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Why Does the WTO Prohibit Export Subsidies but not Import Tariffs?*

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Abstract

We develop a three-stage lobbying game to explain why the WTO prohibits export subsidies but not import tariffs. In this model, the government chooses trade policies (i.e., import tariffs or export subsidies) to maximize a weighted sum of social welfare and lobbying contributions. We argue that the economic rents from export subsidies cannot be contained exclusively within lobby groups because new capitalists, who will enter the growing export sector, freely benefit from export subsidies without paying political contributions at the time of lobbying. In the contracting import-competing industries, no new entrants erode the protection rents from tariffs. Therefore, the government receives large political contributions by protecting these import-competing industries. We show that, given that capital reallocation is costly, when the free-rider problem is severe the government will sign a trade agreement that prohibits only export subsidies.

Keywords: WTO, export subsidy, import tariff, trade negotiations
JEL classification numbers: F13; F15; F53.

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1 Introduction

Since 1948, Article XVI of the General Agreement on Tariffs and Trade (GATT) has called for contracting parties to avoid export subsidies on primary products and to abolish export subsidies on other goods. The WTO's *Agreement on Subsidies and Countervailing Measures*, based on the Tokyo Round subsidies code issued in 1979, defines export subsidies and prohibits them on non-primary products. While countries may choose their import tariff binding level in exchange for concessions, export subsidies are completely prohibited, with few exceptions.

As pointed out by Bagwell and Staiger (2001), the prohibition of export subsidies presents a puzzle to trade economists because it contradicts standard theories of trade agreements, which find that the role of a trade agreement is to resolve the prisoner's dilemma that is driven by terms-of-trade externalities.[1] In the noncooperative equilibrium, large countries exploit their market power by using import tariffs and export taxes to decrease the prices of imports and increase the prices of exports in order to maximize national income. As a result, import tariffs and export taxes are higher than their efficient levels, and the volume of trade is less than its efficient level. Standard theories fail to account for why governments use export subsidies in the absence of a trade agreement because export subsidies lower both a country's terms of trade and its national income.

One way to rationalize export subsidies from the perspective of an individual country is to allow the government to be motivated by distributional concerns in addition to national income. For example, a government may be highly concerned with the welfare of its exporting sectors. However, that still does not explain why the WTO prohibits export subsidies. After all, when a government subsidizes exports, the world price of the export good falls, and foreign consumers receive a positive externality from the subsidy policy. Under a cooperative trade agreement in which this positive externality is internalized, export subsidies should be encouraged by the WTO.

The objective of this paper is to explain why the WTO's member countries have agreed to completely prohibit export subsidies but not import tariffs. According to the commitment theory (Maggi & Rodriguez-Clare, 1998), a country signs an agreement as a commitment device to avoid potential future negotiations with lobby groups that would result in lower social welfare. Our novel contribution is to argue that the asymmetric treatment of export subsidies and import tariffs arises because of the free-rider problem in the expanding export sectors. When the free-rider problem is severe, the government is better off by signing an agreement that completely prohibits only export subsidies but not import tariffs.

To illustrate the main mechanism, we develop a lobbying game between a lobby group and the government based on Maggi and Rodriguez-Clare (1998). Our model is different from the model of Maggi and Rodriguez-Clare (1998) in two main aspects. First, motivated by empirical evidence, our model introduces a reduction in transportation costs. Second, we relax the assumption of capital immobility by allowing capital owners to move their capital between sectors subject to

[1] Some representatives of the standard theories are Johnson (1954), Grossman and Helpman (1995), Levy (1999), and Bagwell and Staiger (1999).

capital reallocation costs. As a result, the predictions of our model are consistent with empirical evidence that in the past decades export industries have grown while import-competing sectors have contracted.

Our game consists of three stages: Stage 0, 1, and 2. At Stage 0, the government chooses whether to sign agreements that prohibit trade policy (i.e., import tariffs or export subsidies). After the government's decision has been made and announced publicly, capitalists allocate their capital between the manufacturing sectors and the numeraire sector.

At Stage 1, if the government has signed the agreement to commit to free trade in a manufacturing sector, no lobby group is organized in that sector. However, if the government has not signed the agreement, the capitalists in the manufacturing sector form a lobby group to negotiate with the government for trade protection. The lobby group negotiates to maximize the capitalists' return on capital net of lobbying contributions paid to the government, while the government maximizes a weighted sum of social welfare and lobbying contributions. After a trade policy is chosen and lobbying contributions are paid, production and international trade occur. Stage 2 begins with a reduction in transportation costs. The reduction in transportation costs causes asymmetric effects on export and import-competing sectors; new firms enter these export sectors while existing firms in the import-competing sectors exit.

In the lobbying game, the government employs trade policy to extract rents in the form of political contributions from the lobbies in the protected sectors. The welfare costs of trade protection arise through two channels: capital misallocation and reduced consumer surplus. First, without an agreement prohibiting trade policy, capitalists anticipate lobbying to occur and expect higher returns on capital from trade policy that will be implemented. As a result, capital is misallocated in the sense that the amount of capital in the lobbying game is different from the amount of capital under an agreement in which the government commits to free trade. Second, trade protections raise the domestic prices of goods. Thus, consumption decisions are distorted and consumer surplus decreases.

In this paper, we restrict our attention to simple agreements in which tariffs and export subsidies are either freely used or completely prohibited. This setup is motivated by the fact that the WTO bans export subsidies as a membership condition, while tariff bindings are bilaterally or multilaterally negotiated and do not require permission from other WTO members. Because the main objective of this paper is to investigate the asymmetric treatment of import tariffs and export subsidies, we abstract from the tariff negotiation issues.

The first part of our analysis considers the lobbying game between the government and the lobby group in the import-competing sector. The game is solved using backward induction. At the last stage (after the transportation cost decreases), the domestic price of the imported good falls and hence the returns on capital in the import-competing sector fall. Because capital is sunk, the capitalists in the import-competing sector have an incentive to lobby for higher tariffs to prevent a large decrease in returns on capital. Our first result is that governments choose to commit to an agreement that prohibits import tariffs when their bargaining powers are sufficiently low.

This result is consistent with Maggi and Rodriguez-Clare (1998). With low bargaining power, the government receives small political contributions that do not cover the welfare costs of trade protections. In this case, the government would sign an agreement in the initial stage prohibiting import tariffs.

The second part of the analysis shifts toward the export sector. The lobby group in the export sector negotiates for export subsidies in exchange for political contributions. In the last stage, after transportation costs decrease, the return on capital in the export sector increases and, thus, new capitalists move their capital into the export sector. Because the government cannot discriminate against them, the new capitalists gain from export subsidies without paying political contributions and the initial capitalists' economic rents from the export subsidies decrease. As the duration of the last stage becomes relatively longer (the free-rider problem becomes more severe), capitalists want to allocate their capital in the numeraire sector in the first stage and then reallocate it to the export sector at the beginning of the last stage. This behavior causes underinvestment in the manufacturing sector. Therefore, the government receives smaller political contributions, because fewer capitalists initially invest in the manufacturing sector, and each capitalist is willing to make smaller contributions. In this situation, the government would sign an agreement that prohibits export subsidies.

To explain the asymmetry between the treatment of export subsidies and that of import tariffs, we compare the parameter spaces in the previous analyses and characterize the set of parameter values such that the government chooses to completely prohibit export subsidies but not import tariffs. Our main conclusion is that, given that capital reallocation is costly, governments sign an agreement that prohibits export subsidies but allows import tariffs when the free-rider problems are very significant.

To the best of our knowledge, our paper is the first to provide an explanation for the asymmetric treatment of export subsidies and import tariffs in the WTO by using the commitment theory. Recent studies such as Bagwell and Lee (2018) and Beshkar and Lashkaripour (2017) provide different reasons for the export subsidy puzzle. Bagwell and Lee (2018) study trade policy under monopolistic competition with heterogeneous firms. In their model, there is the entry-externality effect that causes the level of entry to be inefficiently low. Thus, an export subsidy that encourages additional entries can improve the country's welfare at the expense of the country's trading partner. Beshkar and Lashkaripour (2017) use the complementarity of export subsidies and import tariffs to show that when export subsidies are banned, the countries' unilaterally optimal tariffs are reduced by around 44 percentage points. The main difference between this paper and their papers is that we use a political economy approach.

A number of studies propose various economic rationales for export subsidies but do not explain why import tariffs and export subsidies are treated differently. For example, Brander and Spencer (1985) show that export subsidies are unilaterally optimal in a model in which two exporting countries compete in a Cournot fashion. Bagwell and Staiger (2001) study a model similar to that of Brander and Spencer (1985) in a standard partial-equilibrium setting and find the same

result under the condition that the exporting governments weigh producer surplus heavily. Furthermore, they show that although the exporting government gains when limiting export subsidies, the outcome is inefficient from a global perspective. In the efficient outcome, export subsidies should be promoted, and the importing country should transfer income to the exporting countries. Itoh and Kiyono (1987) propose that export subsidies may be used to alter the pattern of trade of the marginal product. DeRemer (2013) shows that in a model with imperfectly competitive markets, entry subsidies and export subsidies are optimal if (i) the government's political economy weight on profits is high, (ii) the domestic share of consumption is high, and (iii) the substitutability between differentiated goods relative to the outside good is high. Suwanprasert (2017, 2018a, 2018b) shows that a government may use export subsidies when its unemployment is inefficiently high. These works cannot explain why the WTO prohibits export subsidies.

Another strand of the literature argues that trade agreements can be used as a commitment device to help a government enhance its credibility and solve domestic time-inconsistency problems (for example, Maggi & Rodriguez-Clare, 1998; Mitra, 2002; Staiger & Tabellini, 1987; and Tomell, 1991). These models provide a rationale for the government of a small country to commit to a free trade agreement and eliminate both tariffs and export subsidies. Maggi and Rodriguez-Clare (2005 and 2007) develop a model in which trade agreements are motivated both by terms-of-trade and domestic commitment problems. The model allows the agreement to be incomplete, such that governments may specify only tariff and export subsidy ceilings rather than the exact levels of tariffs and export subsidies.[2] Their model also allows lobbying to occur in two stages: when the agreement is designed (ex-ante lobbying) and when the tariff and export subsidy rates are selected by each government (ex-post lobbying). If the ex-post lobbying is stronger than the ex-ante lobbying, the optimal trade agreement is incomplete, and it limits *both* import tariffs and export subsidies. Therefore, they cannot account for the asymmetric treatment of import tariffs and export subsidies in the WTO.

The remainder of the paper is organized as follows. Section 2 describes the basic model. Section 3 analyzes the game in the import-competing sector and studies the condition under which committing to a tariff prohibition agreement improves the government's payoff. Section 4 repeat the same exercises but in the export sector. In Section 5, we study the conditions under which it is optimal for the government to sign an agreement that prohibits export subsidies but allows import tariffs. Section 6 concludes.

2 The Model

This section describes our model, which extends the model of Maggi and Rodriguez-Clare (1998) in two main directions. First, motivated by commonly known empirical evidence, our model introduces a reduction in transportation costs. Second, while Maggi and Rodriguez-Clare (1998)

[2] An agreement is considered complete if it specifies the exact levels of tariffs and export subsidies. For example, if the agreement is incomplete, at this stage, special interest groups might lobby for the values of the tariff and export subsidy ceilings.

assume capital immobility, we relax the capital immobility assumption by allowing capital owners to move their capital between sectors subject to capital reallocation cost. These two features allow the model to generate an expansion in the export sector and a contraction in the import-competing sector.

2.1 The Economic Environment

For simplicity and clarity, consider a *small* open economy called Home (H). There are three goods in the world: one numeraire good, called N, and two manufacturing goods, called X and Y. The world prices of the numeraire good, good X, and good Y are one, p_X^w and p_Y^w, respectively.

There are two factors of production: land and capital. Land is sector-specific. Home has a fixed unit of land for production of each manufacturing good. Capital is used in the production of all goods and mobile across sectors.

The production function of the manufacturing good $j = X, Y$ is

$$F_j\left(k_j\right) = 2\sqrt{k_j},$$

where k_j is the level of capital employed in the production of good j.[3] The marginal product of capital in the production of good j is

$$f_j\left(k_j\right) = \frac{1}{\sqrt{k_j}}.$$

The markets for capital are perfectly competitive. The rental rate of capital in sector j, denoted by r_j, is equal to the value of the marginal product of capital in that sector. The total economic rent on land in sector j is distributed equally back to the population.

The production technology of the numeraire good is

$$G\left(k_N\right) = k_N,$$

where k_N is the amount of capital employed in the numeraire sector.

The preference of the representative household is

$$U\left(q_X, q_Y, q_N\right) = q_N + v_X q_X - \frac{1}{2}\left(q_X\right)^2 + v_Y q_Y - \frac{1}{2}\left(q_Y\right)^2,$$

where q_X, q_Y and q_N are the quantities of goods X, Y, and N that the representative household consumes, respectively, and v_X and v_Y are sector-specific demand shifters. The demand functions

[3] To investigate the rationale of asymmetric treatment between export subsidies and import tariffs, we assume that the production functions of the manufacturing goods are identical so they are not a source of the asymmetry. Nonetheless, our results are independent of the endowments.

of the representative household are

$$q_j\left(p_j\right) = v_j - p_j,$$
$$q_N\left(p_j\right) = I - p_X q_X\left(p_X\right) - p_Y q_Y\left(p_Y\right),$$

where p_j is the local price of the manufacturing good j and I is the net income available for consumption (which will be determined later).

The consumer surplus $CS_j\left(p_j\right)$ from consuming the manufacturing good j at a local price p_j is

$$CS_j\left(p_j\right) = \frac{\left(v_j - p_j\right)^2}{2}.$$

Without loss of generality, we assume that Home is a natural importer of good X and a natural exporter of good Y. The net imports of good X and Y are

$$IM_X\left(p_X\right) = q_X\left(p_X\right) - F\left(k_X\right)$$
$$EX_Y\left(p_Y\right) = F\left(k_Y\right) - q_Y\left(p_Y\right).$$

The local price p_j of the manufacturing good is equal to the world price p_j^w adjusted by the transportation costs and trade policy (import tariff τ or export subsidy s) and can be written as

$$p_X = \overline{p}_X + \tau = \left(p_X^w + \zeta\right) + \tau \tag{1}$$
$$p_Y = \overline{p}_Y + s = \left(p_Y^w - \zeta\right) + s \tag{2}$$

where $\overline{p}_j$ is the price of manufacturing good j under free trade, τ is the import tariff, s is the export subsidy, p_j^w is the world price of manufacturing good j in the world market, and ζ is the cost of transporting the manufacturing goods between Home and the world market. As in standard economic geography models, the numeraire good is traded freely and is transported costlessly. We assume that Home does not use trade policy to alter the pattern of trade.

The social welfare of Home, denoted by ω, is defined as

$$\omega\left(k_X, k_Y, \tau, s\right) \equiv p_X X^s + p_Y Y^s + N^s + CS_X\left(p_X\right) + CS_Y\left(p_Y\right) + \tau \times IM_X\left(p_X\right) - s \times EX_Y\left(p_Y\right) \tag{3}$$

where X^s, Y^s, and N^s are the quantities of good X, good Y, and the numeraire good N that are produced by Home. The right-hand side of equation (3) is the sum of the values of the outputs, the consumer surplus, the tariff revenue, and the subsidy expenditure.

2.2 The Lobbying Game

2.2.1 The Structure of the Game

The game is divided into three stages: Stage 0, Stage 1, and Stage 2. Henceforth, variables may be indexed by a time subscript indicating the associated stage. The length of time in the game is

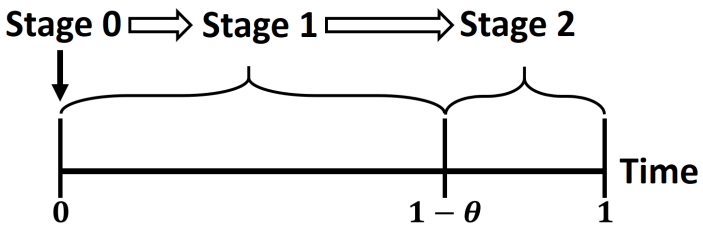

Figure 1: Timeline

normalized to one. The timeline is illustrated in Figure 1.

The game begins with Stage 0, prior to the beginning of time. In this stage, the government has to choose whether or not to sign agreements prohibiting the future use of trade policy. After the government has made a decision and announced it publicly, the capitalists learn the decision and then allocate their capital between the three sectors.

Stage 1 is the period $[0, 1-\theta)$. It is the period of time that starts after capital is allocated and ends right before the transportation cost changes. If the government has not signed the agreement in Stage 0, then in Stage 1 a lobby group is formed in each manufacturing sector. No lobby group is formed in the numeraire sector. The lobby and the government use Nash bargaining to negotiate on a trade policy (tariff τ or subsidy rate s) and political contributions c. After the trade policy is set, it remains unchanged for the whole game. The lobby pays the political contribution, and no more contributions will be paid in the game. If the government has signed the agreement in Stage 0, then the government is committed to free trade and no lobby group is created. During period $[0, 1-\theta)$, goods are produced and traded. Stage 1 ends at time $1-\theta$.

Stage 2 starts at time $1-\theta$ and lasts until the game ends. Motivated by the reductions in trade costs in the past decades, we assume that the transportation costs will fall from ζ_1 to $\zeta_2 < \zeta_1$ at time $1-\theta$.[4] This decrease has been fully anticipated by all the agents, who knew in Stage 0 that it would occur at time $1-\theta$.[5] While the world prices p_j^w are constant for the whole game, the local prices (p_X and p_Y) may change due to the change in the transportation cost ζ, as shown in equations (1) and (2). At the beginning of Stage 2, capital may move between sectors to seek a higher rate of return, but the capital adjustment incurs adjustment cost $\epsilon > 0$. The decrease in the transportation costs has asymmetric effects on the growth rates of the import-competing and export sectors; the export sectors are expanding, but the import-competing sectors are not. After the transportation costs have decreased, capital can be reallocated between sectors to seek a higher return. However, moving capital is subject to the capital adjustment cost $\epsilon > 0$ per unit of capital. In period $[1-\theta, 1]$, goods are produced and traded. For simplicity, we assume no payoff discounting over time.[6]

[4] We can allow for a continuous decrease in the transportation costs. The results are independent of the structure of the reduction in the transportation costs.

[5] The idea of this assumption is that firms anticipate exogenous technology improvements that save transportation costs over time.

[6] We can easily allow for discounting. The parameter θ can be chosen such that the equilibrium allocation without

The lengths of Stages 1 and 2 are $1-\theta$ and θ, respectively. The term $\theta \in (0,1)$ can be interpreted as the degree of the free-rider problem. This capital movement is the main difference between our model and that of Maggi and Rodriguez-Clare (1998). In Maggi and Rodriguez-Clare (1998), capital cannot move across sectors after the protection rate is announced. In the case of $\theta = 0$, Stage 2 disappears and our model becomes a special case of Maggi and Rodriguez-Clare (1998).

2.2.2 Payoffs

In this section, we define the payoff of each player. We begin with the capitalists. The capitalists are highly concentrated and account for a negligible portion of the population. A capitalist maximizes his utility by allocating his capital to the sector with the highest rate of return. Thus, in equilibrium, the expected net returns on capital in both sectors must be equalized.

Given anticipated trade policy, the rates of return on capital in the manufacturing sector j in stage t, denoted by $r_{j,t}$, is

$$r_{X,t} = \begin{cases} (p_X^w + \zeta_1 + \tau)\frac{1}{\sqrt{k_{X,1}}} & \text{if } t = 1 \\ (p_X^w + \zeta_2 + \tau)\frac{1}{\sqrt{k_{X,2}}} & \text{if } t = 2 \end{cases} \tag{4}$$

$$r_{Y,t} = \begin{cases} (p_Y^w - \zeta_1 + s)\frac{1}{\sqrt{k_{Y,1}}} & \text{if } t = 1 \\ (p_Y^w - \zeta_2 + s)\frac{1}{\sqrt{k_{Y,2}}} & \text{if } t = 2 \end{cases} \tag{5}$$

where $k_{j,t}$ is the amount of capital used in production of good j in stage $t = 1, 2$. The rate of return of capital is equal to the product of the local price and the marginal product of capital. To be consistent with empirical evidence mentioned earlier, we focus on interior equilibrium in which the export sector grows and the import-competing sectors decline; we assume the parameters such that each sector employs a positive amount of capital and the transportation cost falls sharply to induce such movements.

A key feature of this model is that new capital that moves to the manufacturing sectors in period 2 can free ride on the trade policies without paying political contributions. The lobby groups cannot legally force new entrants to pay political contributions nor exclude them from receiving benefits from trade policy.

The payoffs of the lobby groups in sectors X and Y (formed by the capitalists in the manufacturing sectors in period 1) denoted by Λ_X and Λ_Y, respectively, are their net returns on capital:

$$\Lambda_X(k_{X,1}, \tau) \equiv ((1-\theta) r_{X,1} + \theta r_{X,2} - c_X) k_{X,1}, \tag{6}$$

$$\Lambda_Y(k_{Y,1}, s) \equiv ((1-\theta) r_{Y,1} + \theta r_{Y,2} - c_Y) k_{Y,1}. \tag{7}$$

The payoff of the lobby is calculated based on the quantity of capital in Stage 1 because the new

discounting under the chosen θ and the equilibrium allocation with discounting are equivalent.

capital that moves into the sector in Stage 2 did not participate the lobby in Stage 1.

The government's payoff is the weighted sum of social welfare and political contributions. It is defined formally as

$$\Omega\left(k_{X,1},k_{Y,1},\tau,s\right)\equiv\left(1-\theta\right)\omega\left(k_{X,1},k_{Y,1},\tau,s\right)+\theta\omega\left(k_{X,2},k_{Y,2},\tau,s\right)+ac_{X}k_{X,1}+ac_{Y}k_{Y,1} \tag{8}$$

The first two terms on the right-hand side are the social welfare in period 1 and period 2, respectively. The term $c_j k_{j,1}$ is the total contribution that the government gets from the lobby in sector j. The term $a \geq 0$ is the weight that the government puts on the political contribution relative to social welfare.

The bargaining subgame is modeled as a Nash bargaining game after capital $k_{j,1}$ is allocated. The lobby group in each sector independently negotiates with the government. The status quo is that the government chooses free trade and the lobby group pays no contributions. The government's and lobby's bargaining powers are σ and $1-\sigma$, respectively. The government and the lobby group choose the trade policy that maximizes their joint surplus, and then the surplus is divided according to their respective bargaining powers.

The Nash bargaining problem in each sector can be written as

$$\max_{\tau,c_X}\left[\Omega\left(k_{X,1},k_{Y,1},\tau,s\right)-\Omega\left(k_{X,1},k_{Y,1},0,s\right)\right]^{\sigma}\left[\Lambda_X\left(k_{X,1},\tau\right)-\Lambda_X\left(k_{X,1},0\right)\right]^{1-\sigma}, \tag{9}$$

$$\max_{s,c_Y}\left[\Omega\left(k_{X,1},k_{Y,1},\tau,s\right)-\Omega\left(k_{X,1},k_{Y,1},\tau,0\right)\right]^{\sigma}\left[\Lambda_Y\left(k_{Y,1},s\right)-\Lambda_Y\left(k_{Y,1},0\right)\right]^{1-\sigma}, \tag{10}$$

where $\Lambda_j\left(k_{j,1},0\right)$ is the payoff under free trade of the lobby in sector j and $\Omega\left(k_{X,1},k_{Y,1},0,s\right)$ and $\Omega\left(k_{X,1},k_{Y,1},\tau,0\right)$ are the government's payoffs when it chooses free trade in sector X and Y, respectively.

In this paper, for simplicity and tractability, we restrict our attention to simple agreements in which tariffs and export subsidies are either freely used or completely prohibited. Tariff bindings are bilaterally or multilaterally negotiated and do not require permission from other WTO members, but the WTO bans export subsidies as a membership condition. To focus on the asymmetry between tariffs and export subsidies, this paper abstracts from the negotiation issues.

3 Import Tariffs and Import-Tariff Prohibition Agreements

In this section, we study the condition(s) under which the government gains from the import-tariff prohibition agreement. To do so, we first solve the game under a tariff prohibition agreement. Then we solve the lobbying game in the absence of tariff agreements. Finally, we find the condition(s) under which the government gains by committing to the agreement.

3.1 Import-Tariff Prohibition Agreements

In this section, the government has an opportunity to precommit to an agreement that prohibits import tariffs before the lobbying game begins. Under the agreement, no lobbies are formed, and capital owners anticipate that $\tau = 0$ and $c_X = 0$ in Stages 1 and 2.

The returns on capital in sector X in both stages in equation (4) are simplified to $\overline{p}_{X,1}/\sqrt{k_{X,1}}$ and $\overline{p}_{X,2}/\sqrt{k_{X,2}}$, respectively.

At the beginning of Stage 2 after the transportation cost declines, the local price of good X decreases and the rate of return on capital in sector X decreases. Therefore, capital owners prefer to move their capital from sector X to seek higher returns elsewhere. The capital reallocation decision can be formalized as

$$\max \left\{ \theta \frac{\overline{p}_{X,2}}{\sqrt{k_{X,2}}}, \theta - \epsilon \right\}.$$

Given any outcome in sector Y, any interior equilibrium in which the numeraire sector employs a positive amount of capital requires that the rate of return on capital must be equalized. As capital owners deallocate their capital from sector X to other sectors, the rate of return in sector X increases until it is equal to $\theta - \epsilon$, the return on capital in the other sectors net of the capital adjustment cost.

In equilibrium, the rate of return on capital in Stage 2 satisfies

$$\theta \frac{\overline{p}_{X,2}}{\sqrt{k_{X,2}}} = \theta - \epsilon.$$

This equation pins down the equilibrium amount of capital in sector X in Stage 2 under free trade (FT).

$$k_{X,2}^{FT} = \left(\frac{\theta}{\theta - \epsilon} \overline{p}_{X,2} \right)^2. \tag{11}$$

The amount of capital $k_{X,2}^{FT}$ is increasing in the adjustment cost ϵ. An increase in the adjustment cost reduces the return from moving capital out of the sector and discourages capital movement. Therefore, more capital stays in sector X despite the decrease in the return.

At the beginning of Stage 1, capital owners allocate their capital until the expected returns are equalized. Capital $k_{X,1}$ is allocated such that it satisfies

$$(1-\theta) \frac{\overline{p}_{X,1}}{\sqrt{k_{X,1}}} + \max \left\{ \theta \frac{\overline{p}_{X,2}}{\sqrt{k_{X,2}}}, \theta - \epsilon \right\} = (1-\theta)(1) + \theta(1). \tag{12}$$

The left-hand side represents the expected lifetime return on capital in sector X. In Stage 1, capital owners receive $(1-\theta)\,\overline{p}_{X,1}/\sqrt{k_{X,1}}$, and in Stage 2 capital owners can choose between staying in sector X (receiving $\theta \overline{p}_{X,2}/\sqrt{k_{X,2}}$) or moving to another sector (getting $\theta - \epsilon$). The right-hand side is the value of the outside option; capital owners can always allocate their capital to the numeraire sector and are guaranteed the return of one in both periods.

We can solve for the equilibrium amount of capital $k_{X,1}$ by substituting equation (11) into equa-

tion (12):

$$k_{X,1}^{FT} = \left(\left(\frac{1-\theta}{1-\theta+\epsilon} \right) \overline{p}_{X,1} \right)^2. \tag{13}$$

Without the adjustment cost ϵ, $k_{X,1}^{FT}$ would be reduced to $\left(\overline{p}_{X,1}\right)^2$. The adjustment cost lowers the return in Stage 2 and discourages capital allocation in Stage 1. In a first-best equilibrium without the adjustment costs, $k_{X,1}^{FT}$ would be higher and $k_{X,2}^{FT}$ would be smaller.

Given any capital $k_{X,1}^{FT}$ and $k_{X,2}^{FT}$, the government's welfare under the tariff prohibition agreement, denoted by Ω_X^{FT}, can be calculated and is equal to

$$\begin{aligned}
\Omega_X^{FT} =& \Omega\left(k_{X,1}^{FT}, k_{Y,1}, 0, s\right) \\
=& (1-\theta)\left[\overline{p}_{X,1} F_X\left(k_{X,1}^{FT}\right) + \left(k - k_{X,1}^{FT}\right) + \frac{1}{2}\left(v_X - \overline{p}_{X,1}\right)^2\right] \\
&+ \theta\left[\overline{p}_{X,2} F_X\left(k_{X,2}^{FT}\right) + \left(k - k_{X,2}^{FT}\right) + \frac{1}{2}\left(v_X - \overline{p}_{X,2}\right)^2\right] - \epsilon\left(k_{X,1}^{FT} - k_{X,2}^{FT}\right) + W_Y\left(k_{Y,1}, s\right),
\end{aligned} \tag{14}$$

where $W_Y\left(k_{Y,1}, s\right)$ captures the terms from sector Y that are independent of the choice of trade policy in sector X. The welfare calculation also includes welfare loss from the capital adjustment cost, $\epsilon\left(k_{X,1}^{FT} - k_{X,2}^{FT}\right)$.

3.2 Import Tariffs in the Absence of Tariff Prohibition Agreements

According to equation (1), the local prices of the manufacturing good Xin periods 1 and 2 are

$$\begin{aligned}
p_{X,1} &= \overline{p}_{X,1} + \tau \\
p_{X,2} &= \overline{p}_{X,2} + \tau.
\end{aligned}$$

In Stage 1, after capital $k_{X,1}$ is allocated, the lobby bargains with the government over the tariff rate τ and political contribution c_X according to the Nash bargaining problem described in equation (9). Capital owners anticipate that the returns on capital in sector X in both stages are $\left(\overline{p}_{X,1} + \tau\right) / \sqrt{k_{X,1}} - c_X$ and $\left(\overline{p}_{X,2} + \tau\right) / \sqrt{k_{X,2}}$ respectively.

After the transportation cost declines at the beginning of Stage 2, the rate of return on capital in the sector X decreases. The capital owners compare the return on staying in sector X (which is $\theta\left(\overline{p}_{X,2} + \tau\right) / \sqrt{k_{X,2}}$) and the return from moving to other sectors (which is $\theta - \epsilon$).

The equilibrium amount of capital in Stage 2 satisfies

$$\theta \frac{\left(\overline{p}_{X,2} + \tau\right)}{\sqrt{k_{X,2}}} = \theta - \epsilon.$$

The equilibrium amount of capital in sector X in Stage 2 under tariff τ is

$$k_{X,2}^{Tariff} = \left(\frac{\theta}{\theta - \epsilon} \left(\overline{p}_{X,2} + \tau \right) \right)^2. \tag{15}$$

The import tariff τ raises the return on capital in Stage 2 and encourages more capital to stay in sector X after trade liberalization. At the beginning of Stage 1 after capital $k_{X,1}$ is allocated, the government's welfare is

$$\begin{aligned} \Omega\left(k_{X,1}, k_{Y,1}, \tau, s\right) = & \\ (1-\theta) & \left[\left(\overline{p}_{X,1} + \tau \right) F_X\left(k_{X,1}\right) + \left(k - k_{X,1}\right) + CS_X\left(\overline{p}_{X,1} + \tau \right) + \tau \left(IM_X\left(\overline{p}_{X,1} + \tau \right) \right) \right] \\ +\theta & \left[\left(\overline{p}_{X,2} + \tau \right) F_X\left(k_{X,2}\right) + \left(k - k_{X,2}\right) + CS_X\left(\overline{p}_{X,2} + \tau \right) + \tau \left(IM_X\left(\overline{p}_{X,2} + \tau \right) \right) \right] \\ & + a c_X k_{X,1} - \epsilon \left(k_{X,1} - k_{X,2} \right) + W_Y\left(k_{Y,1}, s\right). \end{aligned} \tag{16}$$

Given $k_{X,2}^{Tariff}$ from equation (15), the government's gain from tariff τ (relative to free trade) is

$$\Omega\left(k_{X,1}, k_{Y,1}, \tau, s\right) - \Omega\left(k_{X,1}, k_{Y,1}, 0, s\right) = -\left(\frac{1}{2} + \frac{\theta^2}{\theta - \epsilon} \right) \tau^2 + a c_X k_{X,1}.$$

Because tariff τ is chosen after $k_{X,1}$ is determined, a choice of tariff has no impact on the initial capital allocation. The government's welfare change consists of two terms. The first term is the welfare loss of price distortion from tariff: consumption distortion $\left(-\frac{1}{2}\tau^2\right)$ and capital misallocation in Stage 2 $\left(-\left(\frac{\theta^2}{\theta-\epsilon}\right)\tau^2\right)$. The second term, $a c_X k_{X,1}$, is the gain from political contributions.

Under tariff τ, the lobby group's payoff is

$$\Lambda_X\left(k_{X,1}, \tau\right) = \left((1-\theta) \frac{\left(\overline{p}_{X,1} + \tau \right)}{\sqrt{k_{X,1}}} + \max\left\{ \theta \frac{\left(\overline{p}_{X,2} + \tau \right)}{\sqrt{k_{X,2}}}, \theta - \epsilon \right\} - c_X \right) k_{X,1}.$$

Given $k_{X,2}$ from equation (15), the lobby's payoff from tariff τ (relative to free trade) is

$$\Lambda_X\left(k_{X,1}, \tau\right) - \Lambda_X\left(k_{X,1}, 0\right) = \left((1-\theta) \frac{\tau}{\sqrt{k_{X,1}}} - c_X \right) k_{X,1} = (1-\theta)\, \tau \sqrt{k_{X,1}} - c_X k_{X,1}.$$

The tariff τ and political contribution c_X are chosen to maximize the joint surplus of the two bargaining parties as described by equation (9). The Nash bargaining problem is reduced to

$$\max_{\tau, c_X} \left[-\left(\frac{1}{2} + \frac{\theta^2}{\theta - \epsilon} \right) \tau^2 + a c_X k_{X,1} \right]^{\sigma} \left[(1-\theta)\, \tau \sqrt{k_{X,1}} - c_X k_{X,1} \right]^{1-\sigma}$$

The equilibrium protection rate τ and political contribution c_X are

$$\tau\left(k_{X,1}\right)=\frac{a\left(1-\theta\right)\sqrt{k_{X,1}}}{2\left(\frac{1}{2}+\frac{\theta^{2}}{\theta-\epsilon}\right)} \tag{17}$$

$$c_{X}\left(k_{X,1}\right)=\left(\frac{1+\sigma}{2}\right)\frac{a\left(1-\theta\right)^{2}}{2\left(\frac{1}{2}+\frac{\theta^{2}}{\theta-\epsilon}\right)}. \tag{18}$$

It is intuitive that the optimal tariff rate increases in $k_{X,1}$ and a. First, the more the beneficiaries there are, the larger the gain from tariff protection. Second, when the government greatly values political contributions, it would be willing to raise the tariff and receive a larger political contribution in return.

The last step is to determine $k_{X,1}$, the equilibrium amount of capital in sector X in Stage 1. In Stage 0, the expected rates of return in the two sectors are equalized since capital is allocated to seek a higher rate of return. Thus, $k_{X,1}$ satisfies

$$\left(1-\theta\right)\frac{\left(\overline{p}_{X,1}+\tau\right)}{\sqrt{k_{X,1}}}+\max\left\{\theta\frac{\left(\overline{p}_{X,2}+\tau\right)}{\sqrt{k_{X,2}}},\theta-\epsilon\right\}-c_{X}=\left(1-\theta\right)\left(1\right)+\theta\left(1\right). \tag{19}$$

The left-hand side and the right-hand side are the total (periods 1 and 2) return on capital in sector X and the numeraire sector, respectively. The equilibrium amount of capital in sector X in equation (19) is

$$k_{X,1}^{Tariff}=\left(\frac{\left(1-\theta\right)\overline{p}_{X,1}}{1-\theta+\epsilon-\left(\frac{1-\sigma}{2}\right)\frac{a(1-\theta)^{2}}{\left(\frac{1}{2}+\frac{\theta^{2}}{\theta-\epsilon}\right)}}\right)^{2}. \tag{20}$$

The government's welfare under the lobbying game can be calculated by substituting $\tau\left(k_{X,1}\right)$ in equation (17) and $k_{X,1}^{Tariff}$ in equation (20) into the welfare function in equation (16):

$$\Omega_{X}^{Tariff}=\Omega\left(k_{X,1}^{Tariff},k_{Y,1},\tau\left(k_{X,1}^{Tariff}\right),s\right) \tag{21}$$

3.3 The Condition for Import-Tariff Prohibition Agreements

In this section, we analyze how an import-tariff prohibition agreement impacts the capital allocation and the government's welfare.

First, we use equations (11), (13), (15), and (20) to show that

$$k_{X,1}^{Tariff}>k_{X,1}^{FT}\text{ and }k_{X,2}^{Tariff}>k_{X,2}^{FT}$$

The inequalities state that lobbying creates *overinvestment* in sector X. This result is intuitive. Without the agreement, capital owners anticipate that a lobby group would be organized and negotiate for an import tariff that raises the return on capital in sector X in both periods. Therefore,

capital is invested in sector X more than it would be in the presence of the agreement. Note that the level of capital under free trade is constrained-efficient (or second-best). It would be first-best if the capital adjustment cost was zero ($\epsilon = 0$)

The government compares the gains and the losses from signing the agreement. Without the agreement, the government would receive a political contribution. The government's gain depends on its bargaining power (captured by σ), its valuation on political contributions (captured by a), and the additional capital that would be allocated to sector X in Stage 1. With the agreement, the country could prevent welfare loss from consumption distortion and capital misallocation.

We can compare the welfare under the two regimes. Using the government's welfare under free trade Ω_X^{FT} in equation (14) and the government's welfare under the lobbying game Ω^{Tariff} in equation (21), we show that

$$\begin{aligned}\Omega_X^{Tariff} - \Omega_X^{FT} = &- \left[(1-\theta)\left(\sqrt{k_{X,1}^{Tariff}} - \sqrt{k_{X,1}^{FT}}\right)^2 + \theta\left(\sqrt{k_{X,2}^{Tariff}} - \sqrt{k_{X,2}^{FT}}\right)^2\right] \\ &- \frac{1}{2}\tau^2 - \epsilon\left[\left(\sqrt{k_{X,1}^{Tariff}} - \sqrt{k_{X,1}^{FT}}\right)^2 - \left(\sqrt{k_{X,2}^{Tariff}} - \sqrt{k_{X,2}^{FT}}\right)^2\right] + ac_X k_{X,1}^{Tariff} \qquad (22)\end{aligned}$$

The possibility of tariff negotiation affects the government's welfare through three channels. The first channel is the welfare loss from capital misallocation. As capital owners anticipate a positive import tariff in the next stages, more capital owners are willing to enter sector X, causing an inefficiently large amount of capital in the first period $\left(k_{X,1}^{Tariff} > k_{X,1}^{FT}\right)$. In addition, in the second period the tariff also discourages capital reallocation and leads to an inefficiently large amount of capital. This welfare loss is shown by $k_{X,2}^{Tariff} > k_{X,2}^{FT}$. Therefore, the allocation of capital is inefficiently high in sector X in both periods, as captured by the first parentheses in the right-hand side of equation (22). The second channel is the welfare loss from price distortion that comes through consumption distortion. This term is captured by $\frac{1}{2}\tau^2$. The third term is the welfare loss from capital reallocation costs. The last term is the government's gain from political contributions.

After we simplify the terms in equation (22), we show that

$$\Omega_X^{Tariff} - \Omega_X^{FT} = \frac{a^2(1-\theta)^2 k_{X,1}^{Tariff}}{4\left(\frac{1}{2} + \frac{\theta^2}{\theta-\epsilon}\right)^2(1-\theta+\epsilon)}\left[-\left(\frac{1-\sigma}{2}\right)^2(1-\theta)^2 + \sigma(1-\theta+\epsilon)\left(\frac{1}{2} + \frac{\theta^2}{\theta-\epsilon}\right)\right]$$

The set of parameters in which the government gains from committing to the agreement is concluded by Proposition 1.

Proposition 1. *The government gains from the tariff prohibition agreement if and only if*

$$\sigma(1-\theta+\epsilon)\left(\frac{1}{2} + \frac{\theta^2}{\theta-\epsilon}\right) < \left(\frac{1-\sigma}{2}\right)^2(1-\theta)^2.$$

The condition in Proposition 1 generalizes the result in Maggi and Rodriguez-Clare (1998). The model of Maggi and Rodriguez-Clare (1998) can be considered as the special case where both $\theta = 0$

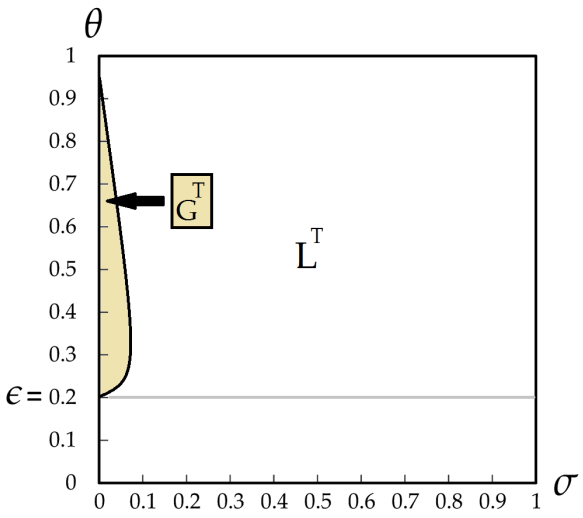

Figure 2: The set of parameters in which the government would gain from signing the tariff prohibition agreement when $\epsilon = 0.2$. The area G^T represents the parameter space in which the government would sign the agreement, and the area L^T represents the parameter space in which the government would allow for tariff negotiation.

and $\epsilon = 0$. In this case, the condition is reduced to $\sigma < 2 - \sqrt{3}$; it is broadly consistent with the conclusion in Maggi and Rodriguez-Clare (1998) that the government's bargaining power must be sufficiently low. The intuition behind this proposition follows straightforwardly from the trade-off faced by the government. Since the size of political contributions depends on the government's bargaining power, a government with low bargaining power gains from signing the agreement because the size of political contributions is relatively small compared to the welfare loss from the distorted consumption and capital allocation. In this paper, we allow for positive values of θ and ϵ. Although the condition is generalized, the conclusion remains unchanged. Proposition 1 shows that for given values of θ and ϵ, the government gains from the tariff prohibition agreement when its bargaining power is sufficiently low.

Figure 2 illustrates the result in Proposition 1. The horizontal and vertical axes show the values of σ and θ, respectively. The value of θ is in the range of $(\epsilon, 1]$, while the range of σ is $[0, 1]$. The total area is divided into two regions: The left area, which is denoted by G^T, represents the parameter space in which the government would sign the agreement, and the right area, which is denoted by L^T, represents the parameter space in which the government would not sign the agreement and would allow for tariff negotiation. We show additional examples with various values of ϵ in Appendix. The conclusion is robust to values of θ and ϵ: The condition in Proposition 1 can be satisfied when σ is sufficiently small.

4 Export Subsidies and Export-Subsidy ProhibitionAgreements

In this section, we consider the lobbying game in sector Y. As in Section 3, we first solve the game under a export subsidy prohibition agreement, then solve the lobbying game in the absence of the agreement, and last, characterize the condition(s) under which the government gains by committing to the agreement.

4.1 Export-Subsidy Prohibition Agreements

Now suppose that the government commits to an export subsidy prohibition agreement before the lobbying game begins. Under this agreement, there is no lobbying and $s = c_Y = 0$. The returns on capital in sector Y in both periods in equation (5) are simplified to $\overline{p}_{Y,1}/\sqrt{k_{Y,1}}$ and $\overline{p}_{Y,2}/\sqrt{k_{Y,2}}$ respectively.

In Stage 2, a reduction in the transportation cost from ζ_1 to ζ_2 raises the local price and the rate of return on capital in sector Y. Capital owners in other sectors consider moving their capital to sector Y until the return on capital in sector Y net of capital adjustment cost is equal to the return on capital in other sectors. Their behavior can be formalized as

$$\max\left\{\theta\frac{\overline{p}_{Y,2}}{\sqrt{k_{Y,2}}}-\epsilon,\theta\right\}$$

Thus, the returns on capital in Stage 2 satisfy

$$\theta\frac{\overline{p}_{Y,2}}{\sqrt{k_{Y,2}}}-\epsilon=\theta.$$

The equilibrium amount of capital in sector Y in Stage 2 under free trade (FT) can be solved explicitly as

$$k_{Y,2}^{FT}=\left(\frac{\theta}{\theta+\epsilon}\overline{p}_{Y,2}\right)^2. \tag{23}$$

In Stage 1, capital owners allocate their capital such that the return on capital in sector Y is equal to the return on capital in the numeraire sector. Thus, capital $k_{Y,1}$ satisfies

$$(1-\theta)\frac{\overline{p}_{Y,1}}{\sqrt{k_{Y,1}}}+\theta\frac{\overline{p}_{Y,2}}{\sqrt{k_{Y,2}}}=(1-\theta)(1)+\max\left\{\theta\frac{\overline{p}_{Y,2}}{\sqrt{k_{Y,2}}}-\epsilon,\theta\right\}. \tag{24}$$

We can solve for $k_{Y,1}$ as

$$k_{Y,1}^{FT}=\left(\left(\frac{1-\theta}{1-\theta-\epsilon}\right)\overline{p}_{Y,1}\right)^2. \tag{25}$$

According to equation (23), an increase in the capital adjustment cost discourages capital from moving into sector Y in Stage 2. Capital owners anticipate less capital to move into sector Y in

Stage 2 and foresee higher returns in Stage 2. More capital owners are willing to invest in sector Y in Stage 1.

Given $k_{Y,1}^{FT}$and $k_{Y,2}^{FT}$ from equations (23) and (25), the government's welfare under subsidy prohibition agreement, denoted by Ω_Y^{FT}, is defined as follows

$$\begin{aligned}\Omega_Y^{FT} &= \Omega\left(k_{X,1}, k_{Y,1}^{FT}, \tau, 0\right) \\ &= (1-\theta)\left[\overline{p}_{Y,1} F_Y\left(k_{Y,1}\right) + \left(k - k_{Y,1}\right) + \frac{1}{2}\left(v_Y - \overline{p}_{Y,1}\right)^2\right] \\ &+ \theta\left[\overline{p}_{Y,2} F_Y\left(k_{Y,2}\right) + \left(k - k_{Y,1}\right) + \frac{1}{2}\left(v_Y - \overline{p}_{Y,2}\right)^2\right] - \epsilon\left(k_{Y,2} - k_{Y,1}\right) + W_X\left(k_{X,1}, \tau\right) \end{aligned} \tag{26}$$

where $W_X\left(k_{X,1}, \tau\right)$ captures the terms from sector X that are independent of the choice of trade policy in sector Y.

4.2 Export Subsidies in the Absence of Subsidy Prohibition Agreements

In period 2, after the local price of good Y increases due to the decrease in the transportation cost, capital owners move their capital to sector Y to gain benefits from the export subsidy and the reduction in transportation costs. The rates of returns on capital in Stage 2 satisfy

$$\theta \frac{\left(\overline{p}_{Y,2} + s\right)}{\sqrt{k_{Y,2}}} - \epsilon = \theta.$$

The equilibrium amount of capital in sector Y in Stage 2 under export subsidy s is

$$k_{Y,2}^{Subsidy} = \left(\frac{\theta}{\theta + \epsilon}\left(\overline{p}_{Y,2} + s\right)\right)^2. \tag{27}$$

Next, we investigate the bargaining problem between the lobby group in sector Y and the government. When negotiating in Stage 1, the government and the lobby foresee the outcome in Stage 2, and they use Nash bargaining to negotiate for a subsidy rate and political contribution. The bargaining happens after capital $k_{Y,1}$ is chosen. Thus, the optimal subsidy rate and political contribution are functions of $k_{Y,1}$.

The government's welfare is

$$\begin{aligned}&\Omega\left(k_{X,1}, k_{Y,1}, \tau, s\right) = \\ &\quad (1-\theta)\left[\left(\overline{p}_{Y,1} + s\right) F_Y\left(k_{Y,1}\right) + \left(k - k_{Y,1}\right) + CS_Y\left(\overline{p}_{Y,1} + s\right) + s\left(EX_Y\left(\overline{p}_{Y,1} + s\right)\right)\right] \\ &\quad +\theta\left[\left(\overline{p}_{Y,2} + s\right) F_Y\left(k_{Y,2}\right) + \left(k - k_{Y,2}\right) + CS_Y\left(\overline{p}_{Y,2} + s\right) + s\left(EX_Y\left(\overline{p}_{X,2} + s\right)\right)\right] \\ &\quad +ac_Y k_{Y,1} - \epsilon\left(k_{Y,2} - k_{Y,1}\right) + W_X\left(k_{X,1}, \tau\right). \end{aligned} \tag{28}$$

Using $k_{Y,2}^{Subsidy}$ from equation (27), the government's welfare gain from export subsidy s (relative to free trade) is

$$\Omega\left(k_{X,1},k_{Y,1},\tau,s\right)-\Omega\left(k_{X,1},k_{Y,1},\tau,0\right)=-\left(\frac{1}{2}+\frac{\theta^{2}}{\theta+\epsilon}\right)s^{2}+ac_{Y}k_{Y,1}.$$

The intuition of the welfare change from an export subsidy is similar to that from an import tariff. On the one hand, because an export subsidy distorts the price, consumers inefficiently consume less of good Y and capital owners allocate an inefficiently large amount of capital in sector Y in Stage 2. On the other hand, the government is compensated by political contributions.

The lobby group's payoff from export subsidy s in equation (7) is simplified to

$$\Lambda_{Y}\left(k_{Y,1},s\right)=\left((1-\theta)\frac{\left(\overline{p}_{Y,1}+s\right)}{\sqrt{k_{Y,1}}}+\theta\frac{\left(\overline{p}_{Y,2}+s\right)}{\sqrt{k_{Y,2}}}-c_{Y}\right)k_{Y,1}.$$

Using $k_{Y,2}^{Tariff}$ from equation (27), the lobby group's gain from export subsidy s (relative to free trade) is

$$\Lambda_{Y}\left(k_{Y,1},s\right)-\Lambda_{Y}\left(k_{Y,1},0\right)=\left((1-\theta)\frac{s}{\sqrt{k_{Y,1}}}-c_{Y}\right)k_{Y,1}=(1-\theta)\,s\sqrt{k_{Y,1}}-c_{Y}k_{Y,1}.$$

The Nash bargaining problem described in equation (10) is simplified to

$$\max_{s,c_{Y}}\left[-\left(\frac{1}{2}+\frac{\theta^{2}}{\theta+\epsilon}\right)s^{2}+ac_{Y}k_{Y,1}\right]^{\sigma}\left[(1-\theta)\,s\sqrt{k_{Y,1}}-c_{Y}k_{Y,1}\right]^{1-\sigma}$$

in which subsidy s and contribution c_{Y} are chosen to maximize the product of net payoffs.

The export subsidy s and political contribution c_{Y} are

$$s\left(k_{Y,1}\right)=\frac{a\left(1-\theta\right)\sqrt{k_{Y,1}}}{2\left(\frac{1}{2}+\frac{\theta^{2}}{\theta+\epsilon}\right)} \tag{29}$$

$$c_{Y}\left(k_{Y,1}\right)=\left(\frac{1+\sigma}{2}\right)\frac{a\left(1-\theta\right)^{2}}{\left(\frac{1}{2}+\frac{\theta^{2}}{\theta+\epsilon}\right)}. \tag{30}$$

Finally, we solve for the amount of capital invested in Stage 1. After the government has announced in Stage 0 that an export subsidy is not prohibited, the capital owners allocate their capital such that the expected returns satisfy

$$(1-\theta)\frac{\left(\overline{p}_{Y,1}+s\right)}{\sqrt{k_{Y,1}}}+\theta\frac{\left(\overline{p}_{Y,2}+s\right)}{\sqrt{k_{Y,2}}}-c_{Y}=(1-\theta)\left(1\right)+\max\left\{\theta\frac{\left(\overline{p}_{Y,2}+s\right)}{\sqrt{k_{Y,2}}}-\epsilon,\theta\right\}. \tag{31}$$

The left-hand side and the right-hand side are the total returns on capital in sector Y and the numeraire sector, respectively. One key difference between equations (19) and (31) is the direction of capital reallocation. In Stage 2, capital is reallocated from sector X to the numeraire sector and sector Y. Capital owners in sector X compare the returns from staying in sector X and moving to the other sectors; capital owners outside sector Y compare the returns from receiving the same return in their initial sector or paying the adjustment cost and receiving the rate of return in sector Y in Stage 2.

The equilibrium amount of capital in the manufacturing sector in equation (31) is

$$k_{Y,1}^{Subsidy} = \left(\frac{(1-\theta)\,\overline{p}_{Y,1}}{1-\theta-\epsilon-\left(\frac{1-\sigma}{2}\right)\frac{a(1-\theta)^2}{2\left(\frac{1}{2}+\frac{\theta^2}{\theta+\epsilon}\right)}} \right)^2 . \tag{32}$$

The government's welfare under the lobbying game can be calculated by substituting $k_{Y,1}^{Subsidy}$ in equation (32) into the welfare function in equation (28):

$$\Omega_Y^{Subsidy} = \Omega\left(k_{X,1}, k_{Y,1}^{Subsidy}, \tau, s\left(k_{Y,1}^{Subsidy}\right)\right) \tag{33}$$

4.3 The Condition for Export-Subsidy Prohibition Agreements

In this section, we analyze how an export-subsidy prohibition agreement affects capital allocation and the government's welfare.

Capital misallocation is defined as the difference between the amounts of capital in the manufacturing sector under the equilibrium export subsidy and under free trade. According to equations (23), (25), (27), and (32), capital misallocation can be shown explicitly as

$$k_{Y,1}^{Subsidy} > k_{Y,1}^{FT} \text{ and } k_{Y,2}^{Subsidy} > k_{Y,2}^{FT}$$

Next, we analyze the welfare change from the export subsidy prohibition agreement. According to equations (26) and (33), the government's welfare gain from committing to the export-subsidy prohibition agreement is

$$\begin{aligned}\Omega_Y^{Subsidy} - \Omega_Y^{FT} = &-\left[(1-\theta)\left(\sqrt{k_{Y,1}^{Subsidy}} - \sqrt{k_{Y,1}^{FT}}\right)^2 + \theta\left(\sqrt{k_{Y,2}^{Subsidy}} - \sqrt{k_{Y,2}^{FT}}\right)^2\right] \\ &-\frac{1}{2}s^2 - \epsilon\left[\left(\sqrt{k_{Y,2}^{Subsidy}} - \sqrt{k_{Y,2}^{FT}}\right)^2 - \left(\sqrt{k_{Y,1}^{Subsidy}} - \sqrt{k_{Y,1}^{FT}}\right)^2\right] + ac_Y k_{Y,1}^{Subsidy}\end{aligned} \tag{34}$$

The intuition of this equation is as same as that of equation (22). The first term on the right-hand side captures the welfare loss from capital misallocation. Capital is misallocated in Stage 1 because the capital owners anticipate additional economic rents from an export subsidy that would be granted. In Stage 2, the export subsidy encourages additional capital movements toward sector Y.

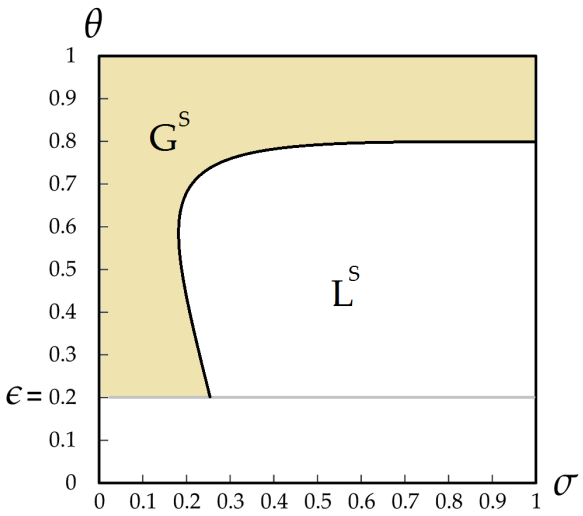

Figure 3: The set of parameters in which the government would gain from signing the subsidy prohibition agreement when $\epsilon = 0.2$. The area G^S represents the parameter space in which the government would sign the agreement, and the area L^S represents the parameter space in which the government would allow for export subsidy negotiation.

Therefore, the amount of capital in sector Y is inefficiently large in both periods. The second term represents the welfare loss from price distortion. An export subsidy, which distorts price ratios, induces inefficient consumption. The loss is simplified to $\frac{1}{2}s^2$. The next term is capital reallocation cost. The last term is the government's gain from political contributions paid by the lobby group in Stage 1.

Equation (34) can be simplified to

$$\Omega_Y^{Subsidy} - \Omega_Y^{FT} = \frac{a^2 (1-\theta)^2 k_{Y,1}^{Subsidy}}{4\left(\frac{1}{2} + \frac{\theta^2}{\theta+\epsilon}\right)^2 (1-\theta-\epsilon)} \left[-\left(\frac{1-\sigma}{2}\right)^2 (1-\theta)^2 + \sigma (1-\theta-\epsilon)\left(\frac{1}{2} + \frac{\theta^2}{\theta+\epsilon}\right)\right]$$

The set of parameters in which the government gains from an export subsidy prohibition is summarized by Proposition 2.

Proposition 2. *The government gains from the export subsidy prohibition agreement if and only if*

$$\sigma (1-\theta-\epsilon)\left(\frac{1}{2} + \frac{\theta^2}{\theta+\epsilon}\right) < \left(\frac{1-\sigma}{2}\right)^2 (1-\theta)^2 .$$

An example of Proposition 2 is shown in Figure 3. The figure illustrates the G^S region in which the government gains from the export subsidy prohibition agreement and the L^S region in which the government loses from the agreement. Based on Figure 3, the government would sign an export subsidy prohibition agreement when either (i) σ is sufficiently low or (ii) θ is sufficiently high. The first observation is consistent with the case of import tariff in Figure 2. When the government

has small bargaining power, it cannot extract sufficient economic rents to cover the welfare loss from the export subsidy, and thus it would be better off by prohibiting export subsidy.

The second case is the main mechanism in our paper. When the free-rider problem is sufficiently severe, the government would simply sign an export-subsidy prohibition agreement. As θ increases, the political contribution c_Y decreases, because the lobby group realizes that new capital which will enter the export sector in Stage 2 free rides on the economic rents. In addition, allowing for the possibility to bargain for export subsidy leads to capital misallocation in Stage 1. Therefore, when the free-rider problem is severe, the government would sign an export subsidy agreement to commit the country to free trade.

In Appendix, we consider alternative values of ϵ. The conclusion is robust in the sense that, although the set of parameters in Proposition 2 depends on ϵ, the government signs an export-subsidy prohibition agreement when either (i) σ is sufficiently low or (ii) θ is sufficiently high.

5 Optimal (Simple) Agreements

In this section, we let the government choose its most preferred option among the following simple agreements: (i) import tariffs and export subsidies are allowed; (ii) import tariffs are prohibited but export subsidies are allowed; (iii) import tariffs are allowed but export subsidies are prohibited; and (iv) import tariffs and export subsidies are prohibited. We describe the set of parameters under which the government would prefer the agreement to ban export subsidies but allow import tariffs (over the other types of simple agreements).

Prior to presenting our main result, we first provide two lemmas to show that the set of desired parameters is nonempty and characterize the set.

Lemma 1. *The set of parameters in which among the four simple trade agreements the government would prohibit only export subsidies but not import tariffs is nonempty if ϵ is positive.*

Proof. See Appendix □

Lemma 1 establishes the existence of our result. In short, as long as capital reallocation cost is nonzero, there is a nonempty set of parameters such that the government prohibits only export subsidies but not import tariffs. The condition for existence likely holds true empirically since it requires only that capital owners cannot costlessly reallocate their capital

The intuition of how a capital adjustment cost creates asymmetry comes directly from the nature of capital movements. In import-competing sectors, tariffs act as safeguards; they protect import-competing firms and reduce the need for capital reallocation. In export sectors, export subsidies raise the gain for capital reallocation and result in additional capital reallocation.

Given that the capital adjustment cost is positive, we then characterize the set of parameters such that the government would eliminate only export subsidies but not import tariffs. Lemma 2 summarizes the result.

Lemma 2. *The set of parameters in which the government would prohibit only export subsidies but not import tariffs is*

$$\left\{(\theta,\sigma) \mid \sigma\left(1-\theta+\epsilon\right)\left(\frac{1}{2}+\frac{\theta^2}{\theta-\epsilon}\right) > \left(\frac{1-\sigma}{2}\right)^2(1-\theta)^2 > \sigma\left(1-\theta-\epsilon\right)\left(\frac{1}{2}+\frac{\theta^2}{\theta+\epsilon}\right)\right\}.$$

Proof. The inequalities are directly from the conditions in Proposition 1 and Proposition 2. □

Having established the condition for non-emptiness and characterized the set of parameters in which the government would prohibit only export subsidies but not import tariffs, we state the main result of this paper in Proposition 3.

Proposition 3. *Among the four simple trade agreements, when the free-rider problem is severe (θ is sufficiently high), the government would prefer an agreement that prohibits only export subsidies but not import tariffs.*

The idea of Proposition 3 follows from the ideas of Proposition 1 and Proposition 2. According to Proposition 1, whether the government gains or loses from an agreement to prohibit tariffs depends only on its bargaining power (σ). With sufficiently high bargaining power, the government receives large political contributions from using tariffs, and an agreement to prohibit tariffs is undesirable.

In addition, according to Proposition 2, whether an agreement to prohibit export subsidies is desirable to the government depends on θ and σ. The government would sign an export subsidy agreement if either (i) the government's bargaining power is sufficiently low or (ii) the free-rider problem is severe. For sufficiently high θ, the political contribution that the government receives from export subsidies is eroded by free riders, and the government would be better off if export subsidies were prohibited. For sufficiently low θ, the government would not be concerned about the free-rider problem, and the decision would be based on the amount of political contributions the government could receive.

Figure 4, which combines Figures 2 and 3, illustrates the idea of Proposition 3. We are interested in the region in which the agreement that prohibits only export subsidies provides higher welfare than the other simple agreements. That is, we find the parameter space such that the government (i) does not gain from the tariff prohibition agreement (represented by the area L^T) but (ii) gains from the export-subsidy prohibition agreement (represented by the area G^S). The desired area consists of the top part, in which θ is large, and the middle bottom area, in which the bargaining power is moderate. In Appendix, we provide examples of alternative values of ϵ. The conclusion is robust to the capital adjustment cost; only the size of the parameter space changes accordingly.

In this paper, we are interested in the impact of the free-rider problem. When we combine the results in Proposition 1 and Proposition 2, we can conclude that when the free-rider problem is severe, the government will sign an export-subsidy prohibition agreement as a commitment contract to eliminate capital misallocation.

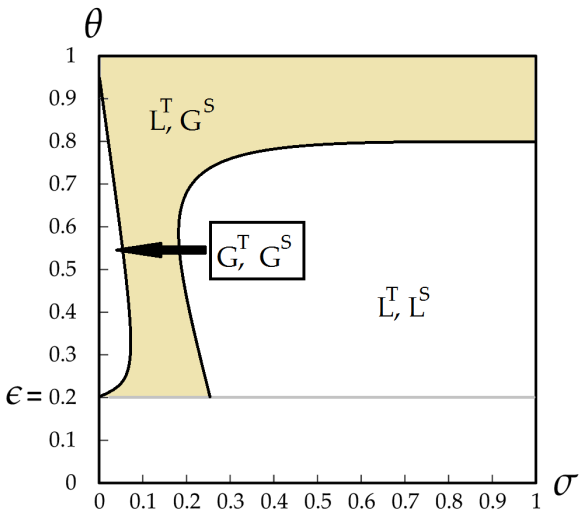

Figure 4: Gains and losses from subsidy prohibition and tariff prohibition ($\epsilon = 0.2$)

6 Conclusion

In this paper, we introduce the free-rider problem into the commitment theory in Maggi and Rodriguez-Clare (1998) to explain the asymmetric treatment of import tariffs and export subsidies in the WTO. In our model, the anticipation of protection creates an inefficient investment. A government may choose to commit to a tariff prohibition agreement and/or export-subsidy prohibition agreement to increase social welfare. However, when committing to these agreements, the government loses the political contributions collected from lobbying groups. Therefore, the government commits to a trade agreement if the social welfare gain is greater than the welfare loss of political contributions.

In an environment where transportation costs are decreasing, export sectors grow and import-competing sectors decline. In the export sectors, export subsidies attract new entrants and investment. These entrants erode the protection rent. On the other hand, the return on capital in import-competing sectors falls after a decrease in transportation costs. Since capital is sunk, protection raises the rate of return in these sectors without attracting entry. Thus, the protection rent in import-competing sectors is not eroded by new entrants, and the government may extract large political contributions. In this environment, we find that under the condition in which the free-rider problem is severe, the most preferred agreement is the agreement that prohibits only export subsidies but not import tariffs.

References

[1] Bagwell, K. and Lee, S. H. (2018). "Trade Policy under Monopolistic Competition with Heterogeneous Firms and Quasi-linear CES Preferences," Working Paper.

[2] Bagwell, K. and Staiger, R. W. (1999). "An Economic Theory of GATT," *American Economic Review*, 89, 215-248.

[3] Bagwell, K. and Staiger, R. W. (2001). "Strategic Trade, Competitive Industries and Agricultural Trade Disputes," *Economics and Politics*, 13(2), 113-128.

[4] Baldwin, R. and Robert-Nicoud, F. (2002). "Entry and Asymmetric Lobbying: Why Governments Pick Losers," NBER Working Paper no. 8756.

[5] Baldwin, J. R. and Gu, W. (2004). "Trade Liberalization: Export-Market Participation, Productivity Growth and Innovation," *Oxford Review of Economic Policy*, 20, 372-392.

[6] Bernard, A. B. and Jensen, J. B. (2002). "The Deaths of Manufacturing Plants," NBER Working Paper no. 9026

[7] Beshkar, M. and Lashkaripour A. (2017). "Interdependence of Trade Policies in General Equilibrium," Working Paper.

[8] Brander, J. A. and Spencer, J. B. (1985). "Export Subsidies and International Market Share Rivalry," *Journal of International Economics*, 18(2), 83-100.

[9] DeRemer, D. R. (2013). "The Evolution of International Subsidy Rules." ECARES Working Paper 2013-2145.

[10] Ethier, W. J. (2003). "Trade Agreements Based on Political Externalities," Mimeo, University of Pennsylvania.

[11] Feenstra, R. C., Romalis, J. and Schott, R K. (2002). "U.S. Imports, Exports and Tariff Data," NBER Working Paper no. 9387.

[12] Glismann, H. and Weiss, F. (1980). "On the Political Economy of Protection in Germany," World Bank Staff Working Paper 427.

[13] Grossman, G. M. and Helpman, E. (1994). "Protection for Sale," *American Economic Review*, 84, 833-850.

[14] Grossman, G. and Helpman, E. (1995). "Trade Wars and Trade Talks," *Journal of Political Economy*, 103(4), 675-708.

[15] Grossman, G. and Helpman, E. (1996). "Rent Dissipation, Free Riding, and Trade Policy," *European Economic Review*, 40, 795-803.

[16] Hufbauer, G. and Rosen, H. (1986). "Trade Policy for Troubled Industries," Policy Analyses in International Economics, 15, Institute for International Economics Washington, D.C.

[17] Hufbauer, G., Berliner, D. and Elliot, K. (1986). "Trade Protection in the United States," 31, Case Studies, Institute for International Economics, Washington, D.C.

[18] Itoh, M., and Kiyono, K. (1987). "Welfare-enhancing Export Subsidies", *Journal of Political Economy*, 95(1), 115-137. Retrieved from http://www.jstor.org/stable/1831302

[19] Johnson, H. (1954). "Optimum Tariffs and Retaliation," *Review of Economic Studies* 21(2), 142-153.

[20] Levy, I. R (1999). "Lobbying and International Cooperation in Tariff Setting," *Journal of International Economics*, 47, 345-370.

[21] Maggi, G. and Rodriguez-Clare, A. (1998). "The Value of Trade Agreements in the Presence of Political Pressures," *Journal of Political Economy*, 106, 574-601.

[22] Maggi, G. and Rodriguez-Clare, A. (2005). "Import Tariffs, Export Subsidies and the Theory of Trade Agreements," Mimeo, Princeton University.

[23] Maggi, G. and Rodriguez-Clare, A. (2007). "A Political-Economy Theory of Trade Agreements," *American Economic Review*, 97(4), 1374-1406.

[24] Mitra, D. (2002). "Endogenous Political Organization and the Value of Trade Agreements," *Journal of International Economics*, 57, 473-485.

[25] Rodrik, D. (1995). "Political Economy of Trade Policy," In: Grossman, G. and K. Rogoff [eds.], Handbook of International Economics (Amsterdam: North-Holland), 1457-1495.

[26] Staiger, R. W., and Tabellini, G. (1987). "Discretionary Trade Policy and Excessive Protection," *American Economic Review*, 77, 823-837.

[27] Subramanian, A. and Wei, S. J. (2003). "The WTO Promotes Trade, Strongly but Unevenly," NBER Working Paper No. 10024. U.S.

[28] Suwanprasert, W. (2017). "A Note on 'Jobs, Jobs, Jobs: A "New" Perspective on Protectionism' of Costinot (2009)", *Economics Letters*, 157, 163-166.

[29] Suwanprasert, W. (2018a). "Optimal Trade Policy, Equilibrium Unemployment and Labor Market Inefficiency," Working Paper.

[30] Suwanprasert, W. (2018b). "Optimal Trade Policy in a Ricardian Model with Labor-Market Search-and-Matching Frictions," Working Paper.

[31] Tomell, A. (1991). "Time Inconsistency of Protectionist Programs," *Quarterly Journal of Economics*, 106, 963-974.

Appendix

Proof of Lemma 1.

Proof. According to the equations in Proposition 1 and Proposition 2, the government prohibits only export subsidies but not import tariffs if $\sigma(1-\theta+\epsilon)\left(\frac{1}{2}+\frac{\theta^2}{\theta-\epsilon}\right) > \left(\frac{1-\sigma}{2}\right)^2(1-\theta)^2$ and $\sigma(1-\theta-\epsilon)\left(\frac{1}{2}+\frac{\theta^2}{\theta+\epsilon}\right) < \left(\frac{1-\sigma}{2}\right)^2(1-\theta)^2$. The two conditions can be satisfied simultaneously if $\epsilon > 0$. □

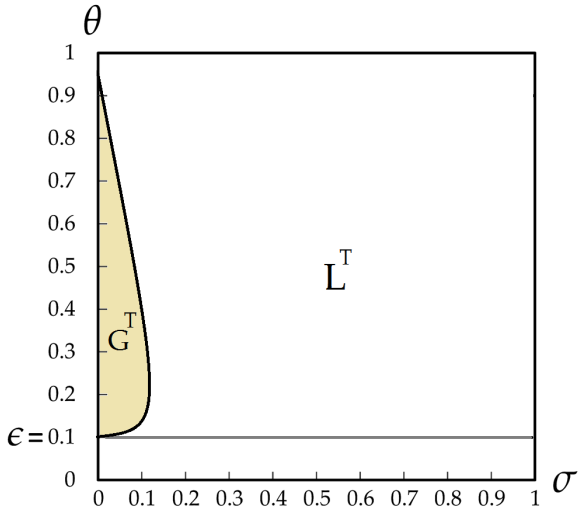

Figure 5: Comparison between the welfare under free trade and the welfare under the tariff prohibition agreement. ($\epsilon = 0.1$)

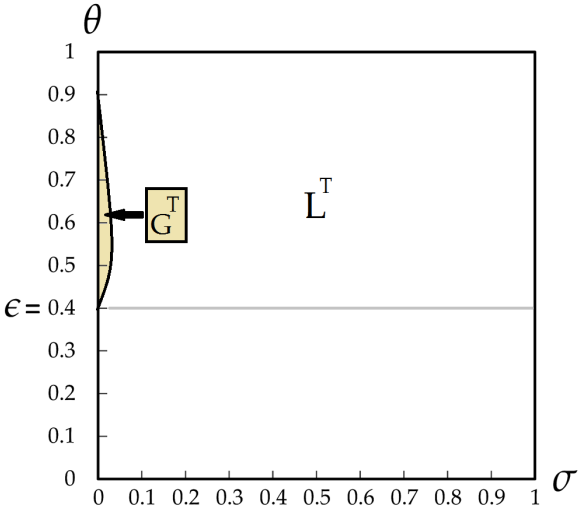

Figure 6: Comparison between the welfare under free trade and the welfare under the tariff prohibition agreement. ($\epsilon = 0.4$)

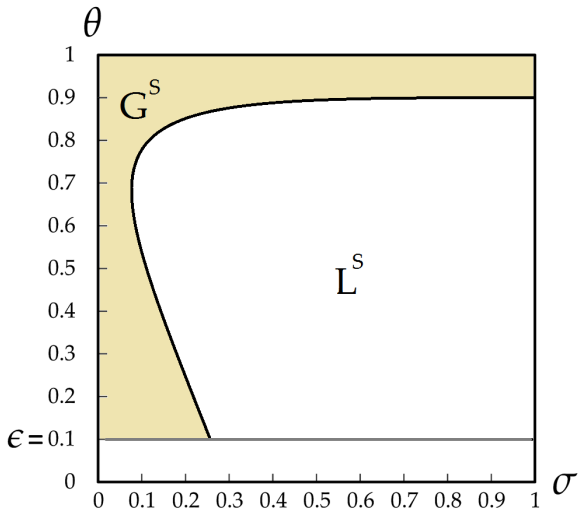

Figure 7: Comparison between the welfare under free trade and the welfare under the export subsidy prohibition agreement. ($\epsilon = 0.1$)

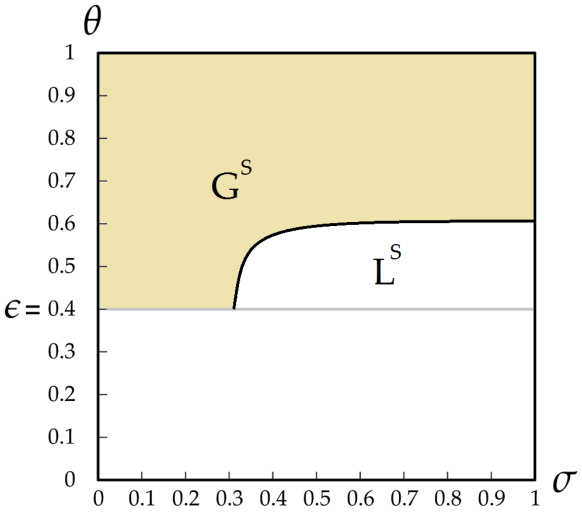

Figure 8: Comparison between the welfare under free trade and the welfare under the export subsidy prohibition agreement. ($\epsilon = 0.4$)

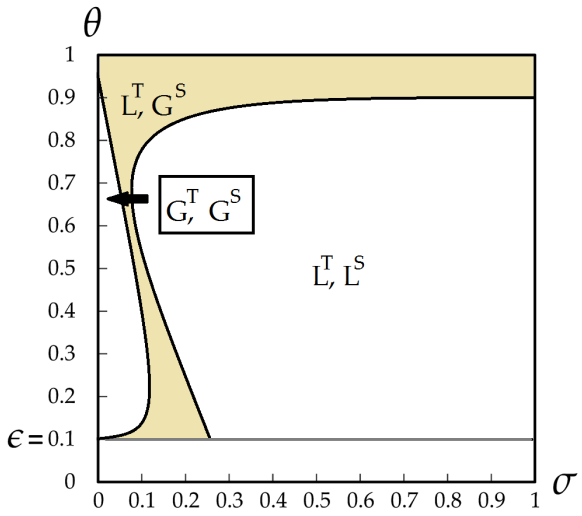

Figure 9: Gains and losses from subsidy prohibition and tariff prohibition ($\epsilon = 0.1$)

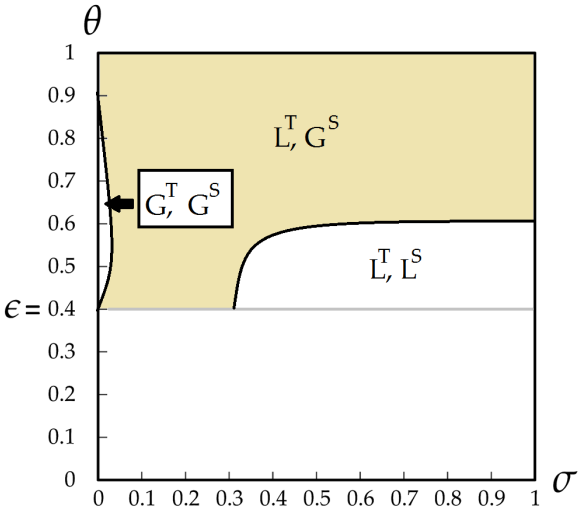

Figure 10: Gains and losses from subsidy prohibition and tariff prohibition ($\epsilon = 0.4$)