 < b < 0.272$. Figure 1 represents the comparison of the main results between domestic CSR and foreign CSR for all $b \in (0, 1)$ in the C game.

<Figure 1: Comparisons between domestic and foreign CSRs in the C game>

This shows that the strategic CSR and flexible tariff always decrease with b under foreign CSR; that is, $\partial\alpha^{CF}/\partial b < 0$ and $\partial t^{CF}/\partial b < 0$. Furthermore, both social welfare and foreign firm's profit decrease with b ; that is, $\partial\pi_2^{CF}/\partial b < 0$ and $\partial W^{CF}/\partial b < 0$. Comparing the main results between domestic CSR and foreign CSR in the C game, we have the following lemma.

Lemma 2: *In the C game, we obtain the following relationships:*

- (i) $\alpha^C \leq \alpha^{CF}$ and $t^C \geq t^{CF}$;
- (ii) $\pi_2^C \leq \pi_2^{CF}$ and $W^C > W^{CF}$, and the equality holds only when $b \in [0.272, 1)$.

Lemma 2 (i) states that the domestic firm determines a lower CSR than the foreign firm if the government moves later. Thus, when the CSR-firm can determine CSR levels first, the foreign firm decides to engage in more CSR activities than the domestic firm. Lemma 2 (i) also shows that the flexible tariff under domestic CSR is higher than under foreign CSR, because the government can reduce to a lower tariff if the foreign firm engages in CSR activities. Finally, Lemma 2 (ii) shows that the promotion of foreign CSR increases its profit but reduces social welfare in the C game. Thus, the

¹¹ $H_2 = (18b^4(3-b^2)^3(9-2b^2)(54+21b-18b^2+4b^3)^2 + b^3(3-b^2)^3(54+21b-18b^2+4b^3)^{3/2}3^{1/2}(157464-288684b+491346b^2+375219b^3-416502b^4-88992b^5+104328b^6-4176b^7-8640b^8+1792b^9)^{1/3}$.

foreign firm will be better off if it engages in CSR activities, irrespective of the timing between tariff policy and CSR activities and product substitutability. However, society will be worse off if foreign firms determine the CSR before the government.

4.3 Comparisons under foreign CSR

We now compare the equilibrium outcomes in the two situations under foreign CSR and discuss some policy-relevant implications. Figure 2 presents the relationship of the optimal import tariff, strategic CSR, the firms' output, the CSR-firm's profit, and social welfare between T and C games under foreign CSR.

<Figure 2: Comparisons between T and C games under foreign CSR>

Proposition 4: *Tariff-then-CSR yields lower (higher) CSR and higher (lower) tariff than CSR-then-tariff when the product substitutability is low (high) under foreign CSR.*

Proposition 4 states the relationship between CSR and tariff in the two situations under foreign CSR. It shows that the T game can yield lower CSR by the foreign firm than the C game when b is low; that is, $\alpha^{TF} < \alpha^{CF}$ if $0 < b < 0.262$. Proposition 4 also indicates that the T game can yield higher or lower committed tariffs than the C game under foreign CSR, depending on b . Note that this result is different from the finding under domestic CSR in Proposition 1.

Proposition 5: *Tariff-then-CSR yields higher (lower) output for the domestic firm and lower (higher) output for the foreign firm than CSR-then-tariff when the product substitutability is low (high) under foreign CSR.*

Proposition 5 demonstrates that the relationship of the output in the two situations depends on product substitutability, that is, $q_1^{TF} > q_1^{CF}$ if $0 < b < 0.260$ and $q_1^{TF} < q_1^{CF}$ if $0.260 < b < 1$, while $q_2^{TF} < q_2^{CF}$ if $0 < b < 0.260$ and $q_2^{TF} > q_2^{CF}$ if $0.260 < b < 1$. Further, we can show that $Q^{TF} < Q^{CF}$ when $0 < b < 0.260$ and $Q^{TF} > Q^{CF}$ when $0.260 < b < 1$. Thus, the T game generates higher total output than the C game when b is high under foreign CSR. These findings are also different from the result under domestic CSR in Proposition 2.

Proposition 6: *Tariff-then-CSR yields lower (higher) social welfare for society and lower (higher) profits for the CSR-firm than CSR-then-tariff when the product substitutability is low (high) under foreign CSR.*

Proposition 6 states that the relationship between social welfare and the CSR-firm's profit in the two situations depends on product substitutability. First, when the foreign firm engages in CSR activities, it

can be better off if it moves after the government, that is, $\pi_2^{TF} > \pi_2^{CF}$ when $0.206 < b < 1$. Second, the government may prefer to move after the foreign firm that determines the level of CSR, that is, $W^{TF} < W^{CF}$ when $0 < b < 0.262$. Finally, the owner of the CSR-firm and government can have the same preferences under foreign CSR: Both of them prefer the C game when $0 < b < 0.206$, while the T game is preferred when $0.262 < b < 1$. These findings are different from the result under domestic CSR in Proposition 3

5. ENDOGENOUS TIMING GAME

We now consider an endogenous timing game between the owner of a CSR-firm and the government. In particular, we play an observable delay game proposed by Hamilton and Slutsky (1990) and examine movement timings between the two players. Note that the owner of the CSR-firm or the government announces the timing of determining CSR or choosing import tariffs. In this game, both simultaneously decide whether to move first ($T_i = 1$) or second ($T_i = 2$). Table 1 shows the observable delay game's payoff matrix. Specifically, if both of them decide to move at the same time, the game is a simultaneous-move game. Contrariwise, the game is a sequential-move game of the T or C game. Thus, we examine and compare the equilibrium of the game under different types of CSR.

<Table 1: Payoff matrices in an endogenous timing game>

First, we investigate an endogenous timing game under domestic CSR and find the following:

Proposition 7: *In an endogenous timing game, one sequential-move outcome, $(T_1, T_2) = (1, 2)$, is a unique Nash equilibrium under domestic CSR.*

Proposition 7 shows that the T game is a unique Nash equilibrium in an endogenous timing game under domestic CSR for all $b \in (0, 1)$. Furthermore, from Proposition 3, this equilibrium is always socially desirable.

Proposition 8: *Tariff-then-CSR is a socially desirable equilibrium under domestic CSR.*

Proposition 8 states that the government should determine the committed import tariff when the domestic firm adopts CSR, irrespective of product substitutability.

Second, we investigate an endogenous timing game under foreign CSR and find the following:

Proposition 9: *In an endogenous timing game under foreign CSR:*

(i) *when $b \in (0, 0.272)$, two sequential-move outcomes, $(T_1, T_2) = (1, 2)$ and $(T_1, T_2) = (2, 1)$, are Nash equilibria;*

(ii) when $b \in [0.272, 1)$, two sequential-move outcomes and one simultaneous-move outcome, $(T_1, T_2) = (1, 2)$, $(T_1, T_2) = (2, 1)$, and $(T_1, T_2) = (1, 1)$, are Nash equilibria.

Proposition 9 shows that both T and C games could be a Nash equilibrium under foreign CSR for all $b \in (0, 1)$. However, from Proposition 6, welfare consequences depend on product substitutability under foreign CSR. In particular, the C game is socially desirable when $b \in (0, 0.262)$, whereas the T game is socially desirable when $b \in (0.262, 1)$ under foreign CSR.

Proposition 10: *CSR-then-tariff (tariff-then-CSR) can be a socially desirable equilibrium if the product substitutability is low (high) under foreign CSR.*

Proposition 10 implies that from the viewpoint of social welfare, product substitutability is an important factor when evaluating the effect of commitments between the government's tariff policy and foreign firm's CSR activities, implying that the government should preemptively set the committed tariff when the domestic and foreign products are more substitutable. However, when the products are less substitutable, the government should wait until the foreign firm commits to CSR activities and then set the flexible tariff in a time-consistent policy framework.

Finally, we can summarize the equilibrium results between domestic and foreign CSR scenarios:

Proposition 11: *Tariff-then-CSR could be a Nash equilibrium in an endogenous timing game irrespective of the type of CSR, but it is only socially desirable if the product substitutability is high.*

Proposition 11 indicates that the government can commit to the tariff when the products are more substitutable, irrespective of which firm engages in CSR activities. However, when the products are less substitutable, the active role of the government in choosing between committed tariff and flexible tariff depends on which firm engages in CSR activities.

6. CONCLUSIONS

In the analysis of the effect of commitments, we considered two different timings between import tariff policy and CSR activities. We identified the nationality of the CSR-firm and investigated the role of product substitutability in the sequential choices between different types of CSR. We showed that the strategic CSR is higher and optimal tariff is lower in the committed tariff game than in the committed CSR game under domestic CSR, while the strategic CSR is lower (higher) and optimal tariff is higher (lower) if the product substitutability is low (high) under foreign CSR. We also showed that the CSR-firm's profit is lower and social welfare is higher in the committed tariff game than the committed CSR game under domestic CSR, while the CSR-firm's profit is lower (higher) and social welfare is lower (higher) if the product substitutability is low (high) under foreign CSR. In an endogenous timing game

between the owner of a CSR-firm and the government, we showed that the committed tariff game is a unique Nash equilibrium under domestic CSR and is always socially desirable, while the committed CSR (committed tariff) game could be an equilibrium under foreign CSR but is only socially desirable if the product substitutability is low (high).

We believe that our findings can provide a theoretical basis for both the government's decision on import tariff and firms' decision on CSR activities in international trade; however, there remain some issues for future research. First, we can generalize the duopoly model into an oligopoly model by relaxing the linear demand and marginal cost function under different competition modes, such as Bertrand and Stackelberg competitions in production. Second, we focused on unilateral CSR activities, where only one firm takes CSR initiatives, but the analysis could be extended to bilateral CSR activities. Finally, it is also important to examine other types of CSR, such as environmental concerns and health issues, in future research.

REFERENCES

- Bernard, A.B., Jensen, J. B., Redding, S.J., Schott, P.K., 2018. Global firms. *Journal of Economic Literature*, 56(2), 565-619.
- Brand, B., Grothe, M., 2015. Social responsibility in a bilateral monopoly. *Journal of Economics*, 115(3), 275-289.
- Chang, Y.M., Chen, H.Y., Wang, L.F.S., Wu, S.J., 2014. Corporate social responsibility and international competition: A welfare analysis. *Review of International Economics*, 22, 625-638.
- Chen, J.Q., Lee, S.H., Muminov, T.K., 2019. Time-inconsistent output subsidy/tax policies in free-entry mixed markets. *Hitotsubashi Journal of Economics*, 60(1):61-77.
- Cho, S.M., Lee, S.H., Hoang, X.T., 2019. Corporate social responsibility and strategic trade policy: An endogenous timing game and its policy implications. *Australian Economic Papers*, 58(4), 480-497.
- Crifo, P., Forget, V., 2015. The economics of corporate social responsibility: A firm-level perspective survey. *Journal of Economic Survey*, 29(1), 112-130.
- Fanti, L., Buccella, D., 2017. Corporate social responsibility in a game-theoretic context. *Economia e Politica Industriale*, 44(3), 371-390.
- Garcia, A., Leal, M., Lee, S.H., 2018. Time-inconsistent environmental policies with a consumer-friendly firm: Tradable permits versus emission tax. *International Review of Economics & Finance*, 58, 523-537.
- Goering, G. E., 2014. The profit-maximizing case for corporate social responsibility in a bilateral monopoly. *Managerial and Decision Economics*, 35(7), 493-499.

- Guo, M.Y., Zheng, C.D., 2021. Foreign ownership and corporate social responsibility: Evidence from China. *Sustainability*, DOI: 10.3390/su13020508.
- Hamilton, J.H., Slutsky, S.M., 1990. Endogenous timing in duopoly games: Stackelberg or Cournot equilibria. *Games & Economic Behavior*, 2(1), 29-46.
- Haraguchi, J., Matsumura, T., 2020a. Implicit protectionism via state enterprises and technology transfer from foreign enterprises. *Review of International Economics*, 28(3), 723-743.
- Haraguchi, J., Matsumura, T., 2020b. Lack of commitment to future privatization policies may lead to worst welfare outcome. *Economic Modelling*, 88, 181-187.
- Hirose, K, Lee, S.H., Matsumura, T., 2020. Noncooperative and cooperative environmental corporate social responsibility. *Journal of Institutional and Theoretical Economics*, 176, 549–571.
- Ino, H., Matsumura, T., 2010. What role should public enterprises play in free-entry markets? *Journal of Economics*, 101(3), 213-230.
- Ino, H., Miyaoka, A., 2020. Government-induced production commitment vs. import-tariff under endogenous entry of foreign firms. *Journal of International Trade and Economic Development*, 29(7), 797-820.
- Kabiraj, A., Kabiraj, T., 2017. Tariff induced licensing contracts, consumers' surplus and welfare. *Economic Modelling*, 60, 439-447.
- Kabiraj, T., Marjit, S., 2003. Protecting consumers through protection: The role of tariff-induced technology transfer. *European Economic Review*, 47, 113-124.
- KPMG, 2015. International survey of corporate responsibility reporting 2015. *KPMG International*.
- Leal, M., Garcia, A., Lee, S.H., 2018. The timing of environmental tax policy with a consumer-friendly firm. *Hitotsubashi Journal of Economics*, 59(1), 25-43.
- Lee, S.H., Park, C.H., 2021. Eco-firms and the sequential adoption of environmental corporate social responsibility in the managerial delegation. *The B.E. Journal of Theoretical Economics*, 19(1), 20170043.
- Lee, S.H., Sato, S., Matsumura, T., 2018. An analysis of entry-then-privatization model: Welfare and policy implications. *Journal of Economics*, 123(1), 71-88.
- Lee, S.H., Xu, L., Chen, Z., 2013. Competitive privatization and tariff policies in an international mixed duopoly. *Manchester School*, 81(5), 763-779.
- Liu, Q., Wang, L.F.S., Chen, C.L., 2018. CSR in an oligopoly with foreign competition: Policy and welfare implications. *Economic Modelling*, 72, 1-7.
- Manasakis, C., Mitrokostas, E., Petrakis, E., 2018. Strategic corporate social responsibility by a multinational firm. *Review of International Economics*, 26(3), 709-720.
- Mukherjee, A., Pennings, E., 2006. Tariffs, licensing and market structure. *European Economic Review*, 50, 1699-1707.

- Planer-Friedrich, L., Sahm, M., 2018. Why firms should care for all consumers. *Economics Bulletin*, 38, 1623-1612.
- Porter, M.E., Kramer, M.R., 2006. Strategy and society: The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84, 78-92.
- Porter, M. E., Kramer, M. R., 2011. Creating Shared Value. *Harvard Business Review*, 89, 62-77.
- PWC global CEO survey 2016. *Pulp & Paper International*.
- Schreck, P., 2011. Reviewing the business case for corporate social responsibility: New evidence and analysis. *Journal of Business Ethics*, 103(2), 167–188.
- Suto, M., Takehara, H., 2018. Does foreign ownership enhance the corporate social performance of Japanese firms? *Building New Bridges Between Business and Society: Recent Research and New Cases in CSR, Sustainability, Ethics and Governance*, edited by Lu, H., Schmidpeter, R., Capaldi, N., Zu, L., DOI: 10.1007/978-3-319-63561-3_11
- UN-Global Compact-Accenture strategy CEO study 2016. *UN Global Compact Reports*.
- Wang, L.F.S., Wang, Y.C., Zhao, L., 2012. Tariff policy and welfare in an international duopoly with consumer-friendly initiative. *Bulletin of Economic Research*, 64(1), 56-64.
- Xu, L., Lee, S.H., 2018. Environmental policies with excess burden of taxation in free-entry mixed markets. *International Review of Economics & Finance*, 58, 1-13.
- Xu, L., Lee, S.H., 2019. Tariffs and privatization policy in a bilateral trade with corporate social responsibility. *Economic Modelling*, 80, 339-351.
- Xu, L., Lee, S.H., 2020. Corporate profit tax and strategic corporate social responsibility under foreign acquisition. *The B.E. Journal of Theoretical Economics*, DOI: 10.1515/bejte-2020-0028.
- Xu, L., Lee, S.H., Matsumura, T., 2017. Ex-ante versus ex-post privatization policies with foreign penetration in free-entry mixed markets. *International Review of Economics & Finance*, 50, 1-7.
- Xu, L., Lee, S.H., Wang, L.F.S., 2016. Free trade agreements and privatization policy with an excess burden of taxation. *Japan and the World Economy*, 37-38: 55-64.
- Xu, L., Su, F., Lee, S.H., 2021. Strategic corporate social responsibility and partial privatization policy with foreign penetration. *Japanese Economic Review*, DOI:10.1007/s42973-021-00075-x.

APPENDIX: PROOFS OF PROPOSITIONS

Proof of Proposition 1: Comparing the strategic CSR and optimal tariff under domestic CSR in Eqs. (9), (10), (17), and (18) yield the following relationships: (i) $\alpha^T > \alpha^C$; and (ii) $t^T < t^C$.

Proof of Proposition 2: Comparing the outputs of the firm and market under domestic CSR in Eqs. (11), (12), (19), and (20) yield the following relationships: (i) $q_1^T > q_1^C$; (ii) $q_2^T < q_2^C$; and (iii) $Q^T > Q^C$.

Proof of Proposition 3: Comparing the profit of the CSR-firm and social welfare under domestic CSR in Eqs. (13), (14), (21), and (22), we have that (i) $\pi_1^T < \pi_1^C$; and (ii) $W^T > W^C$, and the equality holds only when $b = 0$.

Proof of Proposition 4: Comparing the strategic CSR and optimal tariff under foreign CSR yield the following relationships: (i) $\alpha^{TF} \lesseqgtr \alpha^{CF}$ when $b \lesseqgtr 0.262$; and (ii) $t^{TF} \gtrless t^{CF}$ when $b \lesseqgtr 0.221$.

Proof of Proposition 5: Comparing the equilibrium outputs under foreign CSR yield the following relationships: (i) $q_1^{TF} \gtrless q_1^{CF}$ when $b \lesseqgtr 0.260$; (ii) $q_2^{TF} \lesseqgtr q_2^{CF}$ when $b \lesseqgtr 0.260$; and (iii) $Q^{TF} \lesseqgtr Q^{CF}$ when $b \lesseqgtr 0.260$.

Proof of Proposition 6: Comparing the profit of the CSR-firm and social welfare under foreign CSR yield the following relationships: (i) $\pi_2^{TF} \lesseqgtr \pi_2^{CF}$ when $b \lesseqgtr 0.206$; and (ii) $W^{TF} \lesseqgtr W^{CF}$ when $b \lesseqgtr 0.262$.

Proof of Proposition 7: We first analyze a simultaneous game in which the government and the owner of a domestic firm make decisions simultaneously. In the first stage, the differentiation of π_1 and W in Eq. (8) with respect to α and t yield the following strategic CSR and optimal tariff: $\alpha^S = \frac{45+18b-7b^2-4b^3+b^4-H_2}{2(15+6b-6b^2-b^3+b^4)}$ and $t^S = \frac{27(45-H_2)+b(1134-837b-342b^2+117b^3+32b^4-6b^5+6H_2)}{4b(405-126b^2+11b^4)}$, where $H_2 = (2025 + 1620b - 1206b^2 - 792b^3 + 427b^4 + 80b^5 - 70b^6 + 4b^7 + b^8)^{1/2}$ and the superscript ‘‘S’’ represents the equilibrium outcome in the simultaneous-move game under domestic CSR. Then, the domestic firm’s profit is $\pi_1^S = \frac{27(5-b)^2(9-2b^2)}{26325-3240b-8766b^2+720b^3+1087b^4-52b^5-70b^6+4b^7+b^8+(225-18b-37b^2+2b^3+b^4)H_2}$. Social welfare is $W^S = \frac{(45+18b-17b^2-2b^3+b^4)H_2-2025-1620b+3294b^2+216b^3-751b^4+4b^5+58b^6-b^8}{16b^2(405-126b^2+11b^4)}$. Finally, comparing the profit of the CSR-firm and social welfare in the three cases under domestic CSR, we have $W^T > W^S > W^C$ and $\pi_1^C > \pi_1^T > \pi_1^S$ for all $b \in (0, 1)$.

Proof of Proposition 8: From Proposition 7, we see that the T game is a Nash equilibrium for all $b \in (0, 1)$. Furthermore, comparing social welfare in the three cases, we have $W^T > W^S > W^C$. Thus, the T game is always a socially desirable Nash equilibrium under domestic CSR.

Proof of Proposition 9: We first analyze a simultaneous game in which the government and the owner of a foreign firm make decisions simultaneously. In the first stage, the differentiation of π_2 and W in Eq. (24) with respect to α and t yield: $\alpha^{SF} = 0$ and $t^{SF} = \frac{(3-b)(6+b)}{45-4b^2}$, where the superscript “SF” represents the equilibrium outcome in the simultaneous-move game under foreign CSR. The profit of the domestic firm and social welfare are: $\pi_2^{SF} = \frac{3(9-4b)^2}{2(45-4b^2)^2}$ and $W^{SF} = \frac{29-8b}{2(45-4b^2)}$. Comparing the equilibrium profit of the foreign firm and social welfare in the three cases under foreign CSR, we have (i) $W^{TF} > W^{SF}$; and (ii) $W^{CF} \geq W^{SF}$, $\pi_2^{TF} \geq \pi_2^{SF}$, $\pi_2^{CF} \geq \pi_2^{SF}$, and the equality holds when $0.272 \leq b < 1$.

Proof of Proposition 10: From Proposition 9, we see that the T game and the C game are Nash equilibria when $0 < b < 1$ under foreign CSR, and the S game is the Nash equilibrium when $0.272 \leq b < 1$. Furthermore, comparing social welfare in the three cases under foreign CSR, we have that (a) W^{CF} is the highest when $0 < b < 0.262$; and (b) W^{TF} is the highest when $0.262 < b < 1$. Thus, we obtain that (i) the C game is a Nash equilibrium under foreign CSR and it is socially desirable when $0 < b < 0.262$; and (ii) the T game is a Nash equilibrium and it is socially desirable when $0.262 < b < 1$.

TABLES

Table 1: Payoff matrices in an endogenous timing game

<i>Government/The owner of firm i</i>	$T_2 = 1$	$T_2 = 2$
$T_1 = 1$	(W^S, π_i^S)	(W^T, π_i^T)
$T_1 = 2$	(W^C, π_i^C)	(W^S, π_i^S)

FIGURES

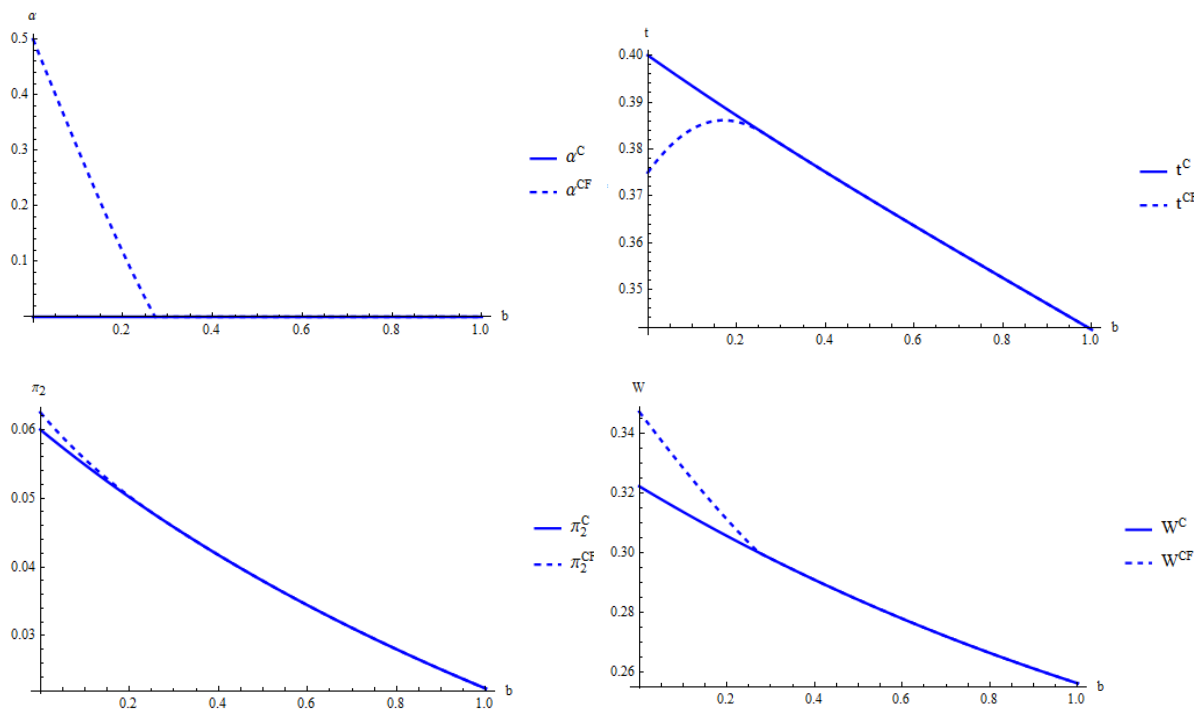
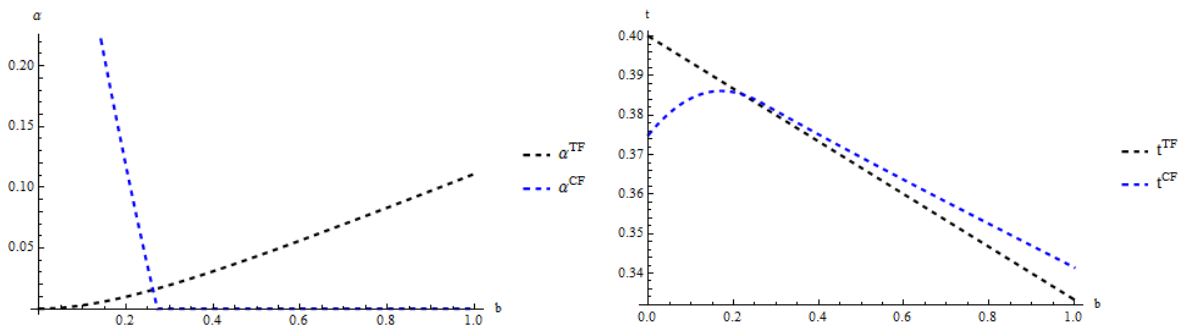


Figure 1: Comparisons between domestic and foreign CSRs in the C game



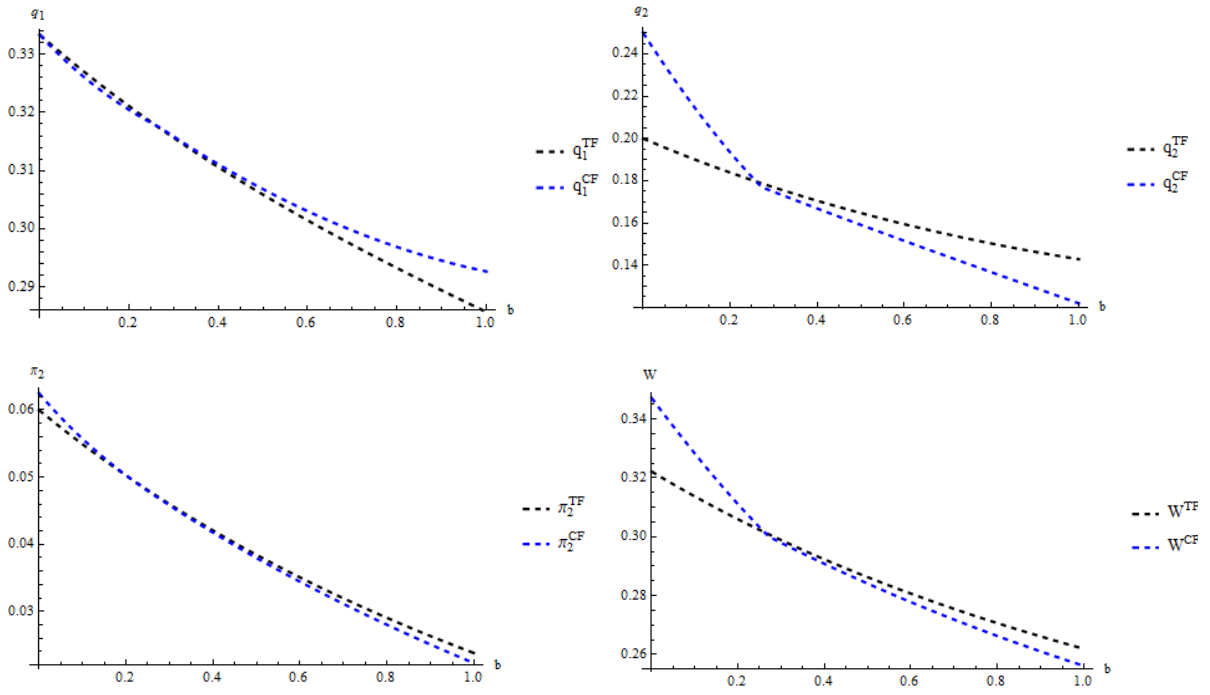


Figure 2: Comparisons between T and C games under foreign CSR