Why Does the WTO Prohibit Export Subsidies but Allow Import Tariffs?*

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December 25, 2018

Abstract

We apply the commitment theory (Maggi & Rodriguez-Clare, 1998) to explain why WTO member countries have agreed to prohibit export subsidies but allow non-zero import tariffs. We argue that the economic rents from export subsidies cannot be contained exclusively within lobby groups because new firms can enter the growing export sector and freely benefit from export subsidies without paying political contributions. In contrast, the free-rider problem does not exist in import-competing sectors because existing firms receive negative profits and are exiting the sectors. We show that a government would agree to allow import tariffs but completely prohibit export subsidies when (i) the government's bargaining power is sufficiently large and (ii) the free-rider problems in its export sectors are severe.

Keywords: WTO; Export Subsidy; Import Tariff; Trade Negotiations.
JEL classification numbers: F13; F15; F53.

*This paper was previously circulated under the title "Import Tariffs and Export Subsidies in the WTO: A Small-Country Approach." We are grateful to Robert Staiger, Yeon-Cho Che, John Kennan, Bijit Bora, and Kiriya Kulkolkarn for their helpful comments. We have benefited from discussions with seminar participants at Midwest International Trade conference (Fall 2017), Kentucky Economic Association conference (2017), Eastern Economics Association conference (2018), Southern Economics Association conference (2018), and the WTO. Tanapong Potipiti thanks the WTO for its financial support. All remaining errors are our own.

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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 own 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 non-cooperative 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 prohibit export subsidies but allow positive import tariffs. According to the commitment theory (Maggi & Rodriguez-Clare, 1998), countries sign 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 government has high bargaining power and the free-rider problem is severe, the government has an incentive to sign an agreement that prohibits export subsidies but allows import tariffs.

To illustrate the main mechanism, we develop a three-stage lobbying game between a lobby group and the government in each country based on Maggi and Rodriguez-Clare (1998). At the initial stage, the government of a small country chooses whether to sign an agreement that prohibits 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

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

sector and the numeraire sector.

At the next stage, if the government has signed the agreement to commit to free trade, no lobby group is organized. However, if the government has not sign 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. The last stage begins with a reduction in transportation costs, which is our key change relative to the Maggi and Rodriguez-Clare (1998) study. The reduction in transportation costs has 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 in the next period and expect higher returns on capital from trade policy that will be implemented. As a result, additional capitalists enter the manufacturing sector at the first stage. Capital is misallocated in the sense that the level of capital in the lobbying game is different from the level 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. In reality, the WTO bans export subsidies as a membership condition, while import tariff levels are mostly bilaterally negotiated among WTO members. This paper abstracts from the tariff negotiation issues and mainly investigates the asymmetric treatment of tariffs and export subsidies.

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. In the second stage, 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 receive gains from export subsidies without paying political contributions, and the economic rents from the export subsidies decrease. As the duration of the second stage becomes shorter, capitalists want allocate their capital in the numeraire sector at first and then reallocate it to the manufacturing 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 consensus of governments is to prohibit export subsidies and allow import tariffs. Our main conclusion is that the majority of countries would vote for an agreement that prohibits export subsidies but allows import tariffs when the governments have sufficiently large bargaining power and free-rider problems in the member countries 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 (2015) 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 which 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.

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,

2018c) 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 by both 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 in which committing to a tariff prohibition agreement improves the government's payoff. Section 4 analyzes the game in the export sector and studies the conditions in which committing to an export-subsidy prohibition agreement improves the government's payoff. In Section 5, we study the conditions under which it is optimal for the consensus of governments to join 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, while Maggi and Rodriguez-Clare (1998) focus on one small open economy, our model consists of a continuum of infinite small open economies that are members of the WTO.[3] Second, motivated by empirical evidence, our model introduces a reduction in transportation costs, which causes an expansion in export sectors and a contraction in import-competing sectors.

[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.

[3] We could easily allow some countries to be large enough such that they may use trade policy to manipulate the world prices. However, an existence of large countries does not significantly change our main results. As discussed in the introduction, large countries would use import tariffs and export taxes to manipulate world prices. Even without political economy incentives, large countries would support the WTO's agreement to banning export subsidies but keeping non-zero import tariffs.

2.1 The Economic Environment

The world consists of a continuum of infinite small countries that are indexed by $i \in [0,1]$. These countries are identical in all aspects except that they may have different preferences or different endowments, which result in different patterns of trade. There are two goods in the world: numeraire (N) and manufacturing (M). The price of the numeraire good is normalized to one, and the world price of the manufacturing good is p^w. These countries are small and therefore completely *separable*.

All countries have identical production technologies but may have different endowments. Country i is endowed with $\bar{k}^i$ units of capital and $\bar{l}^i$ units of land. The production function of the numeraire good N is

$$F\left(k_N, l_N\right) = \alpha l_N k_N - \frac{\gamma}{2}\left(k_N\right)^2,$$

where k_N and l_N are, respectively, the levels of capital and land employed in the production of N, $\alpha > 0$, and $\gamma > 0$. Land is used in the numeraire sector only.

The marginal product of capital in the production of the numeraire good in country i, denoted by $f^i\left(k_N^i\right)$, can be simplified to

$$f^i\left(k_N^i\right) = \frac{\partial F\left(k_N^i, l_N = \bar{l}^i\right)}{\partial k_N^i} = \alpha^i - \gamma k_N^i,$$

where $\alpha^i \equiv \alpha \bar{l}^i$. The market for capital in country i is perfectly competitive. The rental rate of capital in country i, denoted by r_N^i, is equal to the value of the marginal product of capital in that country. That is,

$$r_N^i = f^i\left(k_N^i\right) = \alpha^i - \gamma k_N^i.$$

The total economic rent on land in country i, which is distributed equally back to the population, is

$$R^i \equiv F\left(k_N^i, l_N\right) - r_N^i k_N^i = \frac{\gamma}{2}\left(k_N^i\right)^2.$$

The production technology of the manufacturing good is

$$H\left(x^i\right) = x^i,$$

where x^i is the amount of capital employed in the manufacturing sector in country i. Capital in the manufacturing sector is different from the generic capital in the numeraire sector. The generic capital in the numeraire sector can be transformed to be used in the manufacturing sector, but the process is irreversible; once capital is transformed, it cannot be used in the numeraire sector again.[4]

[4] In Maggi and Rodriguez-Clare (1998), capital cannot be relocated. We re-interpret their assumption as irreversible capital transformation.

The preference of the representative household in country i is

$$U\left(q_M, q_N\right) = q_N + v^i q_M - \frac{1}{2}\left(q_M\right)^2,$$

where q_M and q_N are the quantities of good M and good N that the representative household consumes, and v^i is the country-specific demand shifter of country i. The demand functions of the representative household in country i are

$$\begin{aligned} q_M^i\left(p^i\right) &= v^i - p^i, \\ q_N^i\left(p^i\right) &= I^i - p^i q_M^i\left(p^i\right), \end{aligned}$$

where p^i is the local price of the manufacturing good in country i and I^i is the net income of country i (which will be determined later).

The consumer surplus $cs^i(p^i)$ of country i from consuming the manufacturing good at a local price p^i is

$$cs^i(p^i) = \frac{\left(v^i - p^i\right)^2}{2}.$$

The net import of the manufacturing good imported by country i, which is the difference between its domestic demand and supply, is

$$im^i\left(p^i\right) = q_M^i\left(p^i\right) - H\left(x^i\right).$$

Without loss of generality, the country index is sorted such that countries $i \in [0, 1/2]$ are natural importers of the manufacturing good from the world, while countries $i \in (1/2, 1]$ are natural exporters of the manufacturing good to the world.

The local price p^i of the manufacturing good in country i is equal to the world price p^w adjusted by the transportation costs and trade policy and can be written as

$$p^i \equiv \overline{p}^i + \tau^i = \begin{cases} \left(p^w + \zeta\right) + \tau^i & \text{if } i \in [0, 1/2] \\ \left(p^w - \zeta\right) + \tau^i & \text{if } i \in (1/2, 1] \end{cases} \tag{1}$$

where $\overline{p}^i$ is the price of the manufacturing good in country i under free trade, τ^i is the import tariff if country i is an import country or the export subsidy if country i is an export country, p^w is the world price of the manufacturing good in the world market, and ζ is the cost of transporting the manufacturing good between the world market and the two countries. As in standard economic geography models, we assume that the numeraire is traded freely and is transported costlessly. We assume that no countries use trade policy to alter the pattern of trade.

Throughout the paper, we restrict our attention to interior equilibria in which the levels of cap-

ital in all sectors are always positive. To have such interior equilibria, we assume that the marginal productivity of capital in the numeraire sector is not too high or too low and the government's weight on political contributions is not too high.

Assumption 1. *For any country $i \in [0,1]$, the country's parameters satisfy*

$$f^i(0) > p^w + \zeta \quad \text{and} \quad p^w - \zeta > f^i\left(\overline{k}^i\right) \quad \text{and} \quad \gamma \geq a > 0.$$

The social welfare of country i, denoted by ω^i, is defined as

$$\omega^i \equiv R^i + r_N^i k_N^i + p^i x^i + cs^i\left(p^i\right) + im^i\left(p^i\right)\tau^i. \tag{2}$$

The right-hand side of equation (2) is the sum of the return on land, the producer surplus (in both sectors), the consumer surplus, and the tariff revenue. Using the capital market clearing condition $x^i + k_N^i = \overline{k}^i$ and equation (1), we can express ω^i as a function of x^i and p^i:

$$\omega^i = \omega^i\left(x^i, p^i\right).$$

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 some point in time. To ensure that a subgame Nash equilibrium exists, we make the following assumption about the magnitude of the decrease in transportation costs.

Assumption 2. *The reduction in the transportation costs is sufficiently large such that*

$$\zeta_2 - \zeta_1 \leq -\frac{a(1+\sigma)\left[p^w + \zeta_1 - f^i\left(\bar{k}^i\right)\right]}{2\gamma(1-\sigma) - a(1-\sigma-2\theta)} < 0. \tag{3}$$

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.

Henceforth, variables may be indexed by a time subscript indicating the associated time period.

2.2 The Lobbying Game

The structures of the lobbying games in all countries are identical. Without loss of generality, in this section we describe only the lobbying game in country i.

The Structure of the Game

The length of time in the game is normalized to one. Let $t \in [0,1]$ be the time index of the game. The game is divided into three stages: Stage 0, Stage 1, and Stage 2. The timeline is illustrated in Figure 1.

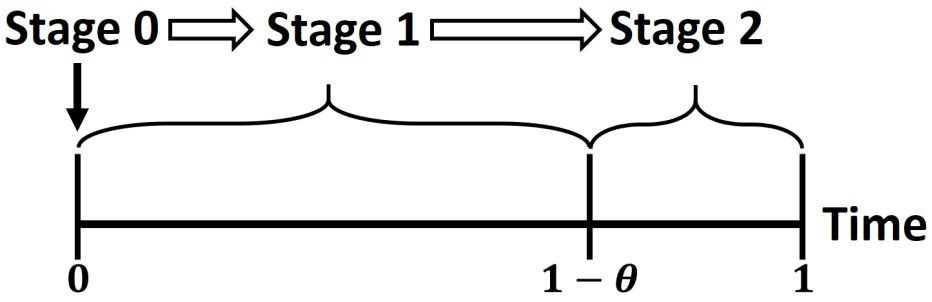

Figure 1: Timeline

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 an agreement 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 numeraire sector and the manufacturing sector.

Stage 1 is the period where $t \in [0, 1-\theta)$, after capital is allocated and before the transportation cost changes. If the government did not sign the agreement in Stage 0, then in Stage 1 a lobby is formed in the manufacturing sector. No lobby group is formed in the numeraire sector. The lobby and the government use Nash bargaining to negotiate on a protection rate τ and political contribution c. After the protection rate τ 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 signed the agreement in Stage 0, then the government is committed to free trade and no lobby group is created. During time $t \in [0, 1-\theta)$, goods are produced and traded. Period 1 ends at time $t = 1-\theta$.

At time $t = 1-\theta$, the transportation cost ζ decreases permanently from ζ_1 to ζ_2. This decrease has been fully anticipated by all the agents, who knew in stage 0 that it would occur at $t = 1-\theta$.[5] While the world price p^w is constant for the whole game, the local price (p^i) may change due to the change in the transportation cost ζ, as shown in equation (1).

Stage 2 starts at time $t = 1-\theta$ and lasts until the game ends at $t = 1$. At the beginning of period 2, capital in the numeraire sector may move to the manufacturing sector to seek a higher rate of return, but capital used in the manufacturing sector is irreversible and stays there forever. In period $t \in (1-\theta, 1]$, goods are produced and traded. The game ends at $t = 1$. For simplicity, we assume no payoff discounting over time.[6]

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),

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

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

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).

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 τ^i and political contribution c^i, the rates of return on capital in the manufacturing sector of country i in period t, denoted by $r^i_{M,t}$, is

$$r^i_{M,1} = \begin{cases} p^w + \zeta_1 + \tau^i - c^i & \text{if } i \in [0, 1/2] \\ p^w - \zeta_1 + \tau^i - c^i & \text{if } i \in (1/2, 1] \end{cases}$$

$$r^i_{M,2} = \begin{cases} p^w + \zeta_2 + \tau^i & \text{if } i \in [0, 1/2] \\ p^w - \zeta_2 + \tau^i & \text{if } i \in (1/2, 1] \end{cases}$$

In period 1, the rate of return of capital is equal to the local price minus the political contribution. In period 2, the rate of return is equal to the local price, because there is no political contribution paid in this period.

The change in the rate of return in the manufacturing sector in country i between periods 1 and 2 is

$$r^i_{M,2} - r^i_{M,1} = \begin{cases} c^i + (\zeta_2 - \zeta_1) & \text{if } i \in [0, 1/2] \\ c^i - (\zeta_2 - \zeta_1) & \text{if } i \in (1/2, 1] \end{cases}$$

New capital moving to the manufacturing sector in period 2 can free ride on the protection without participating in the lobbying. Motivated by the fact that reductions in transportation costs have fallen such that export sectors have been growing and import-competing sectors have been contracting, this paper focuses on a case where transportation costs fall sharply such that the rate of returns on capital in the manufacturing sectors of the import-competing countries falls. There is no incentive for new capital to move into import-competing sectors in period 2.

The payoff of the lobby in country i (formed by the capitalists in the manufacturing sector in period 1) denoted by Λ^i is its net return on its irreversible capital:

$$\Lambda^i \left(x^i_1, \tau^i \right) \equiv (1 - \theta)\, p^i_1 x^i_1 + \theta p^i_2 x^i_1 - c^i x^i_1, \tag{4}$$

where x^i_t is the amount of capital in the manufacturing sector in country i in period t.

The government of country i's payoff, which is the weighted sum of social welfare and political

contributions, is defined formally as

$$\Omega^i\left(x_1^i,\tau^i\right)\equiv(1-\theta)\,\omega^i\left(x_1^i p_1^i\right)+\theta\omega^i\left(x_2^i,p_2^i\right)+ac^i x_1^i. \tag{5}$$

The first and the second terms on the right-hand side are the social welfare in period 1 and period 2, respectively. The term $c^i x_1^i$ is the total contribution that the government gets from the lobby in the manufacturing sector. The term $a \geq 0$ is the weight that all governments put on the political contribution relative to social welfare. All countries have the same preference regarding political contributions.

The bargaining subgame is modeled as a Nash bargaining game after capital x_1^i is allocated. The status quo is that the government chooses free trade and the lobby 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 can be written as

$$\max_{\tau^i,c^i}\left[\Lambda^i\left(x_1^i,\tau^i\right)-\Lambda^i\left(x_1^i,0\right)\right]^{1-\sigma}\left[\Omega^i\left(x_1^i,\tau^i\right)-\Omega^i\left(x_1^i,0\right)\right]^{\sigma}, \tag{6}$$

where $\Lambda^i\left(x_1^i,0\right)$ and $\Omega^i\left(x_1^i,0\right)$ are the lobby's and the government's payoffs under free trade, respectively.

The welfare loss from the trade policy τ^i, defined as $\triangle^i\left(x_1^i,\tau^i\right)$, is the difference between the free trade welfare and the welfare under the chosen trade policy:

$$\triangle^i\left(x_1^i,\tau^i\right)\equiv(1-\theta)\left[\omega^i\left(x_1^i,\overline{p}_1^i\right)-\omega^i\left(x_1^i,\overline{p}_1^i+\tau^i\right)\right]+\theta\left[\omega^i\left(x_2^i,\overline{p}_2^i\right)-\omega^H\left(x_2^i,\overline{p}_2^i+\tau^i\right)\right]. \tag{7}$$

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. In reality, the WTO bans export subsidies as a membership condition, while tariff levels are (mostly bilaterally) negotiated among the WTO members. To focus on the first order distinction between tariffs and export subsidies, this paper abstracts from the negotiation issues. In other words, this paper focuses on a consensus among all countries, not only bounded tariffs between bilateral parties.

3 Import Tariffs and Import-Tariff Prohibition Agreements

In this section, we study how a government might gain from an agreement to prohibit tariffs. Without loss of generality, we choose an arbitrary country $i \in [0,1/2]$. We first solve the lobbying game in country i in the absence of tariff agreements. Then, we solve the game under a tariff prohibition agreement and find the conditions under which the government gains by committing to the agreement.

3.1 Import Tariffs in the Absence of Tariff Agreements

The lobbying game is solved by backward induction. We conjecture (and will verify) that in equilibrium, no capital moves from the numeraire sector to the manufacturing sector in period 2.

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

$$p_1^i = p^w + \zeta_1 + \tau^i$$
$$p_2^i = p^w + \zeta_2 + \tau^i.$$

In period 1, after capital x_1^i is allocated, the lobby bargains with the government over the tariff rate τ^i and political contribution c^i according to the Nash bargaining problem described in equation (6). The tariff $\widetilde{\tau}^i$ is chosen to maximize the joint surplus of the two bargaining parties given by equations (4) and (5). The optimal protection rate $\widetilde{\tau}^i$ and political contribution $\widetilde{c}^i$ satisfy

$$\widetilde{\tau}^i = \widetilde{\tau}^i\left(x_1^i\right) = \underset{\tau^i}{\operatorname{argmax}} \left\{ (1-\theta)\,\omega^i\left(x_1^i, \overline{p}_1^i + \tau^i\right) + \theta\omega^i\left(x_2^i, \overline{p}_2^i + \tau^i\right) \right.$$
$$\left. + a\left[(1-\theta)\left(\overline{p}_1^i + \tau^i\right) + \theta\left(\overline{p}_2^i + \tau^i\right)\right] x_1^i \right\}, \tag{8}$$

$$\widetilde{c}^i = \widetilde{c}^i\left(x_1^i\right) = (1-\sigma)\,\frac{\triangle^i\left(x_1^i, \widetilde{\tau}^i\left(x_1^i\right)\right)}{a x_1^i} + \sigma\widetilde{\tau}^i\left(x_1^i\right), \tag{9}$$

where the notation $\widetilde{y}$ denotes the value of y in the subgame perfect equilibrium. The political contribution $\widetilde{c}^i\left(x_1^i\right)$ is the weighted average of the adjusted welfare loss per unit of capital generated by the tariff $\widetilde{\tau}^i$ (captured by $\triangle^i\left(x_1^i, \widetilde{\tau}^i\right)/a x_1^i$) and the lobby's willingness to pay for the protection per unit of capital (captured by $\widetilde{\tau}^i\left(x_1^i\right)$). Based on the conjecture that $\widetilde{x}_2^i = x_1^i$, the equilibrium tariff, which is the solution of the optimization in equation (8), is

$$\widetilde{\tau}^i\left(x_1^i\right) = a x_1^i. \tag{10}$$

It is intuitive that the optimal tariff rate increases in x_1^i and a. First, the more the beneficiaries are, the larger the gain from tariff protection. Second, when the government greatly values political contribution, it would be willing to raise the tariff and receive larger political contribution in return.

Based on equation (10) and the conjecture that $\widetilde{x}_2^i = x_1^i$, the welfare loss from the tariff described in equation (7) is simplified to

$$\triangle^i\left(x_1^i, \widetilde{\tau}^i\left(x_1^i\right)\right) = \frac{1}{2}\left(\widetilde{\tau}^i\left(x_1^i\right)\right)^2 \tag{11}$$

According to equations (9), (10), and (11) in equilibrium the political contribution is a function of x_1^i such that

$$\widetilde{c}^i\left(x_1^i\right) = \frac{a\,(1+\sigma)}{2} x_1^i. \tag{12}$$

Therefore, the total gain for the government from protecting the import-competing sector is

$$g^i\left(x_1^i\right) \equiv \left(\tilde{c}^i\left(x_1^i\right) - \frac{\triangle^i\left(x_1^i, \tilde{\tau}^i\left(x_1^i\right)\right)}{a x_1^i}\right) x_1^i = \frac{a\sigma}{2}\left(x_1^i\right)^2. \tag{13}$$

The functions $\tilde{\tau}^i\left(x_1^i\right)$, $\triangle^i\left(x_1^i, \tilde{\tau}^i\left(x_1^i\right)\right)$, and $\tilde{c}^i\left(x_1^i\right)$ are true for any value of x_1^i, which may be different from the equilibrium $\tilde{x}_1^i$.

The last step is to determine $\tilde{x}_1^i$, the equilibrium amount of capital in the manufacturing sector in period 1. In period 0, capital is allocated between the manufacturing sector and the numeraire sector to seek a higher rate of return on capital. The condition that the rates of return in the two sectors are equalized is

$$(1-\theta) f\left(\overline{k}^i - \tilde{x}_1^i\right) + \theta f\left(\overline{k}^i - \tilde{x}_2^i\right) = (1-\theta)\overline{p}_1^i + \theta \overline{p}_2^i + \tilde{\tau}^i\left(\tilde{x}_1^i\right) - \tilde{c}^i\left(\tilde{x}_1^i\right). \tag{14}$$

The left-hand side and the right-hand side are the total (periods 1 and 2) return on capital in the numeraire sector and the manufacturing sector, respectively. The equilibrium amount of capital in the manufacturing sector in equation (14) is

$$\tilde{x}_1^i = \frac{(1-\theta)\overline{p}_1^i + \theta \overline{p}_2^i - f\left(\overline{k}^i\right)}{\gamma - \frac{1}{2}a(1-\sigma)} \tag{15}$$

According to equation (5), the government's welfare under the lobbying game is

$$\widetilde{\Omega}^i = (1-\theta)\omega^i\left(\tilde{x}_1^i, \overline{p}_1^i + \tilde{\tau}^i\left(\tilde{x}_1^i\right)\right) + \theta\omega^i\left(\tilde{x}_1^i, \overline{p}_2^i + \tilde{\tau}^i\left(\tilde{x}_1^i\right)\right) + a\tilde{c}^i\left(\tilde{x}_1^i\right)\tilde{x}_1^i. \tag{16}$$

Finally, we have to verify the supposition that $\tilde{x}_2^i = \tilde{x}_1^i$. There is no incentive for capital in sector N to move to sector M in period 2 if

$$f\left(\overline{k}^i - \tilde{x}_1^i\right) \geq \overline{p}_2^i + \tilde{\tau}^i\left(\tilde{x}_1^i\right). \tag{17}$$

This condition can be verified by using equations (3), (10), and (15). Because capital in the manufacturing sector is irreversible, the owners of capital in the manufacturing sector cannot move their capital to seek the higher return in the numeraire sector, so the rates of return on capital in both sectors cannot be equalized. Therefore, the equilibrium rate of return in the numeraire sector is higher than that in the manufacturing sector. Importantly, the protection raises only the rate of return in sector M.

3.2 Import Tariff Prohibition Agreements

Now we allow the government to have an opportunity to precommit to an agreement that prohibits import tariffs before the lobbying game begins. Under the agreement, no lobbies can be formed, and the expectation of a tariff is eliminated. Therefore, capital owners anticipate that

$\tau^i = 0$ and $c^i = 0$ in Stages 1 and 2.

The returns on capital in the manufacturing sector in both periods are $r^i_{M,1} = p^w + \zeta_1$ and $r^i_{M,1} = p^w + \zeta_1$ respectively. The condition that the expected rates of return in the two sectors are equalized is

$$(1-\theta) f\left(\overline{k}^i - x^i_1\right) + \theta f\left(\overline{k}^i - x^i_2\right) = (1-\theta)\,\overline{p}^i_1 + \theta \overline{p}^i_2. \tag{18}$$

At the beginning of Period 2, the local price of the manufacturing good decreases because the transportation cost declines. The rate of return on capital in the manufacturing sector falls, and capital owners prefer to move their capital to the numeraire sector. However, because capital is irreversible after being transformed to the manufacturing sector, the amount of capital in the manufacturing sector in period 2 is equal to that in period 1, i.e., $x^i_2 = x^i_1$. Thus, equation (18) is reduced to

$$f\left(\overline{k}^i - x^i_1\right) = (1-\theta)\,\overline{p}^i_1 + \theta \overline{p}^i_2, \tag{19}$$

where $\underline{x}^i_1$ is the equilibrium amount of capital in the manufacturing sector in period 1 under the import tariff prohibition agreement.

The equilibrium allocation of capital in the manufacturing sector in period 1 can be solved explicitly as

$$\underline{x}^i_1 = \frac{(1-\theta)\,\overline{p}^i_1 + \theta \overline{p}^i_2 - f\left(\overline{k}^i\right)}{\gamma}. \tag{20}$$

According to equation (5), the government's welfare under the tariff prohibition agreement, denoted by $\underline{\Omega}^i$, is

$$\underline{\Omega}^i = (1-\theta)\,\omega^i\left(\underline{x}^i_1, \overline{p}^i_1\right) + \theta \omega^i\left(\underline{x}^i_1, \overline{p}^i_2\right). \tag{21}$$

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 (15) and (20) to compare capital allocations. We can show that

$$\widetilde{x}^i_1 = \frac{\gamma}{\gamma - \frac{1}{2}a\,(1-\sigma)}\underline{x}^i_1 > \underline{x}^i_1. \tag{22}$$

This shows that the lobbying creates *overinvestment* in the manufacturing sector, i.e., $\widetilde{x}^i_1 > \underline{x}^i_1$. 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 the manufacturing sector in both periods. Therefore, capital owners invest more of their capital in the manufacturing sector than they would do in the presence of the agreement. Note that the level of capital under free trade is constrained-efficient; if capital in the manufacturing sector were to be reversible, capital in the manufacturing sector under free trade would be higher in period 1 and lower in period 2.

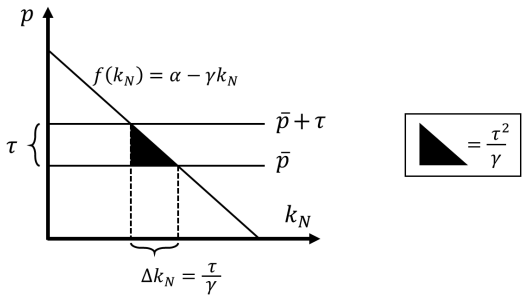

Figure 2: The relationship between γ and the welfare loss from capital misallocation.

The government considers the gains and the losses from signing the agreement. Without the agreement, the government would receive a political contribution. The welfare gain depends on the government's bargaining power (captured by σ), the government's valuation on political contributions (captured by a), and the additional capital that would be allocated to the manufacturing sector (captured by the γ). With the agreement, the country could prevent welfare loss from capital misallocation (captured by the γ). Figure 2 shows an example of the relationship between the welfare loss from capital misallocation (the black triangle) and γ in an environment where $\sigma = 0$. The larger the slope of the marginal product of capital, the smaller the deadweight loss.

According to equation (16) and (21), the government gains from committing to the agreement if

$$\underline{\Omega}^i - \widetilde{\Omega}^i = \frac{a^2 \left((1-\theta)\, \overline{p}_1^i + \theta \overline{p}_2^i - f\left(\overline{k}^i\right) \right)^2 \left((1-\sigma)^2 - 4\gamma\sigma \right)}{8\gamma \left(\gamma - \frac{1}{2} a \left(1-\sigma\right) \right)^2} > 0$$

This statement holds if and only if $\sigma < \overline{\sigma}(\gamma) = 1 - 2\left(\sqrt{\gamma^2+\gamma} - \gamma\right)$. The function $\overline{\sigma}(\gamma)$ is strictly decreasing in γ and has the properties: $\overline{\sigma}(0) = 1$ and $\lim_{\gamma \to \infty} \overline{\sigma}(\gamma) = 0$. Proposition 1 summarizes the above result.

Proposition 1. *The government gains from the tariff prohibition agreement if and only if* $\sigma < \overline{\sigma}(\gamma)$, *where* $\overline{\sigma}(\gamma) = 1 - 2\left(\sqrt{\gamma^2+\gamma} - \gamma\right)$.

The intuition behind this proposition follows straightforwardly from the tradeoff faced by the government. The size of political contributions depends on the government's bargaining power, and the welfare loss from capital misallocation depends on the elasticity of investment with respect to rate of return. A government with low bargaining power ($\sigma < \overline{\sigma}(\gamma)$) gains from signing the agreement because the gain from political contributions is relatively small compared to the welfare loss from the distorted capital allocation. This result is consistent with Maggi and Rodriguez-Clare (1998).

Figure 3 illustrates the result in Proposition 1. The horizontal and vertical axes show the values of σ and θ, respectively. The vertical line at $\sigma = \overline{\sigma}(\gamma)$ divides the area into two regions: the left area, which is denoted by G^T, represents the parameter space in which the government gains from

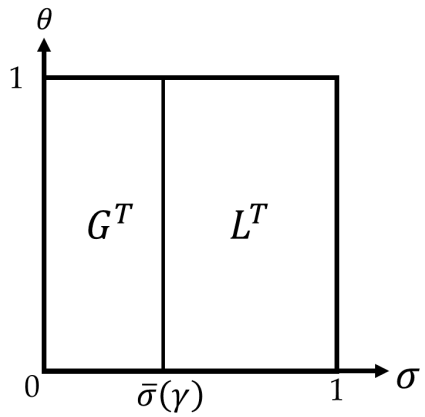

Figure 3: Gain (G^T) and Loss (L^T) from the Tariff Prohibition Agreement

the agreement, and the right area, which is denoted by L^T, represents the parameter space in which the government loses from the agreement.

When γ increases, the supply for capital in the manufacturing sector is less inelastic; a smaller amount of capital responds to the tariff, and the overinvestment inefficiency is reduced. Since the welfare loss from overinvestment is smaller, the benefit from the tariff prohibition agreement disappears. As $\gamma \to \infty$, the overinvestment $(\widetilde{x}_1^i - \underline{x}_1^i)$ problem in the manufacturing sector is completely eliminated. In this case, the threshold $\overline{\sigma}(\gamma)$ converges to zero, and the government always chooses positive tariff and then receives the political contribution regardless of its bargaining power. With the same intuition, the overinvestment problem becomes more severe as $\gamma \to 0$. The threshold $\overline{\sigma}(\gamma)$ converges to one. In this case, committing to the trade agreement becomes more beneficial.

Note that the result in Proposition 1 is independent of θ. To understand the intuition, we should consider the lobbying game as two negotiations in two separate time periods. The sizes of the tradeoffs in the two periods are proportional. The values of σ for which the government wants to sign the agreement in period 1 are identical to those in period 2. Furthermore, the weighted averages of welfare under free trade and under the lobbying game are affected by θ in an identical manner. As a result, the threshold of σ is independent of θ and the curve in Figure 3 is a vertical line.

4 Export Subsidies and Export Subsidy Agreements

In this section, we consider the lobbying game in an export country. Without loss of generality, we select an arbitrary country $j \in (1/2, 1]$. Unlike in Section 3, the lobby group in the manufacturing sector lobbies for an export subsidy rather than a tariff.

4.1 Export Subsidies

As in Section 3, the lobbying game is solved using backward induction.

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

$$p_1^j = p^w - \zeta_1 + \tau^j$$
$$p_2^j = p^w - \zeta_2 + \tau^j.$$

A reduction in the transportation cost from ζ_1 to ζ_2 raises the local price and the rate of return on capital in the manufacturing sector. As a result, in Period 2, capital owners would like to move their capital to the manufacturing sector until the rates of return in the two sectors are equal. This can be described formally as

$$f\left(\overline{k}^j - \widetilde{x}_2^j\right) = \overline{p}_2^j + \tau^j.$$

In equilibrium, the amount of capital in the manufacturing sector is

$$\widetilde{x}_2^j = \frac{\overline{p}_2^j + \tau^j - f\left(\overline{k}^j\right)}{\gamma}. \tag{23}$$

The rate of return on capital rises to $\overline{p}_2^j + \tau^j$ in both the numeraire sector and the manufacturing sector. This is in contrast to the tariff case analyzed above, in which the protection τ^i raises only the rate of return on capital in the manufacturing sector.

When negotiating in period 1, the government and the lobby foresee the outcome in the last period, and they use Nash bargaining to negotiate on the optimal subsidy rate and political contribution.

The optimal subsidy rate $\widetilde{\tau}^j\left(x_1^j\right)$ and political contribution $\widetilde{c}^i\left(x_1^i\right)$ satisfy

$$\begin{aligned}\widetilde{\tau}^j\left(x_1^j\right) = \underset{\tau^j}{\operatorname{argmax}} \Big\{ & (1-\theta)\,\omega^j\left(x_1^j, \overline{p}_1^j + \tau^j\right) + \theta\omega^j\left(x_2^j, \overline{p}_2^j + \tau^j\right) \\ & + a\left[(1-\theta)\left(\overline{p}_1^j + \tau^j\right) + \theta\left(\overline{p}_2^j + \tau^j\right)\right] x_1^j \Big\}\end{aligned} \tag{24}$$

$$\widetilde{c}^j\left(x_1^j\right) = (1-\sigma)\,\frac{\triangle^j\left(x_1^j, \widetilde{\tau}^j\left(x_1^j\right)\right)}{a x_1^j} + \sigma\widetilde{\tau}^j\left(x_1^j\right) \tag{25}$$

After we substitute $\widetilde{x}_2^j$ from equation (23), the optimal subsidy rate can be solved explicitly as

$$\widetilde{\tau}^j\left(x_1^j\right) = \frac{\gamma}{\gamma+\theta} a x_1^j. \tag{26}$$

When we compare $\widetilde{\tau}^j\left(x_1^j\right)$ in equation (26) with $\widetilde{\tau}^i\left(x_1^i\right)$ in equation (10), we observe that

$\widetilde{\tau}^j(x_1) \leq \widetilde{\tau}^i(x_1)$ for all $x_1 \geq 0$. In other words, given the same initial capital allocation, the tariff protection is larger than the subsidy. This result is broadly consistent with the observation that before the GATT, the rates of export subsidies were lower than the rates of import tariffs.[7] Our argument is that the subsidy rate is lower because the marginal benefit that the government and the lobby receive from protection is eroded and free ridden by the capital owners who move their capital to the protected sector in period 2.

The welfare loss in equation (7) can be simplified to

$$\triangle^j\left(x_1^j, \widetilde{\tau}^j\right) = \frac{\gamma+\theta}{2\gamma}\left(\widetilde{\tau}^j\left(x_1^j\right)\right)^2. \tag{27}$$

Substituting equations (26) and (27) into equation (25) simplifies the equilibrium contribution in this lobbying game to

$$\widetilde{c}^j\left(x_1^j\right) = \frac{\gamma}{(\gamma+\sigma)}\frac{a(1+\sigma)}{2}x_1^j. \tag{28}$$

The net benefit to the government from the protection is

$$g^j\left(x_1^j\right) \equiv \left(\widetilde{c}^j\left(x_1^j\right) - \frac{\triangle^j\left(x_1^j, \widetilde{\tau}^j\right)}{ax_1^j}\right)x_1^j = \frac{\gamma}{(\gamma+\sigma)}\frac{a\sigma}{2}\left(x_1^j\right)^2. \tag{29}$$

In period 0, capital $\widetilde{x}_1^j$ is allocated so that the rates of return in the two sectors are equal

$$(1-\theta)f\left(\overline{k}^j - \widetilde{x}_1^j\right) + \theta f\left(\overline{k}^j - \widetilde{x}_2^j\right) = (1-\theta)\overline{p}_1^j + \theta\overline{p}_2^j + \widetilde{\tau}^j\left(x_1^j\right) - \widetilde{c}^j\left(x_1^j\right). \tag{30}$$

The left-hand side and the right-hand side are the total (Periods 1 and 2) returns on capital allocated in the numeraire sector and the manufacturing sector, respectively.

Using equations (23), (26), (28), the equilibrium amount of capital in the manufacturing sector in period 1 is

$$\widetilde{x}_1^j = \frac{2(1-\theta)(\gamma+\theta)\left(\overline{p}_1^j - f\left(\overline{k}\right)\right)}{\gamma\left[2(1-\theta)(\gamma+\theta) - a(1-2\theta-\sigma)\right]}. \tag{31}$$

According to equation (5), the government's welfare under the lobbying-for-export-subsidy game is

$$\widetilde{\Omega}^j = (1-\theta)\omega^j\left(\widetilde{x}_1^j, \overline{p}_1^j + \widetilde{\tau}^j\left(\widetilde{x}_1^j\right)\right) + \theta\omega^j\left(\widetilde{x}_1^j, \overline{p}_2^j + \widetilde{\tau}^j\left(\widetilde{x}_1^j\right)\right) + a\widetilde{c}^j\left(\widetilde{x}_1^j\right)\widetilde{x}_1^j. \tag{32}$$

4.2 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 $\tau^j = 0$. In period 2, after the local price of the manufacturing good increases due to the decrease in the transportation

[7] This asymmetry was discussed by Rodrik (1995).

cost, capital moves from the numeraire sector to the manufacturing sector. Therefore, the returns on capital in both sectors are equalized in both periods. The equilibrium levels of capital in the manufacturing sector in periods 1 and 2, denoted by $\underline{x}_1^j$ and $\underline{x}_2^j$, satisfy

$$f\left(\overline{k}^j - \underline{x}_1^j\right) = \overline{p}_1^j$$
$$f\left(\overline{k}^j - \underline{x}_2^j\right) = \overline{p}_2^j.$$

The equilibrium capital allocations are given by

$$\underline{x}_1^j = \frac{\overline{p}_1^j - f\left(\overline{k}^j\right)}{\gamma} \tag{33}$$
$$\underline{x}_2^j = \frac{\overline{p}_2^j - f\left(\overline{k}^j\right)}{\gamma}.$$

Under the export subsidy prohibition agreement, the government's welfare is

$$\underline{\Omega}^j = (1-\theta)\,\omega^j\left(\underline{x}_1^j, \overline{p}_1^j\right) + \theta\omega^j\left(\underline{x}_2^j, \overline{p}_2^j\right). \tag{34}$$

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 amount of capital in the manufacturing sector under the equilibrium export subsidy and under free trade. According to equations (31) and (33), capital misallocation can be calculated explicitly as

$$\tilde{x}_1^j - \underline{x}_1^j \begin{cases} < 0 & \text{if } 1-\sigma < 2\theta \\ = 0 & \text{if } 1-\sigma = 2\theta \\ > 0 & \text{if } 1-\sigma > 2\theta \end{cases}$$

The characteristic of capital misallocation depends on two parameters: σ and θ. The amount of capital in the manufacturing sector in period 1 would be underinvested if $1-\sigma < 2\theta$ and overinvested if $1-\sigma > 2\theta$. The intuition is straightforward. Capital misallocation depends on two opposing effects. First, when the lobby's bargaining power $(1-\sigma)$ is large, the share of economic rents from the export subsidy in the manufacturing sector in period 1 is large. Thus, firms would overinvest capital in the manufacturing sector. Second, the free-rider problem, which is captured by θ, discourages investment in the manufacturing sector. Capital owners have an incentive to invest in the numeraire sector in period 1 and then in period 2 reallocate their capital to the manufacturing sector to free ride on the economic rents from the export subsidy. Thus, the free-rider problem encourages underinvestment.

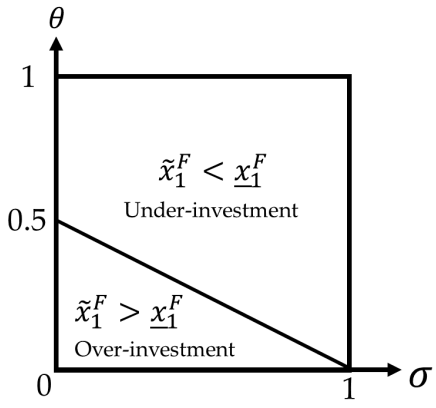

Figure 4: Overinvestment and underinvestment.

When the lobby's bargaining power is sufficiently small compared to the free-rider problem, the second effect dominates the first effect, and the amount of capital in the manufacturing sector is underinvested. In contrast, when the lobby's bargaining power is sufficiently large compared to the free-rider problem, the first effect dominates the second effect, and the amount of capital in the manufacturing sector is overinvested.

Figure 4 illustrates the overinvestment and underinvestment regions. In Figure 4, the northeast region (where θ and σ are sufficiently high so that $1-\sigma < 2\theta$) represents the underinvestment problem while the southwest region (where θ and σ are sufficiently small so that $1-\sigma > 2\theta$) represents the overinvestment problem.

Next, we analyze the welfare change from the export subsidy prohibition agreement. According to equations (32) and (34), the government's welfare gain from committing to the export subsidy prohibition agreement is

$$\underline{\Omega}^j - \widetilde{\Omega}^j = \frac{a^2\left(\overline{p}_1^j - f\left(\overline{k}^j\right)\right)^2(1-\theta)}{2\gamma\left[a(1-\sigma)-2(1-\theta)(\gamma+\theta-a)-2a\right]^2}Q(\sigma,\theta), \tag{35}$$

where $Q(\sigma,\theta) \equiv 4\theta(\theta(1+\sigma)-1)-4\gamma\sigma(1-\theta)+(1-\sigma)^2$. The government receives welfare gain from committing to the agreement if $Q(\sigma,\theta) > 0$ and receives welfare loss from committing to the agreement if $Q(\sigma,\theta) < 0$.

Proposition 2 summarizes this finding.

Proposition 2. *The government gains from the agreement to prohibit export subsidies if and only if (i) θ is sufficiently high or (ii) θ and σ are sufficiently low.*

Figure 5 illustrates the G^S and L^S regions in which the government gains and loses from the export subsidy prohibition agreement, respectively. The shapes of these two regions depend only on the values of σ and θ. For a middle-range value of γ, the government gains from the export subsidy prohibition agreement if (i) θ is sufficiently high or (ii) both θ and σ are sufficiently low.

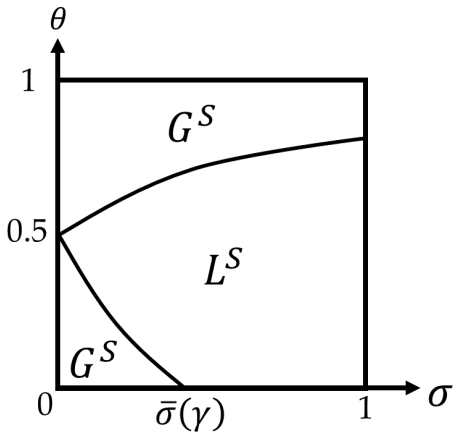

Figure 5: *Gain* (G^S) and *Loss* (L^S) from the subsidy prohibition

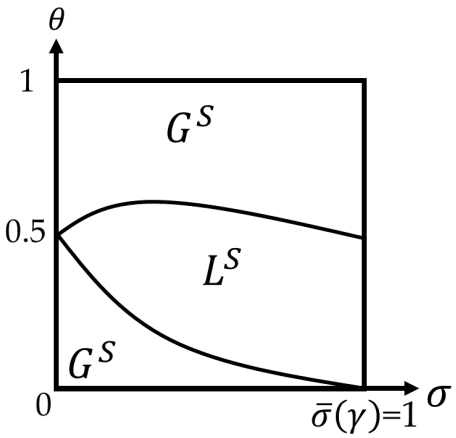

Figure 6: *Gain* (G^S) and *Loss* (L^S) from the subsidy prohibition ($\gamma \to 0$)

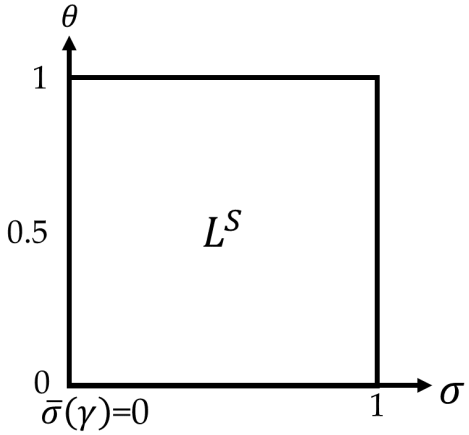

Figure 7: *Gain* (G^S) and *Loss* (L^S) from the subsidy prohibition ($\gamma \to \infty$)

In the first case, as θ approaches one, Period 1 becomes shorter, so the political contribution and the welfare loss from capital misallocation are converging to zero. However, the political contribution decreases at a faster rate. An increase in θ has two negative effects on the total contribution: the size of the protected sector $\widetilde{x}_1^j$ and the political contribution per unit of capital $c^j\left(\widetilde{x}_1^j\right)$ both decrease. Therefore, for θ sufficiently close to one, the decrease in the political contribution dominates the decrease in the welfare loss and the government is better off under the subsidy agreement.

In the second case, when σ and θ are low, the government also gains from committing to the agreement because the agreement helps the government eliminate overinvestment in period 1. The intuition is similar to the rationale of import tariff prohibition agreement in Section 3. The only difference is that, in the case of subsidy agreement, the duration of Period 1 affects the shape of the G^S region. This is because an increase in θ implies the free-rider problem which eliminates the gain from export subsidy in Period 2. The political contribution that the government receives becomes smaller. Thus, the government gains from the subsidy agreement only if the government's bargaining power is sufficiently low.

Now we study the comparative statistics of the G^S and L^S regions in Figure 5. Because the function Q has only one parameter (γ), the shapes of the G^S and L^S regions depend only on γ . To study how these regions change as γ changes, we consider the two extreme cases: $\gamma \to 0$ and $\gamma \to \infty$. Figure 6 shows the G^S and L^S regions generated numerically for $\gamma \to 0$. Comparing Figure 5 with Figure 6, we see that the L^S region shrinks and the G^S region grows as γ drops to zero. The term γ is the slope of the demand for capital in the numeraire sector; it is positively related to the elasticity of the demand for capital in this sector. The higher the value of γ, the more responsive is the demand for capital to the change in the rate of return in the numeraire sector. As discussed in Section 3, for $\gamma \to 0$, investment is highly responsive to export subsidy. The overinvestment or underinvestment is large, and the agreement is more beneficial for the government. Therefore, the G^S region expands as $\gamma \to 0$. On the other hand, in Figure 7, for $\gamma \to \infty$, investment in period 1 is unresponsive to protection. Thus, the agreement has no benefit to the government and the G^S region disappears.

5 The Consensus on Simple Agreements

In this section, we suppose that the small countries participate in a WTO meeting, and each of the countries votes for an import tariff prohibition agreement and an export subsidy prohibition agreement. There are four possible outcomes: (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 conditions under which the majority of the small countries would vote for the agreement to ban export subsidies but allow import tariffs (over the other types of simple agreements).

Proposition 3 states the main result of this paper.

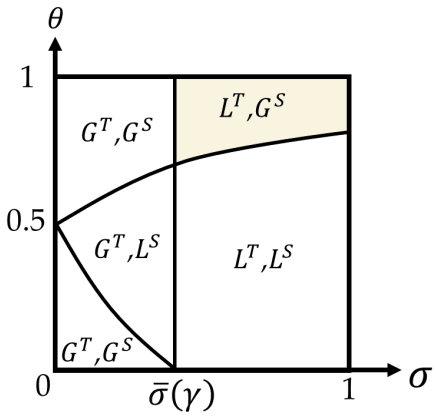

Figure 8: Gains and Losses from subsidy prohibition and tariff prohibition

Proposition 3. *Among simple trade agreements, an agreement that prohibits only export subsidies is optimal when σ and θ are sufficiently high.*

Figure 8 illustrates the idea of Proposition 3. The figure combines Figures 3 and 5. We are interested in the northeast region, in which the agreement that prohibits only export subsidies provides higher welfare than the following simple agreements: (i) the agreement that prohibits both tariffs and export subsidies, (ii) the agreement that prohibits only tariffs, and (iii) the agreement that prohibits nothing.

Proposition 1 and Proposition 2 shed light on the outcome of the majority vote. According to Proposition 1, whether the government of an importing country 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 of an export country depends on θ and σ. The government would vote for an export subsidy agreement if either (i) the free-rider problem in its country is severe or (ii) the free rider problem is not severe but the government's bargaining power is sufficiently low. 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 how much the government could receive in political contributions.

Thus, by majority vote, the consensus would be to allow for import tariffs but prohibit export subsidies if the majority of the governments of the import countries have sufficiently large bargaining power, and the majority of the export countries are facing free-rider problems in their countries.

6 Conclusion

In this paper, we propose a simple small-country model 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 government has high bargaining power and capital moves fast, the optimal agreement prohibits only export subsidies and allows the use of tariffs.

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